
Final Program

Thirty-Sixth Annual Meeting

International Neuropsychological Society

February 6-9, 2008
Waikoloa, Hawaii, USA

WEDNESDAY, FEBRUARY 6, 2008

9:00 AM–12:00 PM

Wednesday Morning CE Workshops
Room: Refer to CE Program for room assignments

1:00–4:00 PM

Wednesday Afternoon CE Workshops
Room: Refer to CE Program for room assignments

4:45–6:15 PM

Paper Session 1
Aging
Room: King's Ballroom

1. SCHRETLEN, DJ Abnormal Neuropsychological Test Performance by Normal Healthy Adults.
2. CHANG, Y Associative Memory in Normal Aging and Individuals with Mild Cognitive Impairment.
3. DOTSON, V Age, Depressive Symptoms, and Longitudinal Cognitive Decline in Older Adults.
4. SMITH, GE The IMPACT Study: A Randomized Controlled Trial of a Brain-Plasticity-Based Training Program for Age-Related Cognitive Decline.
5. MOELTER, ST Apolipoprotein Genotype Mediates Serial Position Effects in Healthy Older Adults.

4:45–6:15 PM

Paper Session 2
Multiple Sclerosis
Room: Queen's Ballroom

1. PRAKASH, RS Material-specific lateralization of memory encoding in Multiple Sclerosis.
2. NELSON, A Therapeutic Misconception and Neuropsychological Impairment in Multiple Sclerosis.
3. DEERY, BJ Longitudinal Investigation of Attention and Executive Function in Pediatric Multiple Sclerosis and Acute Disseminated Encephalomyelitis.
4. JULIAN, LJ Depression and Cognitive Functioning are Differential Predictors of Disability in Valued Life Activities in Multiple Sclerosis (MS).
5. BASSO, MR Informed Consent Capacity In Multiple Sclerosis: Some Improvement and Some Residual Incapacity.

4:45–6:15 PM

Symposium 1
A Critical Examination of fMRI in Neuropsychology: The Assumptions, the Pitfalls, and the Future.
Chair: Frank Hillary
Room: Monarchy Ballroom

1. HILLARY, FG A critical examination of fMRI in neuropsychology: the assumptions, the pitfalls, and the future.
2. BANDETTINI, PA What fMRI can, can't, and might do.
3. SAYKIN, AJ Computational and Conceptual Challenges in Integrating Neuroimaging and Genomics.
4. HILLARY, FG Functional imaging in neuropsychological disorders: a call for greater methodological rigor.

4:45–6:15 PM**Poster Session 1: Pediatric Assessment, Language, Emotion
Room: Water's Edge Ballroom****Child - Assessment**

1. CATO JACKSON, MA Neurovascular, MRI and Neurocognitive Risk Factors in Sickle Cell Disease: A Case Study with Hb SS and Moyamoya.
2. CHAN, RC Developmental profile of multitasking performance in healthy school-aged children: A preliminary report.
3. CHODKOWSKI, B Heterogeneity of Reading Difficulty in Adolescents.
4. HALE, CR A Cluster Analytic Study of the WISC-IV in Children Referred for Psychoeducational Assessment.
5. HERRERA, NJ Neuropsychological and Behavioral Performance in Children with Sleep Disordered Breathing.
6. HOLDNACK, J Development of Parent-Education Adjusted Norms for NEPSY-II Subtests.
7. JOHNSON, CE Executive Functioning and Adaptive Behavior in 2 year-old Children with VLBW.
8. KATZENSTEIN, J Cognitive and Linguistic Catch-Up Among Internationally Adopted Children.
9. ARMENGOL, C Predictors of Reading Speed and Comprehension in Mexican Elementary School Children.
10. RYAN, M * Elithorn Mazes in Children: What does it Measure?
11. SALVADOR, J Analysis of neuropsychological process the preschoolers need to consolidate and acquisition before reading/writing learning.
12. SEBREE, M * Working Memory: Association Between Cognitive Measures and the BRIEF Scale Among Participants in the NIH MRI Study of Normal Brain Development.
13. SOUBBOTINA, M The WCST as a Measure of Executive Functioning.

Emotion

14. AUDINO, BA Negative Emotion Increases Oral Communication Disturbances in Healthy Students.
15. BARBOUR, TA A New Paradigm to Evoke Spiritual Feelings in the fMRI Environment.
16. COX, DE Neuropsychological and Psychophysiological Correlates of Anger Expression Styles.
17. GOJMERAC, C * Age-related Changes in Emotion Regulation.
18. HAYES, CJ Olfactory Disgust in Preclinical Huntington's Disease.
19. LONG, EA Facial Affect Labeling and Interpretation in Bipolar Adolescents.
20. MIKOS, AE * Emotion Self-Perception in Parkinson Disease: Beyond the Masked Face.
21. RAU, HK Neuroticism and the Influence of Emotional Distractors on Cognitive Task Performance.
22. RAU, HK Attention, Executive Control, and Neuroticism: The Effect of Verbal Versus Nonverbal Threats.
23. SUZUKI, T Vocal Expression of Emotion in Schizophrenic patients.
24. ZAHODNE, LB Changes in Apathy and Depression over Time among Patients with Parkinson's Disease.
25. ZAHODNE, LB Profiles of Apathy among Parkinson's Patients in the United States.

Imaging: Functional

26. DAVIS, N An fMRI Study of the Neural Correlates for Exact and Approximate Calculations in Children.

Language: Aphasia

27. BEESON, PM Lexical-Semantic and Sublexical Influences on Reading and Spelling in Acquired Alexia and Agraphia.
28. MARSHALL, RS A Single Subject Study of Unilateral Nostril Breathing in Aphasia.
29. MARSHALL, RS Massed Practice in Aphasia: Necessary, but not Sufficient?
30. RAPCSAK, SZ Are Dissociations between Reading and Spelling Common in Individuals with Acquired Alexia and Agraphia?
31. RAPCSAK, SZ Cognitive Mechanisms of Phonological Dyslexia and Dysgraphia.
32. RODRIGUEZ, AD Is Boston Naming Test and Action Naming Test Performance Comparable in Individuals with Aphasia?
33. SCHWARTZ, MF Assistive Technology for Spoken Language in Aphasia: Test of a Portable Enhancement of the SentenceShaper® Program.
34. STEFANATOS, GA Auditory Attention to Speech in Aphasia: Response to Pharmacologic Treatment.

Language: Other (e.g., Naming, Fluency, Reading)

35. ANDRESEN, E The Prototypicality of Three Priming Tasks.
36. CUTTING, LE Children with Specific Reading Comprehension Impairments: Deficits in Contextual but not Isolated Word Reading Speed?
37. CLEMENTS-STEPHENS, AM The Neurobiology of Single Word Reading in Adolescents with Varying Degrees of Reading Ability.
38. CLEMENTS-STEPHENS, AM * Multi-modal sentence processing reveal common language network.
39. HAUGRUD, NA The Effects of Healthy Aging and Alzheimer's Disease on Strategy Use During Performance on Verbal Fluency Tests.
40. IAMPIETRO, M Intact Performance in Extremely Low Birth Weight Children (< and > 750 grams) on Noun Fluency and Clustering Strategy at Age Six.
41. PATRICK, CJ Reading Ability Moderates the Word Letter Phenomenon (WLP): Support for a Dual Route Model.
42. PATRICK, CJ Reading Ability Moderates Removal of the Word Letter Phenomenon (WLP) in Lateralized Stimuli Displays: Elucidating the role of the Right Hemisphere.

43. RAYMER, AM Errorless Spelling Training in Acquired Dysgraphia.
 44. TLUSTOS, S * Neural Correlates of Sentence Comprehension under Degraded Speech.
 45. ALTMANN, L Effects of Task and Grammatical Complexity on Sentence Production in Parkinson's Disease.
 46. WRIGHT, HH Altering Instructions: Impact on Discourse Performance.
- Learning Disabilities/ADHD**
47. GUNNELL, JC Information Processing Speed in Adults with ADHD and/or LD.
 48. SUHR, J The Relationship of Smoking to Self-reported ADHD Symptoms in Young Adults.
 49. CAPOVILLA, AG Efficacy of an Intervention Procedure in Developmental Dyslexia.
 50. DELLAMEA, SC The Effect of ODD on Language Skills in ADHD.
 51. SUHR, J ADHD Diagnosis, ADHD Symptoms, and Risky Behavior.
 52. SUHR, J The Utility of Neuropsychological Assessment in Discriminating Between ADHD-Diagnosis and ADHD Symptom-Reporting Groups.
 53. FRYE, RE Neuropsychological Characteristics Associated with Reading Ability in Full Term and Prematurely Born Adolescents.
 54. FRYE, RE Context Dependent Impulsivity in Young Adults with Compensated Reading Disability.
 55. GOPIN, C * Persistence and Predictive Utility of Motor Dysregulation in Preschool ADHD.
 56. GUPTA, R Multiple Pathway Model: Predictor for Error Monitoring in ADHD.
 57. HALE, CR Halstead Category Test and WCST Performances of Children with ADHD and Children with NLD.
 58. HOKKANEN, L Executive Dysfunction in Adults with ADHD or Dyslexia.
 59. JOHNSON, LG CNS Vital Signs (CNSVS) as a Tool to Screen for ADHD/LD in Student Athletes.
 60. LESUEUR, L Further Considerations of the LD Diagnoses: How Neuropsychological Data Can Help Us Understand How the Brain Learns.
 61. MESMAN, GR A Comparison of the Double Deficit and Dual Route Theories of Dyslexia.
 62. OBRZUT, JE Verbal Memory Impairments in Reading Disabled Adolescents.
 63. PFLUGRADT, D A Functional Comparison of the Behavior Assessment System for Children and the Behavior Rating Inventory of Executive Function.
 64. PRESTON, AS Verbal and Visual Memory in Children with Dyslexia.
 65. SANTERRE-LEMMON, LE * Do Patterns of Cognitive Deficits Differ Across ADHD Subtypes?
 66. ALOIA, JC Rapid Naming Deficits May Simply Be Processing Speed Deficits in Children Diagnosed with Developmental Dyslexia.
 67. WALKOWIAK, JL Comparing Inhibition and Planning Performance in Children with ADHD/C and ADHD/PI.
 68. WALKOWIAK, JL Comparing Working Memory Performance in Children with ADHD by DSM-IV Subtype and Gender.
 69. BROOKS, BL Clinical Normative Data for the Weiss Functional Impairment Rating Scale in ADHD.
 70. WILDE, NJ Auditory Discrimination in Poor Readers and Children with Phonological Dyslexia.
- Other**
71. DORFLINGER, J The Relationship between Recommendation Follow-Through and Client Satisfaction in a Sample of Survey Responses in a Pediatric Neuropsychology Clinic.

6:15–7:45 PM

**INS Welcome Reception
 Room: Lagoon Lanai**

THURSDAY, FEBRUARY 7, 2008

7:20–8:50 AM

**Thursday Morning CE Workshops
 Room: Refer to CE Program for room assignments**

9:00–10:30 AM

**Paper Session 3
 Pediatric Neuropsychology/Autism
 Room: King's Ballroom**

1. HOOPER, CJ Adolescent Development of the Orbitofrontal Cortex Assessed by Reversal Learning Performance and Diffusion Tensor Neuroimaging.
 2. BAPP NEWMAN, J Neuropsychological Outcome in Preterm-Birth Preschoolers Is Linked to Gestational Age but Not to History of Bronchopulmonary Dysplasia.
 3. CONKLIN, HM Prediction of Clinical Response to Methylphenidate in Long-Term Survivors of Childhood Cancer.
 4. KLEINHANS, NM 5-HTTLPR Genotype is Associated with Biochemical Abnormalities in the Amygdala in Autism Spectrum Disorders.
 5. DAVIS, W The Claustrum in Autism and Typically Developing Male Children: A Quantitative MRI Study.

9:00–10:30 AM

Symposium 2
Cognitive Rehabilitation in Persons with MS: Cognitive and Pharmacological Approaches to Treatment
Chair: Yael Goverover
Room: Queen's Ballroom

1. GOVEROVER, Y Cognitive rehabilitation in persons with Multiple Sclerosis: Cognitive and pharmacological approaches to treatment.
2. GOVEROVER, Y An Evidence Based Review of Cognitive Rehabilitation for Persons with Multiple Sclerosis.
3. DELUCA, J Treating Learning Impairments Improves Memory Performance in Multiple Sclerosis: A Randomized Clinical Trial.
4. BASSO, M Self-Generated Encoding in Multiple Sclerosis: A Promising Rehabilitative Method.
5. CHRISTODOULOU, C Pharmacological Treatment of Cognitive Impairment in Multiple Sclerosis.

9:00–10:30 AM

Invited Symposium
Transdisciplinary Research Strategies For Neuropsychology
Chair: Elizabeth Kozora
Room: Monarchy Ballroom

1. KOZORA, E Transdisciplinary Research Strategies For Neuropsychology.
2. HART, T Opening the "Black Box": The Content and Process of Learning in Traumatic Brain Injury Rehabilitation.
3. PAUL, R Quantified Tractography in Older Individuals at Genetic Risk for Microvascular Disease.
4. BILDER, R Consortium for Neuropsychiatric Phenomics.

9:00–10:30 AM

Poster Session 2: Medical Disorders, Subcortical Dementia, Stroke
Room: Water's Edge Ballroom

Agnosia/Disordered Representations

1. BANOS, J Exploring Awareness after Right and Left Hemisphere Stroke: The Potential Role of Feedback and Generalization.
2. GLEASON, CE Anosognosia for Memory Problems Increases with Age and Language Deficits in a Sample of Community Dwelling Older Adults.

Aneurysms

3. DIAMOND, BJ Visual and Verbal Memory and Awareness in Anterior Communicating Artery Aneurysm: During and After Confabulation.
4. FIELDS, JA Post-Surgical Self-Report of Symptoms in Patients Recovering from Cerebral Aneurysm Surgery.
5. HRICIK, AJ Prevalence of Cognitive Dysfunction 1 year Following Subarachnoid Hemorrhage.
6. PEERY, S Risk Factors for Poor Neuropsychological Outcome after Subarachnoid Hemorrhage.
7. PEERY, S Neuropsychological Outcome after Anterior Communicating Artery Aneurysm Rupture.

Autoimmune Disorders (e.g., CFS, Lupus, Fibromyalgia)

8. BEKKEN, K The Use of Namenda in the Treatment of Mental Compromise in Fibromyalgia.
9. DONINGER, N Cognitive Function and Health Related Quality Of Life in Neuropsychiatric SLE.
10. SHUCARD, JL * The Contributions of Cognitive, Biological, and Psychosocial Factors to Depression in Systemic Lupus Erythematosus.
11. WARD, J Impaired Implicit Learning in Systemic Lupus Erythematosus.

Behavioral Neurology

12. TILLMAN, GD Reliability of Subjective Memory Rating in Predicting Neuropsychological Performance.
13. HAMMOND, JB Dopamine Modulates the Rate of Perceptual Switching in Parkinson's Disease.
14. HAMMOND, JB The Kinetic Depth Effect is Altered in Parkinson's Disease.
15. HOFFMAN, CE * Straight Gyrus Correlates with Disinhibition in Dementia.
16. KINGSLEY, KT The Neuropsychological Impact of a Bilateral Cerebellar Hemorrhage: A Case Study.

Dementia Subcortical (e.g., Huntington's, Parkinson's, PSP)

17. AMICK, M Verbal Fluency in Parkinson's Disease Patients with Subthalamic Nucleus Deep Brain Stimulation.
18. BOGDANOVA, Y * Numerical Cognition in PD: The Spatial Representation of Numerical Distance.
19. CAHN-WEINER, DA * Intra-putaminal Gene Transfer with AAV2-Neurturin (CERE-120) for Parkinson's Disease: Preliminary Neuropsychological Test Results.
20. FEFFER, LB An Analysis of Errors on the Wisconsin Card Sorting Test in Demented and Nondemented Patients with Parkinson's Disease or Huntington's Disease.
21. FLODEN, D Patients with Pre-operative Cognitive Impairment Show Disproportionate Cognitive Slowing Following STN-DBS for Treatment of Parkinson's Disease.
22. GALTIER, I Verbal and visuospatial memory profile in different stages of nondemented Parkinson disease patients.

23. GLISKY, M The Typical Cognitive Profile in Parkinson's Disease: Who Remains Cognitively Intact?
24. JEDRZKIEWICZ, M Bilateral Subthalamic Deep Brain Stimulation in Parkinson's Disease: The Relationship Between Pre-operative Cognitive Functioning and Post-operative Quality of Life and Mood.
25. KIRSCH-DARROW, L Apathy Measurement in Parkinson's disease: Comparing the UPDRS Item 4 and the Apathy Evaluation Scale.
26. KURTZ, S Automated Neuropsychological Assessment Metrics (ANAM) Tower Test Demonstrates Increased Planning Difficulties in Parkinson's Disease Patients.
27. LAGEMAN, SK Prevalence of Pre-Clinical Risk Factors for Neurodegenerative Disease in Parkinson's Disease Patients Presenting for Deep Brain Stimulation.
28. LOMBARDI, KM Contrast Sensitivity as a Contributor to Motor Dysfunction in Parkinson's Disease.
29. ANASTASIO, E Neuropsychological Functioning in Gene Positive but Pre-symptomatic Patients with Huntington's Disease.
30. MURPHY, MK Impulse Control Disorder Behaviors are Frequent in PD DBS Candidates and Unrelated to Medication Status.
31. NEHL, C Functional outcomes and quality of life in pre-diagnosed Huntington's disease: Seeking outcome measures for clinical trials.
32. PIROGOVSKY, E * Memory for Temporal Order in Presymptomatic Gene Carriers for Huntington's Disease.
33. SCHENKENBERG, T Verbal Fluency in Candidates for Deep Brain Stimulation (DBS) Surgery.
34. WEAVER, K Cognitive Decline and Corticostriatal Tract Integrity in Preclinical Huntington's Disease.
35. WINSTANLEY, FS Postoperative outcome of Deep Brain Stimulation (DBS) in an elderly population.

Hydrocephalus

36. LACY, M Executive Functioning in Children with Shunted Hydrocephalus.
37. HESTER, AL Neuropsychological Performance Following Lumbar Drain in Patients Undergoing Evaluation for Treatment of Normal Pressure Hydrocephalus.
38. MEDALIE, L Initiation deficits and adaptive dysfunction in youth with myelomeningocele and shunted hydrocephalus.
39. SWARTWOUT, MD Cognitive Posterior Attention Deficits in Spina Bifida Meningomyelocele Are Unrelated to Parent ADHD Ratings.
40. SWARTWOUT, MD Interactions of SES, IQ, and Achievement in Spina Bifida Meningomyelocele.

Medical Disorders

41. CERCY, SP Cognitive Dysfunction In A Case Of Pre-Treatment Diffuse Large B-Cell Lymphoma.
42. DORFMAN, A Autistic Symptomology and Cognitive Functioning in Tuberous Sclerosis Complex.
43. ELDER, J Neuropsychological profiles of patients with cardiovascular disease: Increasing levels of risk factors and memory impairment.
44. HOTH, KF * Cardiac Dysfunction is Associated with Cognition in Older Adults with Heart Failure.
45. HUIJBREGTS, S Diffuse Cognitive Impairment in Adolescents with Neurofibromatosis Type 1.
46. NABER, C Migraine Prodromes: A Complex Neurophysiologic Process of Cognitive, Emotional and Physical Symptoms.
47. NABER, C Mindfulness, Dialectical Behavior Therapy, and Vestibular Rehabilitation: A Transdisciplinary Approach to Coping with Vestibular Problems.
48. PATERSON, T Self-Reported Depressive Symptoms and Age Predict Medication Adherence in Successful Renal Transplant Patients.
49. POTTER, B The Reliability and Predictive Validity of a Neurocognitive Screening Battery to Identify Learning Problems in Children with Cancer.
50. PRIMEAU, M Does Preoperative Cognition Discriminate among Primary CNS Tumor Types?
51. STEPNOWSKY, C * Effect of Adherence with Sleep Apnea Treatment on a Psychomotor Vigilance Task.
52. SUHR, J Neuropsychological Impairment associated with Hypertension.

Neglect

53. KIM, SH Anatomical correlates of severe hemispatial neglect.
54. PAGLIUCA, G Neglect Dyslexia and the Reading System: Combining Classic Connectionist Models with Neuropsychological Disorders.

Other

55. LIOSSI, C Attentional bias for pain-related information in individuals developing chronic pain after Spinal Cord Injury.
56. BOURKE, R Neurobehavioural Function in Children with Sleep Disordered Breathing.
57. BOWERS, D Apathy in Non-Demented Parkinson Disease: Relationship to Psychophysiological Blunting.
58. BROWN, LN Sensory Temporal Processing in Parkinson's Disease.
59. DO, T Neuropsychological Indices of Cognitive Functioning in Early Parkinson's Disease.
60. FITZGERALD SMITH, J The Relationship between Sleep and Emotional Well-being in Individuals with Parkinson's disease with and without Deep Brain Stimulation.
61. HASSENSTAB, J Pre-diabetes: Brain Volumes, Inflammation, and Verbal Memory in Metabolic Syndrome.
62. JOHNSTONE, GR * The Neuropsychology of Spiritual Experience.
63. MOHN, KR Cognitive Safety of Pallidal Deep Brain Stimulation in Unusual Cases of Dystonia.
64. NAKASE-RICHARDSON, R Serial Yes/No Reliability After TBI: Implications for Emergence from the Minimally-Conscious State.
65. POUTIAINEN, E The Profile of Cognitive Impairment in Patients Resuscitated from Cardiac Arrest May Vary According to the Overall Severity of Cognitive Deficits.
66. SCHIEHSER, DM Behavioral Changes Associated with Apathy, Disinhibition, and Executive Dysfunction in Parkinson's Disease.
67. ZIMMERMAN, ME Neuropsychological Function and Cognitive Reserve in Obstructive Sleep Apnea.

Stroke

68. BENDER, HA Unawareness in a Interdisciplinary Rehabilitation Setting: A Case Study.
 69. GRIFFEN, JA The Effect of Driving Status on Community Integration in Stroke Survivors.
 70. VICKERY, C Cognitive profiles of subcortical stroke on the RBANS.
 71. MARSHALL, RS A Pilot Study on the Effect of Unilateral Nostril Breathing Following Stroke.
 72. MCKAY, C Self-Evaluation of Driving Simulator Performance Following Stroke.
 73. MULLIGAN, RC Endothelial Function Predicts fMRI Activity in the Medial Prefrontal Cortex.
 74. PARK, K plenium or parahippocampus involvement and its relationship to cognitive decline in posterior cerebral artery infarction.
 75. RAPPORT, LJ Circadian preference and cognitive performance among rehabilitation inpatients.
 76. TURKEN, MA Neuropsychological Profiles in Right Posterior Cerebral Artery Strokes: A Case Series.
 77. VAN HEUGTEN, C Cognitive impairments predict quality of life in stroke patients one year post stroke.
 78. VARUGHESE, S The Florida Mental Status Examination for Cognitive Evaluation after Stroke.

10:30–11:00 AM**Thursday Morning Coffee Break
Room: Grand Promenade and Exhibit Hall****10:45 AM–12:15 PM****Paper Session 4
Mild Cognitive Impairment
Room: King's Ballroom**

1. GIOVANNETTI, T Characterization of Everyday Functioning in Mild Cognitive Impairment: A Direct Assessment Approach.
 2. NORDLUND, A Two Year Outcome of Mild Cognitive Impairment Subtypes.
 3. MURPHY, K Episodic but not Semantic Autobiographical Memory is Reduced in Amnesic Mild Cognitive Impairment.
 4. DELANO-WOOD, L Disruption of Posterior Cingulate Integrity and Associations with Cognition in Mild Cognitive Impairment.
 5. CORREIA, S Grey and White Matter Changes on MRI and Diffusion-Tensor Imaging and Cognitive Function in Mild Cognitive Impairment.

10:45–11:45 AM**Invited Plenary: Translation: Neuroscience and Neuropsychology in Spatial Neglect.
Presented by Anna Barrett, Winner of the INS Early Career Research Award.
Room: Monarchy Ballroom****10:45 AM–12:15 PM****Symposium 3
Methods of Assessing Cognitive Trajectories in Outcomes Research and Clinical Practice
Chair: Gordon Chelune, Discussant: Kevin Duff
Room: Queen's Ballroom**

1. CHELUNE, GJ Methods of Assessing Cognitive Trajectories in Outcomes Research and Clinical Practice.
 2. MILLIS, SR Linear Mixed Models: Measuring Change.
 3. ATTIX, DK Trajectories of Normal Neuropsychological Change.
 4. CHELUNE, GJ Deriving Ipsative Trajectories of Cognitive Change.
 5. MARUFF, P Assessing Cognitive Change Versus Assessing Cognitive Impairment.

11:00 AM–12:30 PM**Poster Session 3: Assessment and Cross-Cultural Issues
Room: Water's Edge Ballroom****Assessment/Psychometrics**

1. ADDEO, R Brooks Functional Assessment Scale: Rasch Analysis of a new Brain Injury Functional Outcomes Measure.
 2. ALLEN, BJ Construct Validity Of The Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT) With Traditional Neuropsychological Measures.
 3. SOKAL, BH The Reliability and Validity of Self-Reported Footedness.
 4. BAERWALD, JP Are Cognitive Measures of Achievement Influenced by Personality Facets of Achievement Striving?
 5. BAKER, L Assessing Treatment Effects on Selective Attention in Clinical Trials for Memory-Impaired and Normal Older Adults Using a Computerized Version of the Stroop.
 6. CLARK, R Standardised and automated, touchscreen assessment of neuropsychological function.
 7. SIMON, E Controversy in Neuropsychology: Is NeuroTrax Computerized Cognitive Assessment Friend or Foe?
 8. BOUWENS, S Psychometric Properties of Goal Attainment Scaling Used for People with Cognitive Disorders: A Systematic Review.
 9. CARLOZZI, N Estimating Premorbid IQ in the Prodromal Phase of a Neurodegenerative Disease in the Predict-HD Cohort.
 10. COLEMAN, C Factor Structure of Phonological and Orthographic Awareness Tests.
 11. GARCIA-BARRERA, MA Derivation and Construct Validity Analysis of a Screener for Executive Functions.

12. PINEDA, DA Cross Cultural Validity Analysis Using SEM, of the Behavior Assessment System for Children in a Colombian Sample.
13. DICKINSON, MD Further Validation of a Non-Manual Trail Making Test.
14. ELOFSON, E Pilot Study of a Novel Virtual Reality Spatial Memory Test in Older Adults.
15. FERGUSON, CJ Executive Functioning, Impulsive Aggression and the Validity of a Laboratory Based Aggression Paradigm.
16. FREILICH, B Normative Data on a Multiple Choice Logical Memory Recognition Test for the Wechsler Memory Scale, 3rd Edition (WMS-III).
17. GOLDSTEIN, G Confirmatory Factor Analytic Studies of the Wechsler Scales in Autism.
18. GUILERA, G Decision validity and cut-off scores of the Spanish version of SCIP in a sample with Bipolar Disorder I.
19. HARVEY, DJ Examination of Group Response Consistency on the Frontal Systems Behavior Scale.
20. HARVEY, DJ Examination of Individual Response Consistency on the Frontal Systems Behavior Scale.
21. HILL, BD Confirmatory Factor Analysis of Working Memory, Processing Speed, and Mathematic Ability.
22. HOLDNACK, J Application of NEPSY-II Parent-Education Adjusted Norms in a Clinical Sample.
23. HOLMAN, GI Alternate Forms Reliability of Paper-and-Pencil and Computerized Mental Rotation Tasks.
24. BRIGIDI, BD Comparison of Test Effort in Subgroups of Individuals with Primary Malignant Brain Tumors.
25. JOHNS, E The Montreal Cognitive Assessment: Normative Data in the Community.
26. KEARNS, LA The MMPI-2 Response Bias Scale: Validation in a Sample of U.S. Veterans.
27. LONG, SF Feasibility and Utility of Prorating Trail Making Test Part B.
28. MAHURIN, RK * The Object Memory Test: Validity and Utility in Diverse Clinical Populations.
29. MIKOS, AE Concurrent validity between a computerized battery and the DRS-2 in the Cognitive Screening of Movement Disorders Patients.
30. MORRISON, C Using Demographically-Corrected Norms to Lateralize Seizure Foci in African Americans.
31. PARMENTER, BA * Within condition performance on the n-back paradigm.
32. PRIMI, R Neuropsychological Assessment of Oral Language in Brazilian Children.
33. PRIMI, R Validity Evidence for the Brazilian Reading Competence Test of Words and Non-Words.
34. ROGERS, K Introducing a New Measure of Empathy: The Cognitive and Emotional Empathy Questionnaire.
35. ROTHLIND, JC Self-appraisal of Neuropsychological Performance: Associations with Actual Test Scores and Regional Cortical and Subcortical Volumes Measured With MRI and Deformation Based Morphology.
36. RYAN, GP Does Processing Speed and Working Memory Relate to Academic Achievement?
37. RYAN, GP Response Consistency Across Multiple Processing Speed Tasks.
38. ATKINSON, TM * Interchangeable Use of Trail Making Test Variants During Serial Assessment.
39. ATKINSON, TM Group Neuropsychological Test Administration as an Alternative to Individual Test Administration.
40. BARLOW, A Cross-Validation of the MMSE Norms as Published by PAR.
41. SHIELDS, R 3- and 6-Month Re-Testing on WAIS-III Subtests: Practice Effects and Reliable Change Indices.
42. SITZER, TE Diagnostic Accuracy of Working Memory Measures in Alzheimer Disease: A Comparison of Digit Span Backward and Letter Number Sequencing.
43. STEWART, R Different Tests Have Different SD Sizes At Different Impairment Ranges And This Affects Accuracy In Test-Retest Situations.
44. STROESCU, I A Factor Analytic Examination of the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) in a Mixed Neurological Sample.
45. STRONG, C Validity of the CVMT after Traumatic Brain Injury.
46. THORNTON, GM Semantic and Phonemic Fluency Discrepancies: Normative Data and Differences Between MCI And AD Patients.
47. TURNER, TH * Insufficient Effort or Severe Impairment? Utility of the Test of Memory Malingering (TOMM) in a Memory Disorders Clinic.
48. UTTL, B Cross-validation of a Short Version of NAART (NAART 35) in Normal Healthy and Clinical Samples.
49. WARSCHAUSKY, S Modified Test Administration Using Assistive Technology: Preliminary Psychometric Findings with Typically Developing Children.
50. CARLOZZI, N * Individual and Combined Item Analyses Can Shorten Test Length for the University of Pennsylvania Smell ID Test.
51. ZGALJARDIC, DJ Performance on the Numbers and Letters Subtest of the Neuropsychological Assessment Battery (NAB) Screening Module in a Sample of Individuals with Acquired Brain Injury.

Cross-Cultural Issues

52. BAIRD, R Educational Quality and the Cognitive Performance of Minority and Caucasian HIV+ Subjects.
53. BENDER, HA Construct Validity of the NeSBHIS in a Neurological Sample.
54. BENNETT, J Assessing Creativity and Intelligence in an Ethnically Diverse Sample.
55. CYSIQUE, LA Neurobehavioral Effects of HIV Infection among Former Plasma Donors in rural China.
56. JANIS, PR Clock Drawing Test Differences in Healthy Hispanic and Non-Hispanic Older Adults.
57. JIMENEZ, DE Is Latina Caregiver's Knowledge of Alzheimer's Disease Influenced by Care Recipient's Degree of Cognitive Impairment?
58. PARK, S The Effects of Acculturation and Education upon Intelligence Test Performances in Korean Americans.
59. PONSFORD, JL The Influence of Cultural Background on Experiences and Beliefs about Traumatic Brain Injury and their Association with Outcome.
60. SILVERBERG, ND * Reading Level Accounts for Racial Differences in Neuropsychological Outcome from Traumatic Brain Injury.
61. SUAREZ, PA Performance on Tests of Everyday Functioning in Spanish Speakers with and without HIV Infection.
62. VERNEY, SP * Symptoms of Depression and Cognitive Functioning in Older American Indians.

Cross-Cultural Test Development

63. ARGOLLO-VIEIRA, NS Cross-cultural Adaptation of NEPSY Developmental Neuropsychological Assessment: Brazilian Pilot Study.
 64. ARGOLLO-VIEIRA, NS Cross-cultural Adaptation of "NEPSY Developmental Neuropsychological Assessment": Criterion Validation with WISC-III.
 65. BABBAGE, DR Does the World Need New Zealand Norms?
 66. GONTIER, JJ The Relationship Between Age and Performance in Trail Making Test in a Chilean Population.
 67. LANTING, SC The Clinical Utility of Two Modified Screening Measures in the Detection of Cognitive Impairment and Dementia in Canadian Aboriginal Seniors Referred to a Rural and Remote Memory Clinic: A Case Study Approach.

Other

68. COSLETT, HB Mental Motor Imagery as a Measure of Low Back Pain.
 69. CROSSLEY, M Joys and Challenges of Transdisciplinary Research and Practice: Neuropsychology in an Innovative Interprofessional Memory Clinic.
 70. CROSSLEY, M Interprofessional Diagnosis in a Memory Clinic for Rural and Remote Residents: The Contributions of Clinical Neuropsychology are Enhanced within the Context of a Diverse and Innovative Health-Care Team.
 71. LANTING, S Modifying Neuropsychological Assessment Protocols for Individuals Referred to a Rural and Remote Memory Clinic: Incorporating Insights and Research Methods from Human Geography and Cultural Anthropology.
 72. POOCK, J Interprofessional Research in a Rural and Remote Memory Clinic: The Role of Neuropsychology in Collaborative Research on Differential Diagnosis in Early Stage Dementia.
 73. D'ARCY, C Establishing and Evaluating an Interprofessional Rural and Remote Memory Clinic: Making Transdisciplinary Collaboration Work.
 74. LINCK, JF The Relationship Between the Saint Louis University Mental Status Examination (SLUMS) and other Neurocognitive Tests.
 75. MORDECAI, K The Use of Computer-Based Assessment for Detection of Cognitive Deficits in MCI.
 76. MORERE, DA Neuropsychology and Deafness: Relevant Issues for Critical Evaluation of the Data.
 77. DEAN, P Older Adult and Geriatric Issues in Neuropsychology and Deafness.
 78. REESMAN, J Pediatric and Young Adult Issues in Neuropsychology and Deafness.
 79. SAMEK, JR Supplemental Data of the Grooved Pegboard: Rule Violations, Time to Remove, and Dropped Pegs.

Dementia Alzheimer's Disease

80. FEARING, M Impact of Delirium on Cognitive Trajectory in Patients with Alzheimer's Disease.

Epidemiology

81. KAPLAN, E Epidemiologic Studies of the Clock Drawing Test: Findings from the Framingham Study.
 82. DEVINE, S Normative Data for the Clock Drawing Test: Results from the Framingham Offspring Cohort.
 83. RINN, W Normative and Clinical Characteristics of a Clock Drawing Test Protocol Using Large Preprinted Circle Stimuli.
 84. O'CONNOR, M Relationship of Mild Cognitive Impairment to Clock Drawing Performance in the Framingham Offspring Study.
 85. DENISON, H AD Pathology in Visual Association Cortex linked to Clock Drawing Performance in the Framingham Heart Study.

12:45–2:15 PM

Poster Session 4: Imaging, Cognitive Neuroscience, Demyelinating Diseases Room: Water's Edge Ballroom

Cognitive Neuroscience

1. ADAMSON, MM Neurocorrelates of Perspective-Dependent Spatial Memory in Middle-aged and Older Pilots.
 2. STUDAWAY, A Neuropsychological outcomes of children with sickle cell disease: A meta-analysis.
 3. CAMPBELL, MC Effects of Vim DBS for Essential Tremor on Working Memory.
 4. CARBON, C Prosopagnosia. Transdisciplinary links between neuropsychology, genetics, and cognitive neurosciences.
 5. CONSTANTINIDOU, F Common Object Categorization in TBI and Normal Aging: Executive Network Functioning and Implications for Rehabilitation.
 6. DUMER, AI Position effect in IGT performance.
 7. FARNHAM, S Slower Development of Visual Motor Integration and Expressive Language in Preschoolers with Prenatal Exposure to Methamphetamine.
 8. HASHIMOTO, Y Feedback Effects on Time Estimation in Patients with Brain Injury.
 9. HEITZMAN, T Evaluating Relationships Between Temperament, Executive Functioning, Personality and Attentional Networks in Young Adults: Integrating Cognitive Neuroscience, Neuropsychological and Developmental Theory.
 10. KAZANDJIAN, S The Direction of the Written Language on the Representation of Phrases.
 11. KROL, AL Post-Concussion Symptom (PCS) Reporting using Different Interview Techniques.
 12. NIELSON, KA Event-related fMRI Evaluation of the Common Semantic Networks Associated with Identifying Familiar Faces and Names.
 13. QUINLAN, PS The Impact of Stress in Mild Cognitive Impairment: Endocrine Alterations and Cognitive Dysfunction.
 14. RIES, M The Role of the Ventral Posterior Cingulate Cortex in Episodic Retrieval and Self-Appraisal: An fMRI Study.
 15. SABB, FW Phenowiki: An Online Collaborative Knowledgebase for Cognitive Phenomics Research.
 16. SHEARD, ED A Case Study of the Neuroanatomic Underpinnings of Cognitive Deficits in Higher Order Multiple Birth Children.

17. SHEARD, ED The Neuroanatomy of Cognitive Dysfunction in Fetal Alcohol Spectrum Disorder.
 18. SINDEN, M Cognitive Effects of Thalamic DBS in Essential Tremor.
 19. STEINHAEUER, K The Neuro-Cognitive Dynamics of Late Second Language Acquisition: Evidence from Event-Related Brain Potentials (ERPs).
 20. TANAKA, Y Effects of GABA-ergic Therapy on Cognition in Vascular Dementia.
 21. TAYLOR-COOKE, PA Image Fading Altered by rTMS Targeted to Parietal Cortex.
 22. WALDRON, EJ * The Impact of Second Language Age of Acquisition and Proficiency on Left Hemisphere Broca's Area and Supramarginal Gyrus: An fMRI Study.
 23. WESTON, C Effect of a Brief Meditation Intervention on Pain Perception.
 24. WODKA, EL Evidence That Inter-Stimulus Jitter Facilitates Performance on Computerized Go/No-Go Tasks.

Imaging: Functional

25. ALLEN, MD fMRI Adaptations of Standardized Neuropsychological Assessments: A Case Study in Persistent Post Concussive Syndrome.
 26. BERL, MM The Role of Middle Frontal Gyrus in Verbal Working Memory.
 27. LINEBERRY, M * Amygdala Activation to Emotional Faces in Unmedicated Parkinson Patients: Preliminary Findings.
 28. ELFGREN, C The Role of the Medial Temporal Lobe in the Acquisition of Semantic Memory.
 29. FIELDS, JA Functional Connectivity of the Posterior Cingulate in Mild Cognitive Impairment and Alzheimer's Disease.
 30. FINE, JG Greater Differential Activation to Emotions in Video Vignettes vs. Photos.
 31. FINE, JG Gender Differences in Activation to Happy and Sad Video Vignettes.
 32. GALÁN, I Neuropsychology and laterality of language evaluation in temporal epilepsy patients.
 33. GREEN, E Relationships Between Body Fat and Central Taste Processing Differ for Young and Elderly Adults.
 34. HARRELL, WR Functional MRI and Working Memory in Children with Chronic Kidney Disease.
 35. HUANG, S Middle Age Effects on Hippocampal Activations in a Memory Encoding Task: a fMRI Study.
 36. IKUTA, T Dopaminergic System in Grammar and Linguistic Comprehension: fMRI Study of Parkinson's Disease.
 37. IRANI, F An FMRI Study of Verbal Working Memory, Cardiac Output and Ejection Fraction in Elderly Patients with Cardiovascular Disease.
 38. JACOLA, LM fMRI Reveals the Neural Basis of Semantic Processing in Persons with Down Syndrome.
 39. KOBAYASHI, H * Effects of subject-performed tasks in memory of action events: A fMRI study.
 40. KOZORA, E Visual Memory Impairment in nonNPSLE: Relationship to Right Hippocampal Glutamate and Glutamine.
 41. LANSING, AE * Functional MRI as a Tool to Track Brain Physiological Changes in Response to Pharmacological and Behavioral Interventions.
 42. MADORE, MR Dissociation of Emotional and Attentional Processing for Healthy Individuals.
 43. MAHURIN, RK Brain Activation in Dual Task Performance: An fMRI Study of Attention and Effort.
 44. PARSONS, MW Correlating fMRI and Neuronavigation: Demonstration of a "Whole Hand" Area in Central Cortex.
 45. PENG, Y Mapping Semantic and Phonological Processing in Chinese Left-handers using fMRI.
 46. SCHALLMO, M Depression, Cortisol, and Age but not Stressful Events Predict fMRI Activation Responses to Words with Negative Valence.
 47. SEMRUD-CLIKEMAN, M Right-Left Asymmetry in fMRI to Happy and Sad Photos.
 48. SEMRUD-CLIKEMAN, M Right-Left Asymmetry in Happy and Sad Videos Using fMRI.
 49. WINWARD, JL fMRI Brain Activation to Spatial Working Memory in Adolescent Marijuana and Polysubstance Users.
 50. WOODARD, JL Functional Recruitment During Fame Discrimination in Patients with Mild Cognitive Impairment.
 51. WRIGHT, S Functional Activation and Behavioral Correlations in Emotion Processing by Gender.
 52. WU, C Activation of the Middle Frontal Gyrus (BA9) in Phonological Processing in Left-handed Chinese Speakers.
 53. YANG, L Neural Substrates of Spirituality in a General Population: A Preliminary fMRI Study.

Imaging: Structural

54. DODDS, BA Volumetric MRI Analysis and Developmental Dyslexia in a Paediatric Group: a critical analysis of current theoretical models of reading/spelling.
 55. JAK, AJ Hippocampal Volumes and Relationship to Cognition in Clinical Subtypes of Mild Cognitive Impairment.
 56. KORTTE, KB Neural Circuitry in Anosognosia for Hemiplegia.
 57. LAUDATE, TM Descriptive Brain Morphology in an Ethnic Minority Sample: Findings from the Omni Cohort of the Framingham Heart Study.
 58. MABBOTT, D White matter injury and core cognitive processing in pediatric brain tumor patients: A Diffusion Tensor Imaging Study.
 59. O'BRIEN, KA Longitudinal Analysis of the Temporal Lobes in Children with Traumatic Brain Injury.
 60. ROVET, J Reduced Caudate and Hippocampal Volumes in Adolescents with Congenital Hypothyroidism.
 61. SACH, MB * Detecting Language-related Disconnection Syndrome with Lesion Overlap Analysis.
 62. SEICHEPINE, DR Relation of Stroke Risk to Brain Morphology in an Ethnic Minority Sample: The Framingham Omni Study.
 63. HOOK, J Risky Decision Making and Whole-Brain Radiologically-Defined Normal Appearing White Matter: A Diffusion Tensor Imaging Study.
 64. WALTHER, K White Matter Pathology in Older Adults Is Related to Frontal Function.
 65. WILDE, EA Longitudinal Changes in Moderate to Severe Pediatric Traumatic Brain Injury: Diffusion Tensor Imaging.
 66. YALLAMPALLI, R Diffusion Tensor Imaging of the Fornix in Moderate to Severe Pediatric Traumatic Brain Injury.
 67. YALLAMPALLI, R Acute Changes in the Fornix Following Mild Traumatic Brain Injury Using Diffusion Tensor Imaging.

Language: Other (e.g., Naming, Fluency, Reading)

68. HELDER, EJ Specific Language Impairment and Associated Language Activations in Children with Histories of Early Severe Deprivation.

Memory

69. WULFF, LL Effects of a Two-Week Trial of Physiological Arousal on Memory and Other Cognitive Functions.
70. MANDE, MM The Effect of Distraction on Human Performance in a Simulated Aviation Task.

Multiple Sclerosis/ALS/Demyelinating Diseases

71. ARNETTE, PA Cognitive Factors Contribute to Grooved Pegboard Performance in Multiple Sclerosis Patients.
72. BASSO, MR Prospective Memory Deficits in Multiple Sclerosis.
73. BEENEY, JE Depression Symptoms Mediate the Relationship Between Executive Function and Hostility in an MS sample.
74. BROWN, LN * Corpus Callosum Volume and Interhemispheric Transfer of Somatosensory Information in Multiple Sclerosis.
75. DUQUIN, JA Routine Monitoring of Neuropsychological Symptoms in Multiple Sclerosis.
76. ENGLERT, JJ Understanding Personality Change in Multiple Sclerosis Using a Five-Factor Model Approach.
77. HILL, JM The Impact of Disability Status and Combined Active Lesions as Evidenced on MRI on Mood Level in Multiple Sclerosis Patients.
78. HOLTZER, R Associations Between Fatigue and Working Memory in Multiple Sclerosis.
79. YI, AS Comparison of Neuropsychological Functioning in Four Subtypes of Multiple Sclerosis.
80. RABINOWITZ, AR * MS Symptoms' Effects on General Contentment.
81. REICKER, LI A Comparison of Methods for Improving the Detection of Slowed Processing Speed in Multiple Sclerosis.
82. RYAN, KA * Awareness of deficit, compensatory driving behaviors and driving outcomes in multiple sclerosis.
83. STROBER, LB Comparing the sensitivity of memory tests in multiple sclerosis (MS): The Rao Brief Repeatable Neuropsychological Battery (BRNB) and the Minimal Assessment of Cognitive Function in MS (MACFIMS).
84. STROBER, LB Effects of using same versus alternate form memory tests in multiple sclerosis.
85. SULLIVAN, KD Visual Dysfunction in Pediatric Multiple Sclerosis.
86. WYLIE, C An Investigation Into the Nature of White Matter Damage in Multiple Sclerosis Using Diffusion Tensor Imaging.

Other

87. ACOSTA, MT Neurofibromatosis type 1 (NF1) as a Model to Understand and Treat Learning Problems.
88. CHIU, P "Would You Do This?": Adult Gender Differences in the Neural Substrate of Social Information Processing.
89. TAYLOR-COOKE, PA Persistent Learning on Magnocellular and Parvocellular Processing Tasks but not on a Combined Task.

1:15–2:45 PM**Symposium 4****Cognitive and Neuroimaging Correlates of Fact Retrieval, Calculation, and Estimation in Children with Learning Difficulties****Chair: Linda Ewing-Cobbs****Room: King's Ballroom**

1. EWING-COBBS, L Cognitive and Neuroimaging Correlates of Fact Retrieval, Calculation, and Estimation in Children with Learning Difficulties.
2. RAGHUBAR, K Calculation Errors and Behavioral Inattention in Children with Math Difficulties.
3. CIRINO, PT Latent Prediction of Computation and Problem Solving Skills via Cognitive Arithmetic Speed and Accuracy.
4. DAVIS, N Correlated Brain Tissue Structure and Function in Mathematical Processing.
5. SIMOS, PG Aberrant Spatiotemporal Activation Profiles Associated with Simple Arithmetic Operations in Developmental Math Disability.

2:45–4:15 PM**Poster Session 5: Psychopathology, Drugs, Toxins****Room: Water's Edge Ballroom****Drug/Toxin-Related Disorders (Incl. Alcoholism)**

1. BAVA, S * White Matter Integrity in Adolescent Marijuana Users.
2. CHEN, SR The Morphology of the Corpus Callosum in Alcoholics: A Diffusion Spectrum Imaging (DSI) Study.
3. COLLINS, B Cognitive Effects of Hormonal Therapy in Breast Cancer Patients.
4. DOERING-SILVEIRA, E Neuropsychological Status of Adolescents Using Hallucinogens in a Ritual Religious Context.
5. FERNÁNDEZ GUINEA, S Executive Function Impairment Differences Between Two Typologies of Drug-Consumers: Cannabis and Cocaine Subgroups.
6. HANSON, KL * Longitudinal Study of Cognition Among Adolescent Marijuana Users Over Three Weeks of Abstinence.
7. KAREKEN, DA What if Proust's Teacup had had Cognac? Cerebral Networks of Alcohol Craving Elicited by Alcoholic Odors.
8. KRENGEL, M The Cognitive Correlates of Chronic Multisymptom Illness in GWI Military Pesticide Applicators.
9. KUMBHANI, S Alcoholism and Familial Vulnerability to Neuropsychological Deficits: A Discordant Twin Study.
10. MCCABE, ME Low Level Lead Exposure and Attention Outcomes.
11. MCQUEENY, T Behavioral and Cognitive Impulsivity During Inhibition in Abstinent Adolescent Marijuana Users: An fMRI Study.

12. PEDERSEN, AD Is Cognitive Function Affected in Men with Testicular Cancer Treated with Chemotherapy?
 13. PRICE, JS Ecstasy Consumption and Verbal Memory Functioning: Gender Effects.
 14. SPADONI, AD Utility of Neurocognitive Performance in Predicting Subsequent Heavy Drinking in Adolescence.
 15. TAN, J Cognitive Sequelae of "Darkroom Disease": A Case Study.
 16. VADHAN, NP * Decision-making in Cocaine Abusers: Contingencies and Gambling Task Performance.
 17. VANVOORST, WA New Onset Depression in a Patient with Manganese Neurotoxicity: Cognitive and Neuroimaging Findings.

Other

18. PROPPER, RE The Thought of EEG: Anxiety and Right Hemisphere Activity.

Psychopathology/Neuropsychiatry/Other

19. ACOSTA, MT Pharmacological Response to Stimulant Medication in Patients with ADHD: Conditional Latent Class Clusters Transition as a Phenotype for Pharmacogenetic Trials.
 20. BENITEZ, A Sleep Quality is Associated With Psychological and Cognitive Impairments in Healthy Young Adults.
 21. BURCIAGA, J Psychomotor Deficits in Patients with Bipolar Disorder.
 22. HARIK, L Cognitive Deficits Associated with Anticholinergic Therapy and Drugs with Anticholinergic Properties in Community Dwelling Veterans.
 23. HUH, T The Relationship Between Cognitive Performance and Behavior in Alzheimer's Disease (AD) and Fronto-Temporal Dementia (FTD).
 24. LAMARRE, AK Psychopathic Personality Traits and Ability to Learn on the Iowa Gambling Task.
 25. MACKIN, S Impact of Cognitive Impairment on Cost of Medical Services for Individuals at a Community Mental Health Facility.
 26. PHILLIPS, M A Case of Transient Global Amnesia – Not!
 27. STAVRO-ETTENHOFER, G Executive Function Deficits in Psychopathology.
 28. TRACY, V Executive function and working memory correspond with liver dysfunction in people with eating disorders.

Psychopathology: Anxiety/Stress

29. ANDRES, S VISUO-SPATIAL PERFORMANCE IN EARLY AND LATE ONSET OBSESSIVE-COMPULSIVE DISORDER IN CHILDREN AND ADOLESCENTS.
 30. BLAIR, K 10 Things I Hate About You: The Neural Response to Social Praise and Criticism in Generalized Social Phobia (GSP).
 31. BLAIR, K Response to Emotional Expressions in Generalized Social Phobia (GSP) and Generalized Anxiety Disorder (GAD): Evidence for Separate Disorders.
 32. BRUCE, SE Time estimation, attention, and working memory in patients with PTSD.
 33. KINOSHITA, LM Neuropsychological Profile of Older Veterans with Posttraumatic Stress Disorder and Sleep Disordered Breathing: Preliminary Findings.
 34. MCCOY, SK The Role of Social Rejection and Acceptance in Women's Cardiovascular, Neuroendocrine, and Psychological Response to Acute Stress.
 35. CAPOVILLA, AG Neuropsychological Assessment of Attention, Language and Personal Adjustment in Panic Disorder.
 36. SMITH, SD Post-Traumatic Stress Disorder in a Patient With No Left Amygdala.
 37. WOON, F Premorbid Brain Volume Estimates and Reduced Total Brain Volume in Adults with Posttraumatic Stress Disorder: A Meta-Analysis.

Psychopathology: Depression

38. BASSO, MR Depressive Dimensions and Neuropsychological Impairment.
 39. ROGERS, SA The Relationship between Subgroups of Geriatric Depression and Executive Functions.
 40. BHALLA, RK * Reduced Volume of the Middle Cingulate Gyrus Predicts Cognitive Dysfunction in Late Life Depression.
 41. FIKKE, LT * Cognitive Vulnerability as a Predictor of the Mood-Lowering Effect of Rapid Tryptophan Depletion (RTD).
 42. FRANCHOW, EI Motor Programming Deficits in Depressed Elderly: the Effects of Novelty and Complexity.
 43. GORLYN, M Working Memory Performance Predicts Short-Term Antidepressant Treatment Response in High Suicide Risk Patients with MDD.
 44. BROOKS, BL A Short Form of CNS Vital Signs for Use in Depression.
 45. MACKIN, S * Cognitive and Psychiatric Predictors of Financial Capacity in Older Adults.
 46. MCCLINTOCK, SM Rapid Recovery of Orientation Following Magnetic Seizure therapy.
 47. LEE, J Lack of Memory Impairment in Depressed VA Medical Inpatients.
 48. ZIZAK, V The Relationship of Depression Severity on Executive Function Using the D-KEFS Design Fluency Task.

Psychopathology: Schizophrenia

49. BEENKEN, BA Reductions in measures of learning and organizational ability in schizophrenia patients with polydipsia and hyponatremia.
 50. CARLSSON, R Neuropsychological Aspects on First-Episode Psychosis in Predicting Long-term Outcome.
 51. DEFREITAS, C Self-Monitoring, Proprioception, and Symptoms of Schizophrenia.
 52. DEFREITAS, VG Language Lateralization and the Symptoms of Schizophrenia.
 53. DUKE, LA * The Neurocognitive Impairment Associated With Comorbid Schizophrenia and PTSD.

54. EULER, MJ Neural Correlates of Developmental Instability in Healthy Adults and Patients with Schizophrenia.
 55. FLASHMAN, L Relationship between Unawareness of Illness and IQ Measures and Estimates in Individuals with Schizophrenia.
 56. FLASHMAN, L Evidence for Neural Involvement consistent with Anosognosia in Unawareness of Illness in Individuals with Schizophrenia.
 57. GODDARD, K The Assessment of Obsessive-Compulsive Symptoms in First Episode Psychosis: A Comparison of Self-Report versus Clinician-Rated Instruments.
 58. GODDARD, K Low and Stable CPT D-prime Scores Differentiate First Episode Schizophrenia from Substance Induced Psychosis.
 59. HORWITZ, J Regional Brain Physiology of Working Memory and Clinical Presentation in Recent Onset Patients with Schizophrenia.
 60. KAUP, AR Decisional Capacity to Consent to Research in Psychosis: An Analysis of Errors.
 61. KIM, M The effect of visuospatial training on cognitive functions in patients with schizophrenia.
 62. LEAVITT, VM Developing Endophenotypic Markers for Schizophrenia: Testing a Brief Monocular Deprivation Paradigm.
 63. MATHEWS, JR Emotional Processing, Social Cognition, and Social Functioning Deficits in Schizophrenia.
 64. MATSUI, M Cognitive functioning related to quality of life in patients with schizophrenia.
 65. MONNIC, MA Hippocampal Subregion Volume and Memory in Schizophrenia.
 66. NEILSON, HA Cognitive Effects of Clozapine and Risperidone in Chronic Schizophrenia Spectrum Disorder.
 67. PURDON, SE Sustained Attention (CPT) Deficits Associated with Risk of Schizophrenia and Proton MRS Glutamate Levels.
 68. COHEN, H Cognition and Neuroleptics in Chronic Schizophrenia.
 69. RUHL, DA Cerebellar Cortical Volume and Executive Functioning in Schizophrenia.
 70. THYSEN, J * The Relationship Between Computerized Measures of Attention and Executive Domains and Quality of Life in Schizophrenia.
 71. VELLA, L Neuropsychological Functioning and Work Rehabilitation Outcomes in Schizophrenia.

Psychopharmacology

72. FANI, N Neuropsychological Functioning in Patients with Posttraumatic Stress Disorder Following Paroxetine Treatment.
 73. MARSHALL, P * Sensitivity of Neuropsychological Tests To Sedating Effects of Psychotropic Medications.
 74. MUELLER, SC Saccadic incentive task reveals differences in cognitive control as a function of medication status in pediatric bipolar disorder.
 75. PURDON, SE Memory Enhancement After Two Weeks' Exposure to American Ginseng Extract HT1001 in Young and Middle Aged Healthy Adults.

Other

76. MIDORIKAWA, A A novel disconnection syndrome: Unilateral motor dyssynchronization to periodical visual stimuli.

2:45–3:05 PM

Thursday Afternoon Coffee Break Room: Grand Promenade and Exhibit Hall

3:00–4:30 PM

Paper Session 5 Assessment/Cross Cultural Issues/Forensics Room: King's Ballroom

1. LARRABEE, GJ Evaluation of New MMPI-2 Validity Scales in Malingering Civil Litigants and Non-Malingering Clinical Patients.
 2. ALLEN, MD Functional Neuroimaging Evidence for High Cognitive Effort on the Word Memory Test.
 3. HILL, BD Validity of the WAIS-III Working Memory Index: Comparison to a Working Memory Criterion Construct.
 4. GONZÁLEZ, HM Acculturation and the cognitive and functional status of older Mexican Americans, a paradox?
 5. TULSKY, DS The NIH Toolbox: An Instrument for Assessment of Neurological and Behavioral Function.

3:00–4:30 PM

Symposium 5 Computerized Testing and Assessment II: Detection and Diagnosis of Mild Cognitive Impairment (MCI), Dementia and Cognitive Impairments in Older Adults. An Update for Clinical Neuropsychologists Chair: Monique Cherrier Room: Queen's Ballroom

1. CHERRIER, M Computerized Testing and Assessment II: Detection and diagnosis of mild cognitive impairment (MCI), dementia and cognitive impairments in older adults. An update for clinical Neuropsychologists.
 2. ERLANGER, D Validation the HeadMinder™ Cognitive Screening Test (CST) – A 12-minute, Computerized Dementia Screening Tool for Primary Care.
 3. KANE, R Use of the Automated Neuropsychological Assessment Metrics (ANAM) Test System in the Assessment of Neurodegenerative Disorders.
 4. MARUFF, P Validity of the CogState battery in central nervous system (CNS) disease.
 5. SALING, M Computerized assessment in neuropsychology: diagnostic and professional issues.
 6. SIMON, E Idiopathic Elderly Fallers Have a Distinct Cognitive Profile from Amnesic MCI, Early Alzheimer's Disease, and Parkinson's Disease: A Review of Studies using Mindstreams Computerized Cognitive Assessment.

4:45–5:45 PM **Birch Lecture- Human Lateral Temporal Cortical Neuronal Activity in Language, Recent Verbal Memory and Verbal Associative Learning.**
George Ojemann
Room: Monarchy Ballroom

FRIDAY, FEBRUARY 8, 2008

7:20–8:50 AM **Friday Morning CE Workshops**
Room: Refer to CE Program for room assignments

9:00–10:30 AM **Paper Session 6**
Tramatic Brain Injury
Room: King's Ballroom

1. FITZPATRICK, N Evolution of Prefrontal Involvement in Working Memory Following TBI: Evidence against Brain Reorganization Hypotheses.
2. TURNER, GR Compensatory neural recruitment during verbal working memory performance after TBI: evidence for an altered functional engagement hypothesis.
3. VOELBEL, C Functional Near Infrared Spectroscopy (fNIRS) Reveals Cortical Recruitment of the Prefrontal Lobe in Traumatic Brain Injury During Working Memory.
4. LARSON, MJ Double Jeopardy! The Additive Consequences of Negative Affect on Performance Monitoring Decrements Following Severe TBI.
5. HAN, S Predictors of Job Status Change Following TBI Among Active Military Personnel.
6. WILLMOTT, C Rehabilitation of Attention Following Traumatic Brain Injury: A Model for Methylphenidate.

9:00–10:30 AM **Symposium 6**
Early Risk and Protective Factors for Cognitive Decline
Chair: Sherry Willis, Discussant: Alfred W. Kaszniak
Room: Monarchy Ballroom

1. SCHRETLEN, DJ Structural Neuroimaging and the Contribution of Brain Reserve to Cognitive Aging.
2. TAYLOR, JL Expert Knowledge, APOE epsilon4, and Risk for Decline in Aviation Performance.
3. SAGER, MA Early Risk and Protective Factors for Cognitive Decline.
4. JONES, J Wisconsin Registry for Alzheimer's Prevention (WRAP): Biomarkers of Preclinical AD.
5. WILLIS, SL Risk of Midlife Cognitive Decline and Brain Volume in Old Age.

9:00–10:30 AM **Symposium 7**
The Neurobiology of Fetal Alcohol Spectrum Disorders: Emerging Findings from Neuroimaging
Chair: Kimberly Kerns
Room: Queen's Ballroom

1. MATTSO, SN Functional Brain Changes in Children and Adolescents with Heavy Prenatal Alcohol Exposure.
2. RASMUSSEN, C Diffusion Tensor Imaging (DTI) in Children with Fetal Alcohol Spectrum Disorder.
3. CARMICHAEL OLSON, H Findings from an MRI, MRS, fMRI and Neuropsychological Study of Children with Fetal Alcohol Spectrum Disorders.
4. ROVET, J Prenatal Alcohol Exposure and Hippocampal Development.
5. KERNS, KA Electrophysiological Evidence of Atypical Reward Processing in Children with Fetal Alcohol Spectrum Disorders.
6. KERNS, KA The Neurobiology of Fetal Alcohol Spectrum Disorders: Emerging Findings from Neuroimaging.

9:00–10:30 AM **Poster Session 6: HIV, Epilepsy, Forensics**
Room: Water's Edge Ballroom

Epilepsy

1. ASMUSSEN, SB Non-Epileptic and Epileptic Seizures: Personality Assessment Inventory (PAI) Profiles and Gender Differences.
2. BARKER, M Executive Functioning in Temporal Lobe Epilepsy: Performance Before and After Anterior Temporal Lobectomy.
3. BAUM, KT Infant Temperament and Neuropsychological Functioning in Children with New-Onset Seizures.
4. KLAAS, PA Postoperative Behavior Problems in Children with Temporal Lobe Epilepsy.
5. COADY, EL Psychological Distress in Patients with Comorbid Epilepsy and Psychogenic Nonepileptic Seizures.
6. COADY, E Utilizing the MMPI-2 Validity Scales in Epileptic and Non-Epileptic Seizure Patients.
7. COHEN, MJ Intellectual and Memory Performance in Children With Complex Partial Seizures of Left or Right Hemisphere Origin.

8. FLAHERTY-CRAIG, CV Pre-surgical Personality Traits Serve as Prognostic Indicators of Psychosocial Success Following Surgical Relief of Seizures in Temporal Lobe Epilepsy.
9. FLAHERTY-CRAIG, CV Pre-surgical Executive Functioning Capacities Predictive of Psychosocial Outcome Following Surgical Relief of Seizures in Temporal Lobe Epilepsy.
10. GAWRYLUK, JR Does the Concept of Emotional Intelligence Contribute to Our Understanding of Temporal Lobe Resection?
11. MCGLONE, J Subjective Memory Change Following Temporal Lobe Resection for the Treatment of Medically-Intractable Complex Partial Seizures: A Meta-Analysis.
12. GRIFFITH, NM Assessing Optimistic and Pessimistic Explanatory Style in an Intractable Seizure Disorder Population.
13. HILL, SW Seizure Laterality Predicted by the NAB Shape Learning & WMS-III Visual Reproduction.
14. JONES, JE Psychosocial Outcomes of Anterior Temporal Lobectomy: A 10-year Follow-up Investigation.
15. KORMAN, BM Cognitive Profile of Children with Histopathological Subtypes of Cortical Dysplasia and Intractable Epilepsy.
16. KULUVA, JE Treatment of Gelastic Seizures with Associated Improvement in Cognitive Function: A Case Presentation.
17. LORING, DW * Utility of Multiple-Level Likelihood Ratios in Characterization of Wada Memory Asymmetry Scores.
18. MANDABACH, DR Association Between Handedness and Neuropsychological Function in Children with Epilepsy.
19. MCDONALD, CR Multimodal Imaging in Patients with Temporal Lobe Epilepsy (TLE): Examining the Contributions of the Uncinate Fasciculus (UF), Arcuate Fasciculus (AF), and Neocortical Thinning to Memory and Language Functioning in TLE.
20. MRELASHVILI, D Role of Behavioral Adverse Effects in Discontinuation of Pregabalin in Patients with Intractable Partial Seizures. A Post-Marketing Analysis.
21. NAKHUTINA, L Test-Retest Reliability and Reliable Change Indices for the Rey-Osterrieth Complex Figure Test for Partial Epilepsy.
22. SEPETA, L Memory Functioning in Children with Temporal Lobe Epilepsy.
23. SHERMAN, EM Pre-Surgical Evaluation of Pediatric Epilepsy Surgery Candidates: Construct Validity of Memory Measures.
24. TAYLOR, AM Psychometric Discrimination of Patients with Epileptic from Nonepileptic Seizures.
25. VEDERMAN, A Ictal Auras and Memory Performance on the CVLT.
26. WINSTANLEY, FS * Category-specific naming during electrical stimulation mapping identifies wider cortical language representation and predicts naming outcome.
27. WOLKIN, JR Assessment of Major Depressive Disorder in Patients with Epilepsy using the BDI.

Forensic Neuropsychology

28. BAGLEY, A The Neuropsychological Effects Associated with Taser Shock Administrations.
29. BOWDEN, S When is a new test ready for clinical application? The validity of the Word Memory Test under the microscope.
30. BIGLER, E Functional and Structural Neuroimaging Correlates of Symptom Validity Test Performance.
31. BUNNAGE, M Criterion Validity of the Word Memory Test: An Audit of a Sample of Patients Assessed for Clinical not Litigious Reasons.
32. GREGG, N Validity of Commonly-Used Measures of Effort When Used With Adults Demonstrating Learning Disabilities or AD/HD.
33. SHORES, EA The TOMM is More Resilient than the WMT to Distraction in Patients with Moderate to Severe Brain Injury: Implications for Clinical Practice.
34. CURTIS, KL Classification Accuracy of Finger Tapping and Grooved Pegboard Variables to Malingering in Traumatic Brain Injury.
35. DENBOER, J Memory for Complex Pictures (MCP) vs. the Test of Memory Malingering (TOMM): Sensitivity, Specificity, and Face Validity.
36. MOONEY, S Prediction of Cognitive Symptom Validity Tests by Fake Bad Scale and Response Bias Scale.
37. HANE, L * Face Validity of Two Effort-Detection Measures: Memory for Complex Pictures and the Word Memory Test.
38. HERKOV, MJ Neuropsychological Functioning in Serial Murder: A Case Study of Aileen Wuornos.
39. HANKS, R Assessing Insufficient Effort Using the Yes/No Recognition Foils of the CVLT-II.
40. MOONEY, S Performances of the MMPI-2 Restructured Clinical Scales in Patients with Elevated FBS.
41. BOETTCHER, A * Detection of Malingering in Traumatic Brain Injury with the Conners' Continuous Performance Test-II.
42. POSTHUMA, A Legal and Psychological Research on the Assessment of Remote Mild-Traumatic Brain Injury.
43. SARTORI, G Neural Correlates of Detecting Lies Using the Forensic-IAT.
44. SIM, A The Impact of Low Education on Test of Memory Malingering (TOMM) Performance Among Forensic and Non-forensic Psychiatric Inpatients.
45. VICTOR, TL Interpreting the Meaning of Multiple Effort Test Failure: Examination of Free-standing Effort Tests.
46. VILAR-LÓPEZ, R Congruence between reported symptoms and neuropsychological results in malingering detection.
47. WEINBORN, M A Validation of the Verbal and Nonverbal Medical Symptom Validity Tests Using a Simulation Design.
48. WILLIAMS, BR Incidence of Learning Disability in Inmates Compared to Civilian Populations.
49. YLIOJA, S Developing a Spatial Analogue of the Reliable Digit Span: A Within-test Measure of Performance Validity in Neuropsychological Examination after Suspected Traumatic Brain Injury.
50. ZAKZANIS, K Cognitive Variability in High-Functioning Individuals.
51. ZAKZANIS, K Detecting inadequate effort using forced-choice formats of the Benton facial recognition and judgment of line orientation tests: A pilot study.
52. CAMPBELL, Z Validation of the Dementia Rating Scale-II as a Measure of Cognitive Dissimulation: A Pilot Study.

HIV/AIDS

53. COLE, MA Altered Default Mode Network in Individuals Infected with HIV.
54. CONLEY, J Neurocognitive Performance of HIV+ Patients Correlates With MRI Volumetric Measures of the Basal Ganglia.
55. FAMA, R Information Processing Rate in HIV Infection, Alcoholism, and Their Comorbidity.
56. FOLEY, JM Classification of HIV-Related Cognitive Decline and Dementia Differs by Functional Assessment Method.
57. GONGVATANA, A * HIV-Associated White Matter Tract Injury and Neurocognitive Impairment in the HAART Era.
58. HARRISON, TB Abnormal White Matter Signal and Lower CD4 Nadir Independently Predict Lower White Matter Fractional Anisotropy in HIV-infected Individuals.
59. IUDICELLO, JE HIV-associated Deficits in Action (Verb) Fluency Reflect Astrocytosis.
60. NEUFELD, S Cognition's Role in Patient Adherence to Antiretroviral HIV Therapy and in Treatment Outcomes.
61. PYYKKONEN, BA * Depression Symptoms and Gray Matter Atrophy in Individuals with HIV infection: Differential Patterns Associated with Unique Symptomatology.
62. QUARTANA, P * Cognitive Reserve, Viral Load and Information Processing Speed in HIV Infection.
63. SASSOON, SA Global vs. Local Processing Predictors of Visuospatial Memory Performance in Alcoholism, HIV Infection, and Their Comorbidity.
64. SCOTT, J * Predictors of Sustained Cognitive Normality in HIV Infection.
65. SEICHEPINE, DR Clock Drawing Differentiates Cortico-Striatal-Thalamic Disorders: HIV More Sensitive to Executive Dysfunction than Parkinson's Disease.
66. SPINA, L Computer-Based Cognitive Rehabilitation in HIV-Associated Neurocognitive Impairment: A Case Study.
67. TAYLOR, MJ * Frontal White and Gray Matter Integrity Measured by Proton Magnetic Resonance Spectroscopy Predict Different Neuropsychological Functions in HIV-infected Individuals.
68. VAN DER VLUGT, H Contribution of depression and neuropsychological impairment on cognitive symptom burden in HIV/AIDS and their impact on overall health.
69. WRIGHT, MJ Recent Cocaine use Exacerbates Verbal Memory Deficits in HIV+ Individuals.

Infectious disease: HIV/AIDS

70. BECKER, BW * Longitudinal Relationship Between Neurocognitive Dysfunction and Medication Adherence in HIV-Infected Adults.
71. JACOBUS, J Neurocognitive Performance Predicts Altered White Matter Fractional Anisotropy in HIV-infected Individuals.
72. KIT, K Chronic Neurocognitive Sequelae Associated with Progressive Multi-focal Leukoencephalopathy (PML): A Case Report 8 years Post Infection.

Infectious disease: Other (e.g., hepatitis C, West Nile virus)

73. CERCY, SP Atypical Cognitive Findings In A Case Of Probable Sporadic Creutzfeld-Jakob Disease.
74. POSADA, C Hepatitis C Infection Affects Frontal Systems Behaviors.
75. POTTER, B Neuropsychological Functioning in an 11-year-old female with Influenza A Encephalopathy.

10:30–11:00 AM**Friday Morning Coffee Break
Room: Grand Promenade and Exhibit Hall****10:45 AM–12:15 PM****Paper Session 7
Cognitive Neuroscience
Room: King's Ballroom**

1. GLÄSCHER, J Large-scale Lesion Mapping of Cognitive Abilities Derived from the Wechsler Adult Intelligence Scale.
2. MACDONALD, SW Dopamine Binding Modulates Intraindividual Variability in Cognitive Performance.
3. KRAMER, ME "Would You Do This?": Neural Correlates of Social Information Processing in Healthy Adults and Children.
4. CHIOU, K Longitudinal Investigation of Axonal Disruption and its Influence on Brain Activation.
5. MOLFESE, DL Long-Lasting Changes In Hippocampus Gene Regulation Following Traumatic Experience.

10:45 AM–12:15 PM**Invited Symposium
Neuropsychiatric Aspects of Combat Exposure (Blast Injuries, TBI, PTSD)
Chair: Roberta White
Room: Monarchy Ballroom**

1. WHITE, RF Neuropsychiatric Aspects of Combat Exposure (Blast Injuries, TBI and PTSD).
2. HEATON, K Neuropsychological and Neuroanatomical Findings in 1991 GW Veterans with Estimated Low-level Exposures to Sarin and Cyclosarin*.
3. RINGE, WK Gulf War Illness Neuroimaging and Biomarker Studies.
4. KRENGEL, M The Impact of Blast Injury on Cognitive, Psychosocial and Health Outcomes: A preliminary analysis of mild traumatic brain injury in OIF/OEF returnees.
5. VASTERLING, JJ The Effects of Mild Traumatic Brain Injury and Exposure to Extreme Stress on Neuropsychological Functioning in the Iraq War: "Shell Shock" revisited?*

10:45 AM–12:15 PM**Symposium 8****Predicting Real-World Functioning in at-Risk Populations: The Roles of Everyday Problem Solving and Decision Making Competence.****Chair: Stacey Wood****Room: Queen's Ballroom**

1. THORNTON, A Predicting Life Skills Functioning in Patients with Serious Mental Illness.
2. GELB, S Kidney Transplantation: Neuropsychological Abilities as a Mediator of the Relationship between Health Status and Everyday Problem Solving.
3. FINUCANE, ML The Dynamics of Aging and Disease Risk Recognition.
4. WOOD, S Optimal choice in medical decision making in older adults: the role of numeracy and speed.
5. WOOD, S Predicting real-world functioning in at-risk populations: the roles of everyday problem solving and decision making competence.

11:00 AM–12:30 PM**Poster Session 7: Aging, Hormones, Genetics****Room: Water's Edge Ballroom****Aging**

1. MAGUIRE, MJ Gist-based and Detail-based Processing of Information: Effects of Normal Cognitive Aging.
2. BANGEN, KJ The Relationship Between Stroke Risk and Cognition in Normal Aging and Alzheimer's Disease.
3. BELKONEN, SM Detecting Cognitive Impairment in Older Adults Using List Learning Tasks and Genotyping.
4. CROSSON, B Hemispheric Asymmetry Reductions in Older Adults during Category Exemplar Generation.
5. BISIACCHI, PS Is Memory Loss the Distinctive Feature of Alzheimer Disease?
6. BUTTARO, M Vascular Disease Risk Factors and Cognitive Functioning in Normal Elderly.
7. CERNIN, PA Executive Functioning and Health Behaviors in African American Older Adults.
8. CORNEY, P Self-Rated and Objective Divided Attention Performance in Young and Older Adults.
9. CORREIA, R Memory Impairment Pattern in Amnesic Mild Cognitive Impairment (aMCI).
10. DAUGHERTY, A The Relationship between Educational Field and Cognitive Decline with Aging.
11. DEJONG, JE Changes in Cerebral Volumes and Memory in Individuals With and Without APOE-4: A Longitudinal Study.
12. DEVINE, S Clock To Command Drawing Errors In Aging: Norms From The Community-Based Framingham Heart Study Offspring.
13. DUX, M Physical Activity Moderates the Relationship between Age and Cognition in Healthy Older Adults.
14. ELDERKIN-THOMPSON, V Association Between Daily Functioning and Orbitofrontal Brain Morphology in Healthy and Depressed Community-Dwelling Elderly.
15. ERCOLI, LM Differential FDDNP PET Patterns in Non-demented Middle-aged and Older Adults.
16. FINLEY, K * Facial, Prosodic, and Lexical Perception of Emotion across the Adult Life Span.
17. GARRETT, DD Covariates of Everyday Memory Compensation in Older Adults.
18. HAWS, KA Decline in Cognitive Processing Speed in Subjects with MCI.
19. HOLTZER, R Validation of the Attention Network Test in older adults: results from the Einstein Aging Study.
20. HOLTZER, R Longitudinal associations between cognitive functions and gait in aging are mediated by sex.
21. JACOBSON, AD Physiological States of Hunger and Satiety Affect Blood Oxygenation Level Dependent (BOLD) Response to Taste Stimuli in Older Adults.
22. KOWALSKI, K Driving Restriction and Cessation in Older Adults with Mild Cognitive Impairment.
23. KRAYBILL, AE Subtypes of Depression and Cognitive Functioning Among Older Adults.
24. KUBIK, JL Everyday problem solving abilities in adults with comorbid chronic illnesses.
25. LOWE, DA Depression and Interference in Verbal and Visual Memory of Older Adults.
26. MCGEE, JS Processing Speed and Functional Decline in Older Cancer Survivors.
27. MCLAUGHLIN, P Improving Attention in Healthy Elderly and Individuals with Mild Cognitive Impairment through Exogenous Support.
28. MORROW, LA * Medical Co-Morbidity, Medication Use, Depression and Mild Cognitive Impairment in Primary Care Practice Settings.
29. NAVARRETE, G Use of Neural Networks and Feature Selection in MCI diagnosis.
30. NUTTER-UPHAM, KE Novel Computer Tasks Developed for Use with Older Adults with Cognitive Complaints.
31. PACHANA, NA Development and Use of the Geriatric Anxiety Inventory (GAI).
32. PARE, N Objective and Subjective Reports of Working Memory Difficulties in amnesic MCI.
33. PREISS, M Memory Training in Healthy Adults – Subjective and Objective Changes.
34. RABIN, LA Self-Rated and Actual Prospective Memory Ability in Older Adults with Cognitive Complaints.
35. RECKNOR, EC False Facial Recognition: The Relationship Between False Alarms and Frontal Lobe Functioning in Older Adults.
36. RODRIGUEZ-ARANDA, C * The importance of psychomotor slowing in performance of four verbal tasks among young and healthy elderly adults.
37. ROGALSKI, Y Aging and Affect: Emotional Word and Picture Ratings in Older versus Younger Adults.
38. SCHUTTE, C Medication Adherence in the Elderly: Associations with Prospective Memory and Neuropsychological Functioning.
39. SEIDENBERG, M Semantic Knowledge of Famous Names in Mild Cognitive Impairment.
40. SPITZNAGEL, MB Serum Amyloid Beta is Associated with Reduced Cognitive Function in Healthy Older Adults.

41. TARSHISH, CY The Cognitive Performance Scale: A Quantitative Comparison with the Clinical Dementia Rating in the Long-Term Care Setting.
42. VANDERHILL, S Mild Cognitive Impairment: Enhanced Classification Procedures and Six-Year Outcome Data.
43. YORK, PJ Depression and Degree of Cognitive Decline Among Older Adults.

Endocrine Disorders/Hormones

44. BENGE, J Neurocognitive Sequelae of Primary Hyperparathyroidism and their Response to Parathyroidectomy.
45. FISCHER, BL * Hormone Therapy Facilitates Performance on Executive Functioning and Visuospatial Tasks.
46. MEAGER, M Cognitive Status of Men with Prostate Cancer: Before and After Androgen Ablation Therapy.
47. MORDECAI, K Effects of Oral Contraceptive Use and Anxiety on Verbal Memory.
48. RICH, JB * The Effect of Estrogen-Replacement Therapy on Implicit Memory in Postmenopausal Women.
49. THILERS, PP Cognition and Endogenous Estrogen in Menopause: A Longitudinal Study.
50. KANAI, H Influence of age or circadian time on bcl-family gene expression in the hippocampus after corticosterone exposure.

Genetic Disorders

51. ADAMS, H Genotype-Phenotype Associations in Juvenile Ceroid Neuronal Lipofuscinosis (JNCL; CLN3).
52. BLOSS, CS Profiles of RCFT Copy Performance Differ as a Function of APOE Genotype in School-Aged Children: Multivariate Item Analysis Using Methods Borrowed from Gene Expression Studies.
53. CHABERNAUD, C Basal ganglia T2-Hyperintensities in children with neurofibromatosis type 1: relationship to cognitive functioning.
54. HARDER, L Neuropsychological Profile of Pendred Syndrome: A Longitudinal Case Study.
55. KEY, AP * Evidence of Global Perceptual Precedence In Adults With Williams Syndrome.
56. KRIVITZKY, L Neuropsychological Functioning in Individuals with Urea Cycle Disorders.
57. LLANES, SJ MELAS: A Neuropsychological and Radiological Follow-Up Case Study.
58. SHAPIRO, EG Neuropsychological function and neuroimaging in severe and attenuated Mucopolysaccharidosis Type I.
59. WALSH, KS Neuropsychological Profile in a Case of Maple Syrup Urine Disease.

Normal Aging

60. ELDERKIN-THOMPSON, V Executive Function and MRI Prefrontal Volumes Among Health Elderly.
61. GAVETT, RA Complex Activities of Daily Living and Cognitive Function in Non-Demented Older Women.
62. JOUK, A The Risky Business of Losing: Skin Conductance Response Examines Loss Aversion across the Lifespan.
63. LEE, GJ Hormone Replacement Therapy and Cognitive Decline in Healthy Postmenopausal Women: A Longitudinal Study.
64. MCGREGOR, KM Age Group Comparisons in Category Member Generation Tasks: Effect of Stimulus Design.
65. MUSIL, S "Super Aging": Pathways to High Maintenance of Functioning in Old Age.
66. SCHULTE, T Neural Correlates of Redundancy Effects in Visual Parallel Processing in Younger and Older Women: A Functional Magnetic Resonance Imaging Study.
67. SHIKHMAN, M Demographic Influences on Working Memory Tasks in Early to Middle Adulthood.
68. SPRINGATE, B Reaction Time and Level of Processing in the Normal Elderly.
69. TOLENTINO, JC Temporal Order Memory in Nondemented Older Adults at Risk for Alzheimer's Disease.
70. WARKENTIN, S Information processing speed is associated with folate in ApoE++ but not in ApoE+- healthy elderly.
71. WIEGAND, MA Change in Everyday Memory Ability of Healthy Older Adults through a Practical Memory Training Program.

Other

72. COOKE, G The Impact Of Hypothyroidism On Neurocognitive Functioning: A Model Of Neuroplasticity In The Mature Adult Human Brain.
73. CUTTLER, C Baby Brain: Neuropsychological Deficits in Pregnant Women.
74. STROTHER, DF Pregnancy and Cognition: Effects of Nausea and Mood.
75. WEBER, M Cognitive Function and Depressive Symptoms through the Menopausal Transition.
76. WISHART, HA * COMT Val158Met Genotype Predicts Normal Variation in Cognitive Flexibility in Healthy Adults.

Sex Differences/Sex Hormones

77. CLEMENTS-STEPHENS, AM Sex-based Differences in the Relative Contributions of Verbal, Visuospatial, and Motor Processing to Task Performance.
78. FINE, JC Gender Differences in Activation to Happy and Sad Human Faces.
79. MOHN, KR * Cortical Activation and Cognition in Long-Term Oral Contraceptive Users.
80. MUELLER, SC Gender Differences in Eye Movements during Spatial Navigation in Virtual Environments.
81. WHARTON, W Oral Contraceptives and Androgenicity: Influences on Visuospatial Task Performance.

12:45–2:15 PM

Poster Session 8: Intervention, Executive Abilities Room: Water's Edge Ballroom

Cognitive Intervention/Rehabilitation

1. BOUWENS, S Do Demented Patients Benefit from Rehabilitation for their Everyday Problems?
2. CHAN, AS Bilateral Frontal Activation Associated with Cutaneous Stimulation of Elixir Field: An fMRI Study.

3. CHEUNG, M Cutaneous Stimulation Improves Language and Social Interaction of Children with Autistic Spectrum Disorders (ASD).
4. SZE, SL Effect of Mind/body Training on Children with Behavioral and Learning Problems: A Randomized Controlled Study.
5. HAN, YM Electroencephalographic (EEG) Measurements of Mindfulness-based Triarchic Body-Pathway Relaxation Technique.
6. HAMPSTEAD, BM Behavioral effects of cognitive rehabilitation in patients with mild cognitive impairment.
7. HAMPSTEAD, BM Functional neuroimaging changes following cognitive rehabilitation in patients with mild cognitive impairment.
8. HASHIMOTO, Y Cognitive –Behavioral Group Therapy for the Treatment of Psychosocial Issues Following Brain Injury.
9. JANSIEWICZ, E The Relationship Between Executive Functions and Metacognitive Strategy Learning and Application.
10. KESLER, S Cognitive Intervention and Neuroplasticity in Children with Neurodevelopmentally Based Executive Function Deficits.
11. KIM, S Effects on Health-Related Quality of Life in Individuals with “Chemobrain” Using a Brain-Plasticity-Based Training Program.
12. KRAFT, M Preliminary Results of a Psychoeducational Group on Age-Related Cognitive Changes.
13. LOCKE, DE A Combined Cognitive Rehabilitation and Problem-Solving Focused Intervention to Improve Quality of Life in Patients with Primary Brain Tumors: A Pilot Study.
14. LUBINSKY, T Cognitive Mechanisms Supporting Errorless Learning in Healthy Controls and Individuals with Amnesic Mild Cognitive Impairment.
15. MILLER, KJ The Memory Fitness Study: Healthy Lifestyle Choices Improve Memory.
16. NOVAKOVIC-AGOPIAN, T Rehabilitation of Executive Functioning with Goal Self Management Training: Pilot neuropsychological, functional and fMRI data.
17. SCHMITTER-EDGEcombe, M Efficacy of a Memory Notebook Intervention for Persons with Early-Stage Dementia.
18. SHIOZAWA, M A principle of wide application for rehabilitation concerning of cognitive dysfunction of frontal lobe.
19. VAN HEUGTEN, C Efficacy of Time Pressure Management (TPM) in stroke patients with slowed information processing.
20. WERTHEIMER, JC * Differential Impact of Coping Styles on Quality of life for Individuals with Parkinson’s Disease.

Executive Abilities/Frontal System

21. ABE, N Neural basis of human deceptive behavior: Evidence from Parkinson’s disease.
22. ALTMANN, LJ N-Back in Three Modalities: What Are We Measuring?
23. BARLOW, AS The Relationship Between Executive Functioning and Memory Performance as a Function Of Cognitive Reserve.
24. BARLOW, AS Mediation Effects of Cognitive Reserve on the Relationship Between Executive Function and Memory.
25. CAPOVILLA, AG Executive Functions Assessment in Schizophrenic Patients and their First-Degree Relatives.
26. BRIGIDI, BD Executive and Memory Dysfunction in Depressed Individuals with Frontal High Grade Glioma.
27. DAWSON, E Self-Reported Executive Dysfunction in Bipolar Disorder Greater in Patients with Mixed than Manic Mood State.
28. EASTVOLD, A Deconstructing reaction time: Utility for neuropsychological research.
29. ELLENBERG, L * Executive Functioning in Long-Term Survivors of Childhood Brain Tumors.
30. FINE, EM Magnetic Resonance Imaging Predictors of D-KEFS Sorting Task Performance.
31. FOSTER, E * The Relationship Between Executive Dysfunction and Activity Participation in Non-demented Persons with Parkinson’s Disease (PD): Connecting the Lab to Everyday Life.
32. FRAZER, J Unexpected All-or-None Processing Utilized by Executive Control Systems When Working Memory and Inhibitory Control Demands are Increased.
33. GORAL, M Executive Functions Predict Comprehension at Both Ends of the Lifespan.
34. JOVANOVSKI, D Ecologically Valid Assessment of Executive Functioning in the (Virtual) Real World: the Multitasking in the City Test.
35. KONG, L Source Memory and Executive Functioning in Parkinson’s Disease.
36. KRAYBILL, M * Branching improves ecological validity of executive measures: prediction of functional independence.
37. LARSON, JC Motor Planning Contributions to Design Fluency Performance: Replication and Extension.
38. LEWIS, MW Putting the “Function” back into Executive Functioning.
39. LINDQVIST, S Manipulation of Task Difficulty in Three Inhibitory Control Paradigms.
40. LOKKEN, KL Prefrontal Systems Involvement in Eating Behavior.
41. LUBOYESKI, E Developmental Trajectories of Executive Functioning from Childhood through Early Adulthood: Effects of Age and Gender.
42. MARQUINE, MJ Impaired Self-Knowledge, but Preserved Other-Person Knowledge in a Case of Confabulation.
43. MARTEL, M Developmental Changes in Executive Function.
44. MOLNAR, AE Specific versus Common Executive Deficits in ADHD-C and ADHD-PI Using the BRIEF.
45. NIKI, C Can patients with right frontal lobe damage intentionally inhibit activating action schema?
46. POOLE, J Profiles of Impairment in Traumatic Brain Injury using the Delis-Kaplan Executive Function System.
47. POSSIN, KL Rule Violation Errors are Associated with Right Dorsolateral Prefrontal Cortex Atrophy in Neurodegenerative Disease.
48. POYSKY, J Executive dysfunction is predictive of social and school problems in Duchenne muscular dystrophy.
49. PULSIPHER, DT * Thalamo-Frontal and Executive Dysfunction in Juvenile Myoclonic Epilepsy.
50. ROACHE, C Executive Functioning as a Predictor of Scholastic Functioning in Adolescents with and without Spina Bifida.
51. SARAZIN, FF Chronic severe executive and neurobehavioral dysfunction post recovery from hypothyroidism: A longterm follow-up case study.
52. SAVLA, GN * Do Executive Functions Uniquely Contribute to Capacity to Consent to Research Among People with Schizophrenia?

53. SCHLICHTING, E Classification of Patients with Mild Cognitive Impairment vs. Normal Controls Based on Experimental and Standardized Measures of Processing Speed and Working Memory.
54. SCHRETLEN, DJ * Voxel-Based Morphometric Analysis of Iowa Gambling Task Performance in Healthy Adults.
55. SMITH, SS Cognitive Impairment in Women Newly Diagnosed with Breast Cancer.
56. SUNDERMANN, EE Relationships Between Nonverbal and Verbal Measures of Fluency.
57. SULLIVAN, C Sensitivity of DKEFS Fluency, Trails and Color-Word Inhibition Compared to their Traditional Counterparts in Assessing Traumatic Brain Injury.
58. TILLMAN, C Working Memory, Inhibition, and Sustained Attention as Independent Predictors of Intelligence in Children.
59. VAN ADEL, JM The Development of Multitasking in Children.
60. VASSILEVA, J Impaired Decision-Making in Antisocial MDMA Users.
61. VEGA, C Cognitive Flexibility in Spanish/English Bilingual Children.
62. WAGNER, MC Electrophysiological Indices of Age-Related Differences in Response Inhibition.
63. WELLER, JA Executive Dysfunction in Suicide Ideators and Suicide Attempters.
64. WELSH, M A Longitudinal Study of Executive Functions in a Low-Income Hispanic Sample of Young Children.
65. WINICKI, JM Reliability, Validity, and Normative Data for the Hopkins Ideational Fluency Test Battery.
66. WORKMAN, CI Self-Reported Sleep Predicts Performance on Tests of Attention and Executive Function: Preliminary Findings.
67. YOCHIM, B Effects of Focal Frontal Lobe Lesions on the D-KEFS Tower Test.
68. ZINN, S Mobility Proficiency as a Function of Cognitive Speed in Cerebrovascular Disease.

Traumatic Brain Injury

69. PONSFORD, JL Psychosocial and Emotional Outcome Ten Years Following Traumatic Brain Injury.

1:15–2:45 PM

Symposium 9

Cognitive Neuroscience and Experimental Psychopathology: a Transdisciplinary Approach Towards a Better Understanding of Depression Vulnerability

Chair: Rudi De Raedt

Room: King's Ballroom

1. DE RAEDT, R Cognitive Neuroscience and Experimental Psychopathology: a Transdisciplinary Approach Towards a Better Understanding of Depression Vulnerability.
2. DE RAEDT, R Depression Vulnerability: the Interplay Between Increasing Cognitive and Neurobiological Vulnerability.
3. DANNLOWSKI, U Emotion Processing in Major Depression: Neural Correlates and Genetic Susceptibility.
4. VANDERHASSELT, M High Frequency-Repetitive Transcranial Magnetic Stimulation Over the Left and Right Prefrontal Cortex: Effects on Attentional Processing of Non-Emotional and Emotional Information in Healthy Volunteers.
5. BAEKEN, C Biological Impact of High Frequency-Repetitive Transcranial Magnetic Stimulation of the Dorsolateral Prefrontal Cortex in Depression.

1:15–2:15 PM

Invited Plenary- Pathways to Neuronal Injury: Similarities and Dissimilarities Across Neurodegenerative Disorders

Eliezer Masliah

Room: Monarchy Ballroom

2:30–2:50 PM

Friday Afternoon Coffee Break

Room: Grand Promenade and Exhibit Hall

2:45–3:45 PM

Invited Plenary- Homage to Lorenz: Measuring Human Behavior and Performance in the Real World

Matthew Rizzo

Room: Monarchy Ballroom

2:45–4:15 PM

Paper Session 8

Neuropsychiatry

Room: Queen's Ballroom

1. LANGENECKER, SA Predicting Treatment Response in Major Depressive Disorder (MDD) using Computer-based Neuropsychological Instruments in a Clinical Setting.
2. KEILP, JG Neuropsychological Dysfunction in Suicidal Behavior: Executive or Information Processing Deficit?
3. KNIGHT, JA Relationship of Neurocognitive Problems to PTSD in Gulf War Veterans.
4. MACMULLEN, L Errors? What Errors? Impaired Everyday Error Detection in People with Schizophrenia.
5. TWAMLEY, EW Prospective Memory Impairment and Everyday Functioning in Schizophrenia.

2:45–4:15 PM

**Poster Session 9: Pediatric Acquired and Developmental Disorders
Room: Water's Edge Ballroom****Child - Acquired Disorder: Other**

1. ADDAMO, PK The Influence of Attentional and Motor Demands on Childhood Motor Overflow Production.
2. ANDREWS, GL Behavioral Development of Children with Agenesis of the Corpus Callosum: A 4-year Follow-up Study.
3. ARMSTRONG, MM Depression, Anxiety, and Neuropsychological Performance in Children with Sickle Cell Disease.
4. BAPP NEWMAN, J Categorical vs. Continuous Indices of Illness Severity and Neuropsychological Outcome: A Study of Preterm-Birth Preschoolers with History of Chronic Lung Disease.
5. BUTLER, RW Attentional Function in Children with Chronic Kidney Disease.
6. CHAN, RC Neurological soft signs in healthy school-aged children and children with ADHD.
7. DI PINTO, M Predicting Verbal Memory Performance after Conformal Radiation Therapy for Children with Craniopharyngioma, Ependymoma, and Low Grade Astrocytoma.
8. ENGLISH, LH * The Impact of Reading Goals on Text Comprehension and Reading Speed in Children with Spina Bifida Myelomeningocele.
9. FASTENAU, PS Comorbidities Associated with Declining Neuropsychological Performance 3 Years Following First Recognized Seizure in Children.
10. MOELTER, ST Executive Dysfunction in Children after Posterior Fossa Tumor Resection.
11. HODGES, E The Relationship of Parent-Reported Sleep Problems and Neuropsychological Functioning in Children Referred for Adenotonsillectomy.
12. HOPYAN-MISAKYAN, T Impaired Cognitive Regulation of Emotion in Music in Children with Cerebellar Tumors.
13. HOPYAN-MISAKYAN, T Increased Cognitive Load Slows Reaction Time in Children with Malignant or Benign Cerebellar Tumors.
14. MCLAUGHLIN-BELTZ, S The Neurological and Neuropsychological Sequela of Eastern Equine Encephalitis: A Case Study.
15. REY-CASSERLY, C Long-term Outcomes in Pediatric Low Grade Gliomas Treated with Surgery Only.
16. SCHWEIGER, A Hemispheric Lateralization following Recovery from Childhood Insult Depends on Age at Onset: Longitudinal fMRI Data.
17. STARGATT, R Academic Skills in Children Treated for Brain Tumor are Influenced by a Variety of Tumor, Treatment, Neuropsychological & Family Factors.
18. UENO, C Environmental Management Improves Behaviors and Intellectual Growth of Juvenile Delinquents in Reformatories.

Child - Acquired Disorder: TBI

19. BEEBE, DW * Sleep problems after Traumatic Brain Injury (TBI) in 3-6 Year-Old Children.
20. FAY, TB Cognitive Predictors of Postconcussive Symptoms in Children with Mild Traumatic Brain Injury.
21. GIOIA, GA Psychometric Properties of the Parent and Teacher Post-Concussion Symptom Inventory (PSCI) for Children and Adolescents.
22. GLASIER, PC Illness Behavior Encouragement as a Predictor of Post-Concussive Symptoms after Mild Traumatic Brain Injury in Children.
23. HAJEK, C * Relationships among Postconcussive and Posttraumatic Stress Symptoms in Children Following Mild Traumatic Brain Injury.
24. HALLDORSSON, JG The Incidence of Pediatric Traumatic Brain Injuries in a Nationwide Sample.
25. HORNEMAN, G Cognitive outcome in children and young adults who sustained severe and moderate brain injury ten years earlier.
26. JANUSZ, J Examination of the Everyday Situations Survey (ESS) in Children and Adolescents.
27. PRASAD, MR Impact of the Caregiver-Child Interaction on Outcome in Infants and Toddlers with Traumatic Brain Injury.
28. SCHNEIDER, JC Parent and Self-Reported Changes of Emotional Functioning Post Concussion.
29. SCHNEIDER, JC Correlation Between Parent and Child Ratings of Emotional Functioning Pre and Post Injury.
30. SHAPIRO, M Documenting Recovery Trajectories in Child/Adolescent Concussion.
31. VAN HEUGTEN, C Screeningtool for cognitive, emotional, and behavioural problems after paediatric brain injury: feasibility, reliability and validity.
32. VAUGHAN, CG * Initial Examination of Self-reported Post-concussion Symptoms in Normal and mTBI Children Ages 5 to 12.

Child - Developmental Disorders

33. BALLANTYNE, CJ Visuo-Spatial Attentional Biases in Children with Fragile X Syndrome and Autism.
34. BANKS, MS Reaction Time Disparities Between Individuals With Autism Spectrum Disorders and Typically-Developing Controls in Response to Congruent and Incongruent Emotional Movies.
35. BAUMGARDNER, J Neurocognitive Contributions to Parenting Stress.
36. BLACK, DO Cognitive Profiles Predicts Social Symptoms and Impairments in High Functioning Children with Autism Spectrum Disorders.
37. BOORSTEIN, HC Diagnostic Stability in Young Children with PDD-NOS: Examining Early Characteristics and Differences.
38. CRAWFORD, S Are visual perceptual and visual motor deficits shared cognitive risk factors for children with developmental coordination disorder, attention deficit hyperactivity disorder and reading disability?
39. DANCEL, GM Ethnic Differences in Performance on the M-CHAT.
40. DAVIS, J What is NVLD?
41. FINE, JG Empirical Bases for NVLD.
42. SEMRUD-CLIKEMAN, M A Meta-Analysis of the Diagnosis of NVLD.
43. SEMRUD-CLIKEMAN, M Interventions for NVLD.
44. DAVIS, AV Social Skill Patterns in Children with Autism Spectrum Disorders and Nonverbal Learning Disabilities.

45. DEWEY, D Neurodevelopmental Trajectories in Children with Autism Spectrum Disorders.
 46. GAMINO, JF Strategic Learning in Children with Attention Deficit Hyperactivity Disorder.
 47. GERRARD-MORRIS, AE Neurocognitive Profiles of Children with Autism Spectrum Disorder.
 48. GIBBS, M Inhibitory Functioning in Children with Autism.
 49. MARKOFF, K Are Children with Autism Susceptible to Contagious Yawning?
 50. JOHNSON, SA Lack of Local Bias during Selective Attention Global-Local Processing in Autism Spectrum Disorders.
 51. KIBBY, MY Relationship between Pars Triangularis Morphology and Phonological Processing.
 52. KIBBY, MY Relationship between Brain Structure and the Double Deficit Model of Dyslexia.
 53. LARKIN, D Difficulties with the Recognition of Motor Coordination Problems.
 54. LOZANO, VJ * Memory, Commissural Dysgenesis, and Spina Bifida Meningocele.
 55. MCMANUS, SM Face Bias During an Audio-Visual Emotion Perception Task Absent in Autism Spectrum Disorders.
 56. MORE, S Cognitive and Behavioral Functioning in Children Undergoing RV to PA Conduit Placement.
 57. NASH, K The Neurobehavioral Profile of Children with Fetal Alcohol Spectrum Disorder (FASD): A Comparison with Attention Deficit Hyperactivity Disorder (ADHD) and Oppositional Defiant/Conduct Disorder (ODD/CD).
 58. NUNEZ, C Attention Performance in Children Prenatally Exposed to Methamphetamine.
 59. PANDEY, J Screening, Developmental, and Diagnostic Differences Between Younger and Older Toddlers Using the Modified Checklist for Autism in Toddlers (M-CHAT).
 60. PARLOW, SE * Anomalous Hand Preference Observed for Bimanual Tasks in Unaffected Siblings of Children with Autism.
 61. PHILLIPS, K Executive Functioning in Children and Adolescents with Williams Syndrome: Performance on Experimental Measures and Comparison to Parental Report.
 62. RADONOVICH, K Motor Impairments in School-aged Children with Autism.
 63. KIMBERG, CI Relationship of Executive Functions and Repetitive Behavior in Preschoolers with Autism.
 64. RANDALL, K Inhibition in Children with ADHD: How Efficient are They?
 65. LARKIN, D Activities of Daily Living in Children with Developmental Coordination Disorder: Dressing, Personal Hygiene and Eating Skills.
 66. TEK, S Predictors of Language Development in Young Children with Autism.
 67. MACEDO, EC Performance of Dyslexics and ADHD Brazilian Children in Single Word Reading Tasks.
 68. TROYB, E Parental Age as a Risk Factor for Autism.
 69. VAURIO, LE Comparison of Neuropsychological Performance in Children with Heavy Prenatal Alcohol Exposure and IQ-Matched Controls.
 70. VERBALIS, AD Symptom Expression Differences in High Functioning Autism and Autism with Cognitive Delay.
 71. VILLALOBOS, ME Social Abilities and IQ Profiles in Autism Probands and their Siblings.
 72. WAHLSTEDT, C Independent Contributions and Interactions of Neuropsychological Dysfunctions to the Explanation of ADHD Symptoms.
 73. WENIGER, R The Discriminative Validity of the Wide Range Assessment of Memory and Learning, 2nd edition (WRAML2) for Children Diagnosed with Reading Disorders (RD), Attention-Deficit/Hyperactivity Disorder (ADHD), and Comorbid ADHD+RD.
 74. WILDE, NJ The Long-Term Consequences of Delayed Walking and Talking.
 75. WILSON, LB Differentiating ASD From Other Developmental Delays in Young Children.
 76. WOZNIAK, JR * Executive Function Correlates of Frontal White Matter Deficits in Children with Fetal Alcohol Spectrum Disorders: A DTI study.
 77. CHAN, RC Perceptual deficits in time discrimination in ADHD.

Learning Disabilities/ADHD

78. WILKINSON, A Motor Speed in Children and Adolescents with Nonverbal Learning Disabilities.

Other

79. ACOSTA, MT Lovastatin as Treatment for Neurocognitive Deficits in Children with Neurofibromatosis type 1 (NF1): Safety and Neuropsychological Data from Phase 1 Study.

Traumatic Brain Injury

80. ELLIOTT, B Gender Differences in Recovery from Post-Concussion Fatigue.

4:15–5:00 PM

**INS Business Meeting
Room: Monarchy Ballroom**

5:00–6:00 PM

**Presidential Address: On the Emerging Role of Neuropsychology in Understanding the Brain Effects of Medical Illnesses: Example of HIV
Igor Grant
Room: Monarchy Ballroom**

6:15–7:45 PM

**INS Reception
Room: Lagoon Lanai**

SATURDAY, FEBRUARY 9, 2008**7:20–8:50 AM****Saturday Morning CE Workshops****Room: Refer to CE Program for room assignments****9:00–10:30 AM****Paper Session 9****Alzheimer's Disease****Room: King's Ballroom**

1. TSCHANZ, J
2. SEIDENBERG, M
3. CRAFT, S
4. BRICKMAN, AM
5. HORNE, NR

Gender Differences in the Trajectory of Cognitive Decline in Alzheimer's Disease in the Cache County Population. Semantic Memory Activation in Individuals at Risk for Developing Alzheimer's Disease: Relationship to Family History and APOE $\epsilon 4$.

Insulin Resistance, Diabetes, and AD: Pathogenetic and Pharmacogenomic Mechanisms.

Cerebral Atrophy and White Matter Hyperintensity Burden Predict More Rapid Cognitive Decline in Alzheimer's Disease.

Decreased White Matter Integrity in Later-Myelinating Fiber Pathways in Alzheimer's Disease: a Diffusion Tensor Imaging Study.

9:00–10:30 AM**Symposium 10****Validation of an Endophenotype for Schizophrenia with Cross-Cultural, Psychological and Biological Correlates****Chair: Scot Purdon****Room: Monarchy Ballroom**

1. PURDON, SE
2. GODDARD, K
3. WOODWARD, N
4. PURDON, SE
5. PINO, O

Validation of an Endophenotype for Schizophrenia with Cross-Cultural, Psychological and Biological Correlates.

Early and Stable Continuous Performance Test (CPT) Deficits Consistent with an Endophenotype for Schizophrenia.

Patients With Schizophrenia and their Unaffected Relatives Demonstrate fMRI Abnormalities in Fronto-subcortical Circuitry During Procedural Learning.

Single Proton MRS Glutamate Levels Associated With Poor Continuous Performance Test (CPT) Scores and Genetic Risk for Schizophrenia.

Sensitivity and Cross-Cultural Consistency, But Not Diagnostic Specificity, of the Screen for Cognitive Impairment in Psychiatry (SCIP).

9:00–10:30 AM**Symposium 11****Neuropsychological Contributions to Understanding the Cognitive and Neurobiological Mechanisms of Perceptual Category Learning****Chair: Vincent Filoteo****Room: Queen's Ballroom**

1. FILOTEO, V
2. ASHBY, C
3. ELL, SW
4. SCHNYER, DM
5. FILOTEO, V

Neuropsychological Contributions to Understanding the Cognitive and Neurobiological Mechanisms of Perceptual Category Learning.

Category Learning in Prediagnosis Huntington's Disease.

The Effect of Focal Basal Ganglia Lesions on Rule-Based and Information-Integration Category Learning.

Dissociable Executive Functions Predict Performance Separately for Rule-Based and Information Integration

Category Learning: Evidence from Patients with Lesions to Frontal Cortex.

Category Learning Deficits in Patients with Parkinson's Disease: Neuropsychological Underpinnings and Clinical Utility.

9:00–10:30 AM**Poster Session 10: Traumatic Brain Injury****Room: Water's Edge Ballroom****Other**

1. IVERSON, GL
2. IVERSON, GL
3. IVERSON, GL
4. LYSACK, C

Preseason Neurocognitive Testing in Athletes with Academic Problems.

Are there lingering effects of a single concussion in young women athletes?

No Obvious Cumulative Effects in Male Athletes with One or Two Previous Concussions.

The Role of Cognition in Predicting Discharge Destination after Rehabilitation.

Traumatic Brain Injury

5. AGUERREVERE, L
6. ALLEN, DN
7. ANDERSON, JW
8. ANDREWS, GL
9. ASHMAN, T

Visual Perception in TBI: Effects of Severity and Effort.

The effects of alcoholism comorbidity on neurocognitive function following traumatic brain injury (TBI).

Attentional Control and Variability following Moderate-to-Severe Traumatic Brain Injury.

Adult Short-Term Memory Loss: A 12-year case study in multidisciplinary rehabilitation.

Cognitive Fatigability, Participation, and Co-Morbid Conditions after TBI.

10. BEAUCHAMP, MH The role of the corpus callosum in social function 10 years after pediatric traumatic brain injury.
11. DOOLEY, J Social Behaviours and Paediatric Traumatic Brain Injury: Long-Term Outcome in Adolescent Boys.
12. HESSEN, E MMPI-2 profiles 23 years after pediatric mild TBI.
13. WARSCHAUSKY, S * Predicting Transition-age Social Functioning Following Traumatic Brain Injury.
14. BLAKE, T Clinical Utility of Demographically Corrected WAIS-III Subtest Scores After Traumatic Brain Injury.
15. BLAKE, T Comparative Utility of Reading Measures For Estimating Premorbid Intelligence Among Persons With Brain Injury: A Preliminary Study.
16. BROOKS, BL Influence of Age on the Acute Neuropsychological Outcome from Uncomplicated Mild Traumatic Brain Injury.
17. BUI, M Facial Affect Recognition in Individuals with Traumatic Brain Injury.
18. ELY, PW You can fool all of the people some of the time.
19. ENNOK, M Deficits in Generalization Ability in Traumatic Brain Injury.
20. EVANS, G Title: Impact of Stressful Life Events and Post-Traumatic Stress on Emotional Distress and Quality of Life After Mild Traumatic Brain Injury.
21. EVANS, CC Impact of Depressive Symptoms, Impaired Self-Awareness, and Therapeutic Alliance on Outcome from Post-acute Brain Injury Rehabilitation.
22. EWING-COBBS, L * Relation of Diffusion Tensor Imaging Metrics from the Corpus Callosum with Neuropsychological Outcomes after Pediatric TBI.
23. FAULHABER, C Neurorehabilitation Outcomes After Brain Injury: Gender Differences.
24. FILANOSKY, C The Relationship Between Sleep Efficiency and Depression after Traumatic Brain Injury (TBI).
25. FITZPATRICK, N Cross-Validation of Diffusion Tensor Imaging in Acute TBI using Proton Magnetic Resonance Spectroscopy.
26. GALE, SD * Decreases in Fractional Anisotropy of the Fornix in Children with Chronic TBI.
27. GHEYTANCHI, A Determinants of Self-Reported Post-Concussive Symptoms in Combat Veterans with Mild to Moderate Traumatic Brain Injury.
28. GINSBERG, A * The Role of Sleep Efficiency in Post-TBI Fatigue: A Comparison between Individuals with TBI and Non-TBI Controls.
29. GOLDSTEIN, G Neurocognitive heterogeneity in traumatic brain injury.
30. GONTKOVSKY, ST Multidimensionality of the State-Trait Personality Inventory with Traumatic Brain Injury Patients: A Rasch Analysis.
31. HAN, S Cognitive Discrepancy Patterns Following Traumatic Brain Injury Among Active Military Personnel.
32. HANKS, RA The Predictive Validity of a Brief Inpatient Neuropsychological Battery for Persons with Traumatic Brain Injury.
33. HEINLY, M Language Dysfunction in Traumatic Brain Injury While Controlling for Effort and Severity.
34. HOWARD, SM Individuals with Traumatic Brain Injury: Visual Impairments and Quality of Life.
35. JANOS, AL Comparison of Cognitive Testing Methods for the Detection of Blast-Related Traumatic Brain Injury.
36. KALMAR, K Feasibility of a Brief Neuropsychological Test Battery for Use During Acute Inpatient Rehabilitation After TBI.
37. KASHLUBA, S Neuropsychological and Functional Outcome after Complicated Mild Traumatic Brain Injury.
38. KEISKI, MA Neurological Content Relevant to Traumatic Brain Injury (TBI) on the Personality Assessment Inventory (PAI).
39. KING, AV The Impact of Specific Attention Retraining after Traumatic Brain Injury.
40. LANGE, RT Influence of Sex on the Acute Neuropsychological Outcome from Traumatic Brain Injury.
41. LEON-CARRION, J Contribution of Growth Hormone Deficiency to Cognitive Deterioration in Patients with Traumatic Brain Injury: A Transdisciplinary Study.
42. LIOSSI, C The effects of organic alexithymia after acquired brain injury on marital satisfaction.
43. MARQUEZ DE LA PLATA, CD * Acute and Chronic Global White Matter Integrity as Biomarkers for Neurocognitive Outcome after DAI.
44. MARQUEZ DE LA PLATA, CD Tractography as a Biomarker for Outcome after Traumatic Diffuse Axonal Injury.
45. MCKERRAL, M * Deficits in Complex Visual Information Processing After Mild TBI: Electrophysiological Markers and Vocational Outcome Prognosis.
46. SCHMITTER-EDGEcombe, M Access to Semantic Knowledge during Early Stage Recovery from Traumatic Brain Injury.
47. ORD, JS Executive Dysfunction in Traumatic Brain Injury: The Effects of Injury Severity and Effort on the Wisconsin Card Sorting Test.
48. PAGULAYAN, KF The Relationship between Alcohol Use and Neuropsychological Functioning Following Traumatic Brain Injury.
49. POOLE, J Assessing Veterans with Mild Brain Trauma and Post Traumatic Stress: Can Neuropsychological Tests Distinguish Cognitive and Emotional Impairments?
50. RASKIN, S Cognitive Rehabilitation of Prospective Memory Using Structured Mental Rehearsal.
51. RITTER, LM Neuroanatomical Models of Impaired Awareness Following Traumatic Brain Injury: Do They Predict Neuropsychological Test Performance?
52. SANDER, AM Family Functioning and Community Integration Following Traumatic Brain Injury.
53. SAWADA, K Cognitive factors related to compensatory behavior in patients with traumatic brain injury.
54. SCHNEIDER, JJ Etiology of Traumatic Brain Injury: Impact on Psychological Functioning.
55. SCHUTTE, C The impact of alcohol intoxication at time of injury on functional and cognitive variables one year post TBI.
56. SEPEHRI, A * Empirical Determination of Post-Traumatic Amnesia Duration Severity Classification Relative to One Year Outcome.
57. YI, AS Treatment for Emotional Self-Regulation and Problem-Solving Deficits in Adults with Moderately to Severe Cognitive Deficits.
58. SHUM, D Performance of individuals with TBI on executive function tests and its relationship with psychosocial outcome.
59. SIM, T The Effects of Blast Exposure and Loss of Consciousness on the Cognitive Functioning of War Veterans.
60. STRUCHEN, MA Executive Functioning, Social Communication, and Functional Outcome After Traumatic Brain Injury.
61. SULLIVAN, C DETERMINANTS OF POST-TRAUMATIC STRESS SYMPTOMS 5 OR MORE YEARS AFTER TRAUMATIC BRAIN INJURY.

62. TERRYBERRY-SPOHR, LS * Interdisciplinary Management of Concussive Events in High School Athletes: The Importance of the Neuropsychologist in Detection and Monitoring of Concussive Injuries.
63. TSAOUSIDES, T Reliability and Validity of the Pittsburgh Sleep Quality Index in Individuals with Traumatic Brain Injury.
64. VANNORS DALL, TD A Voxel-Based Morphometry Study of Neuroanatomic Abnormalities in Traumatic Brain Injury.
65. WEBER-ORNSTEIN, I Long-Term Life Satisfaction after Traumatic Brain Injury: Relationship to Continuing Problems & Community Integration.
66. LOVELL, MR Recovery from Concussion in the Competitive Skier.
67. WILDE, NJ Compensatory Strategy Use and the Ecological Validity of Memory Tests Following TBI.

10:30–11:00 AM**Saturday Morning Coffee Break
Room: Grand Promenade and Exhibit Hall****10:45 AM–12:15 PM****Paper Session 10
HIV/AIDS
Room: King's Ballroom**

1. ETTENHOFER, ML Aging, Neurocognition, and Medication Adherence in HIV Infection: A Latent Model Analysis.
2. JERNIGAN, TL White Matter Damage and Cortical Volume Loss Affect Different Cognitive and Motor Functions in HIV-infected Individuals.
3. BOLDEN, KA Cognitive Performance and Medial Temporal Lobe Volumes in HIV+ Patients.
4. MULLER-OEHRING, EM Effects of Alcohol and HIV-infection Comorbidity on Visual Feature and Conjunction Search: Relation to Corpus Callosum Integrity.
5. SCHWEINSBURG, BC Neurochemical Markers of Cellular Integrity Predict White Matter Anisotropy in HIV Infection.

10:45 AM–12:15 PM**Symposium 12
The Clinical Application of Functional Neuroimaging
Chair: Robert Doss
Room: Monarchy Ballroom**

1. DOSS, R The Clinical Application of Functional Neuroimaging.
2. BAXTER, L Mapping of "Eloquent" Cortex Using fMRI in Brain Tumor Patients.
3. BOOKHEIMER, S Developing Applications and New Populations for Clinical fMRI.
4. RISSE, G Clinical Application of MEG/MSI in the Presurgical Evaluation of Epilepsy Patients.
5. SWANSON, S Clinical fMRI Task Development: Methodological Considerations.

10:45 AM–12:15 PM**Symposium 13
The Neuropsychological Basis of Written Language in Children
Chair: Stephen Hooper
Room: Queen's Ballroom**

1. HOOPER, SR The Neuropsychological Basis of Written Language in Children.
2. WAGNER, RK Comparing Alternative Models of Underlying Dimensions of Written Language.
3. HOOPER, SR Neurocognitive Functioning of First Graders At-Risk for Problems in Written Expression.
4. BERNINGER, VW Brain Differences of 5th Graders with and without Writing Disabilities on fMRI Handwriting, Orthographic Coding, and Finger Succession Tasks.

11:00 AM–12:30 PM**Poster Session 11: Dementia
Room: Water's Edge Ballroom****Dementia Alzheimer's Disease**

1. BACK-MADRUGA, C Executive Variant Alzheimer's Disease: Further Evidence of a Subtype.
2. BAYAN, S The Relationship between the CVLT-II Short Form and Functional Ability in Patients with Dementia.
3. BETTCHER, BM Correction of Everyday Action Errors in Dementia: Time Frames and Neuropsychological Correlates.
4. BHARADIA, V Predicting Alzheimer's Disease (AD) from Mild Cognitive Impairment (MCI): Are Our Biological and Neuropsychological Tools Up to the Task?
5. BRENNAN, L To Cue or Not to Cue: The Influence of Cues on Everyday Action Performance in Dementia.
6. BRUNA, O Clinical and Social Factors Related to Burden on Relatives of Patients with Dementia.
7. CERCY, SP Heterogeneity of Olfactory Processing in Early-Onset Familial Alzheimer Disease Due to Presenilin-1 Mutation.
8. GRIFFITH, R Brain Glucose Metabolism is Associated with Everyday Functional Activities in Patients with Mild Cognitive Impairment and Patients with Alzheimer's Disease.
9. CREAMER, SA Narrative Comprehension in Alzheimer's Disease: Assessing Inferences and Memory Operations with a Think-aloud Procedure.
10. DA PENA, E * The Limited Role of Inhibitory Control in Bilingual Language Production: Evidence from Alzheimer's Disease (AD).

11. DANCEL, GM Performance of Alzheimer's Disease Patients on Individual Subscales of the Direct Assessment of Functional Status.
12. DAVID, S Prediction of cerebral metabolic decline in persons with a family history of Alzheimer's disease.
13. DUEY, KA Aricept (donepezil) Reduces Everyday Action Errors in Alzheimer's Disease but Does Not Improve Error Monitoring.
14. FLORES, DL * Premorbid Psychiatric Abnormalities Are Not Common in Presymptomatic Familial Alzheimer's Disease Gene Carriers.
15. FORD, AI Usefulness of a Telephone Screening for Identifying Cognitive Decline: Retrospective Analysis of Autopsy-Confirmed Cases of Alzheimer's Disease.
16. GARRETT, DD Proximity to Death and Cause of Death Relate Differentially to Dementia Status.
17. GRIFFITH, R * Brain Metabolic Correlates of Decisional Abilities in Patients with Amnesic Mild Cognitive Impairment.
18. HAYASHI, A The Relationship Between Writing Disorders and Linguistic Deficits in Japanese Alzheimer's Disease.
19. HEMMY, L Educational Attainment and Rate of Decline in Alzheimer's Disease.
20. O'BRYANT, SE Cognitive Predictors of Impairment in Specific Functional Domains Among Individuals with Dementia.
21. HYDE, T Dementia Detection Using a Brief Computer Administered Visual Memory Task.
22. JOHNS, E Disproportionate Deficits in Inhibitory Control: Profile of Executive Functioning in Mild Cognitive Impairment.
23. KANE, AE The Integrity of Priming in Alzheimer's Disease Depends on the Nature of the Representation Rather than the Fate of Activation.
24. KARVER, CL Performance-based Functional Assessment: Correlation with Neuropsychological Functioning in a Dementia Sample.
25. MAHENDRA, N Computer-Assisted Training of Face-Name Associations in Persons with Dementia.
26. MEDINA, LD Memory Self-Appraisal and Actual Memory Performance in Mutation Carriers for Familial Alzheimer's Disease.
27. MEDINA, LD The Wisconsin Card Sorting Test in Presymptomatic Familial Alzheimer's Disease Mutation Carriers.
28. MILLER, K A Comparison of Auditory Description Naming and Visual Confrontation Naming Performance in Dementia.
29. MONTROYA, RI Does Bilingualism Delay Alzheimer's Disease Onset? Evidence from a Hispanic Cohort.
30. MOON, JH Aggregated Risk: The Contribution of Multiple Risk Factors in Alzheimer's Disease.
31. MUSIL, S Profiles of Phonemic and Semantic Fluency in Frontotemporal Dementia and Alzheimer's Disease.
32. NIEVES, CA Serial Order Errors and Everyday Action Performance in Dementia.
33. OH, Y Differences in Neuropsychological Functions between Early Onset and Late Onset of Alzheimer's Disease.
34. PADILLA-VELEZ, MM Self-Reported Use Of Mnemonics Has Unique Predictive Ability For Daily Function Beyond That Of Neuropsychological Measures Of Memory.
35. PERSSON, CM Cognitive Development During 3 Years in Patients with Alzheimer's Disease.
36. REPP, AL The Presence of the $\epsilon 4$ Allele and Semantic Clustering in Olfactory Episodic Memory Tasks Using the COLT.
37. RITCHIE, L Patterns of Neuropsychological Decline and Conversion Rates for Three Classification Models of Mild Cognitive Impairment (MCI).
38. ROSSETTI, HC Impact of Demographic Variables on Progression of Alzheimer's Disease Using the CERAD Neuropsychological Battery Total Score.
39. RUEDA, A Time Estimation in Alzheimer's Disease.
40. TIPPETT, LJ Procedural Learning of Daily Tasks in Alzheimer's Disease.
41. SALMON, DP Modality-Specific Patterns of Working Memory Impairment in Alzheimer's Disease, Huntington's Disease, and Parkinson's Disease with Dementia.
42. SAUNDERS, LV Validation of a Self-administered Computerized Screening Test for Cognitive Impairment and Dementia.
43. SCHULTZ, W Longitudinal Evidence for Sex Differences in Verbal Memory Decline in APOE $\epsilon 4$ Carriers.
44. SEELYE, AM * Two Behavioral Interventions for Patients with Mild Cognitive Impairment: A Pilot Study.
45. SHEROD, MG Overestimation of Financial Ability in Alzheimer's Disease: When Does the Loss of Awareness First Occur?
46. CORREIA, S Executive Impairment and MOCA Performance in Mild Cognitive Impairment and Alzheimer's Disease.
47. SUH, M Aphasia types in early and late onset Alzheimer's disease.
48. TAKAHASHI, T Cerebral Blood Flow in Alzheimer's Disease with Depression.
49. TENG, E Utility of the Functional Activities Questionnaire for Distinguishing Mild Cognitive Impairment from Mild Alzheimer's Disease.
50. TENG, E Instrumental Activities of Daily Living in Subtypes of Mild Cognitive Impairment.
51. TESHIBA, T Performance-based Functional Assessment: Correlation with Self- and Informant Report in a Dementia Sample.
52. TOMASZEWSKI FARIAS, S Changes in Memory and Executive Functioning are Associated with Change in Instrumental Activities of Daily Living.
53. VALDIVIESO, E Cognitive Function Predicted from Odor Memory, Body Mass Index and Apolipoprotein Status in Older Adults.
54. WAMBACH, D The Question Makes the Difference: Caregivers' Descriptions versus Predictions in Relation to Everyday Action Performance in Dementia.
55. WIERENGA, C Changes in the Neural Substrates of Semantic Memory in Alzheimer's Disease.
56. WITTENBERG, D Differential Rates of Decline in Verbal Episodic Memory, Working Memory, and Spatial Abilities in Alzheimer's Disease Vs. Fronto-Temporal Dementia.
57. WONG, JT The Relationship between the Mini Mental Status Exam and the Direct Assessment of Functional Status in Patients with Mild Cognitive Impairments.
58. YOON, J Hangul Agraphia in Early-Onset Alzheimer's Disease.
59. ZEC, RF Individual Differences in Performance on the Boston Naming Test in Alzheimer Disease patients and "Normal" Controls.

Dementia: Other (e.g., Semantic Dementia, FTD, VaD)

60. CHIN, J Frontal Behavioral Dysfunctions in Patients with Subcortical Vascular Mild Cognitive Impairment versus Subcortical Vascular Dementia.
61. ELDER, J Alzheimer's Disease and Vascular Dementia: Are the Memory Indices of the RBANS Sufficient for Differential Diagnosis?
62. HAMILTON, JM * Visuoconstruction Deficits Are Related to the Presence of Visual Hallucinations in Autopsy-Proven Dementia with Lewy Bodies.
63. HENRY, ML The Evolution of Reading and Spelling Impairments in Progressive Aphasia.
64. JESSO, S Semantic Dementia - Looking for Meaning.
65. KERTESZ, A * What Is the Meaning of Semantic Dementia (SD)?
66. KWON, JC The correlation of ischemic burdens and neuropsychological abnormalities in Binswanger type Vascular Cognitive Impairment.
67. MEDINA, J Assessing Depression in Primary Progressive Aphasia.
68. MILLIKIN, C Dementia Assessment of Three 50 Year-Old Women Reveals Two Rare Conditions.
69. OSHER, J Emotional Word Processing in Frontotemporal Dementia.
70. PLOWHEAD, A Working Memory in Differing Sub-types of Dementia in Male Veterans.
71. QUITANIA, L Ecological Validity and Neuroanatomical Correlates of the D-KEFS California Card Sorting Test.
72. RANKIN, KP Neuroanatomy Underlying Ecologically Realistic Emotion Identification in Dementia.
73. RASCOVSKY, K Neuropsychological Patterns of Behavioral Variant Frontotemporal Dementia (bvFTD) and Alzheimer's Disease (AD): An Autopsy-Confirmed Study.
74. REILLY, J * Semantic Naming Errors in Alzheimer's Disease and Frontotemporal Dementia: Evidence for Interactivity in Semantic Memory.
75. SCHENK, K Assessing the Mental Rigidity of FTD Patients Using a Random Number Generation Task.
76. SZCZERBACKI, NF A Comparison of Geriatric Depression Scale Scores in Alzheimer's Disease and Primary Progressive Aphasia.
77. TONOMURA, Y Brain Imaging of Progressive Nonfluent Aphasia.

Emotion

78. DIEUVIL, M Assessment of Emotional Semantics in Early Alzheimer's Disease.

Other

79. TREMONT, G Cross Task Consistency of Memory Performance in Mild Cognitive Impairment.

1:00–2:30 PM**Poster Session 12: Neurocognitive Functions
Room: Water's Edge Ballroom****Attention**

1. ACOSTA, MT Latent Class Subtyping of Attention-Deficit/Hyperactivity Disorder and Comorbid Conditions.
2. ANDERSON, JW * "Time Flies When You're Having Fun": Estimating Time during Demanding and Non-Demanding Attention Tasks.
3. ASBJORNSEN, AE Can a rating scale for attention deficits identify attention problems among prison inmates?
4. BAERWALD, JP The Effects of Interstimulus Timing on Modal and Bimodal Response Sensitivity and Bias in a Continuous Test of Focus Attention.
5. BEEBE, DW * Neural Response to Chronic Sleep Restriction in Adolescents: A Pilot fMRI Study.
6. CLARK, A Inducing Slips of Action by Manipulating a Well Learned Action Routine.
7. COHEN, R Adaptive Rate Continuous Performance Test: Standardization and Validation.
8. COHEN, R Attention performance on the ARCPT: A comparison of clinical brain disorders.
9. COOK, SE The Impact of Distraction on Lane Navigation in Older Adults With and Without Cognitive Impairment.
10. HARDER, L The Relation Between Visual-Motor Integration, Attention, and Executive Functioning in School-Aged Children with AD/HD.
11. KUMADA, T Abnormal Spatiotemporal Dynamics of Visual Attention in Patients without Unilateral Spatial Neglect.
12. LUNDY, S Classic and Emotional Stroop Performance in Female Undergraduates "At-Risk" for Anorexia Nervosa and Obsessive-Compulsive Disorder.
13. MANI, T Validation of the Moss Attention Rating Scale (MARS) with an Acute Traumatic Brain Injury Sample.
14. MIARMI, L Awareness of the Environment: Cross-Modal Inattentional Blindness.
15. REYNOLDS, GP Attention Bias for Positive and Negative Emotional Information.
16. VERNEY, SP Sustained Attention Correlates of Cognitive Ability.

Electrophysiology/EEG/ERP

17. THIBAUT, G Effect of Cognitive-Behavioral Therapy on Brain Activity Related to Stimulus-Response Conflict Processing in Gilles de la Tourette Syndrome.
18. COX, DE Cerebral Lateralization and Gustation: A Quantitative Electroencephalography Study.
19. KEY, AP Visual Processing of Facial Features in Infants at Low and High Risk for Autism.

20. LAVOIE, ME * Evaluation and treatment of Tourette syndrome: An integrated behavioral and neurocognitive approach focusing on motor processing.
21. MAGUIRE, MJ The Neurological Underpinnings Of Individual Differences In Learning: Relating ERP Responses To Self-Reported Learning Strategies.
22. MOES, P Asymmetry of ERP-derived Interhemispheric Transfer Times for Facial Stimuli.
23. MOLFESE, PJ Dynamic Links Between Emerging Cognitive Skills and Brain Processes.
24. MOLNAR, AE Electrophysiological Differences from Two Executive Functioning ERP Paradigms in the Same Children 5-to-8 Years of Age.
25. ROMAN, A * Impact of Minor Sleep Loss on Speech Perception in 7 Year Olds.
26. SESMA, HW Assessing Cognitive Development in Infancy: Relations Between Electrophysiological and Behavioral Measures.
27. THIBAUT, G Electrophysiological Manifestations of Stimulus Evaluation and Motor Processing in Patients with Gilles de la Tourette syndrome.
28. TILLMAN, GD * Estradiol Levels During the Menstrual Cycle Differentially Affect Latencies to Right and Left Hemispheres During Dichotic Listening.
29. TILLMAN, GD Neurophysiological Marker of Semantic Object Retrieval.
30. WAFORD, R Variations in Event-Related Potentials Across Time and Sleep Duration.

Hemispheric Asymmetry/Laterality/Callosal Studies

31. BRIDGMAN, MW * Eye-tracking During Facial Emotion Recognition in Primary Agenesis of the Corpus Callosum.
32. CUTIONGCO, R Semantic Analysis of the Awareness of Consequences Test in Agenesis of the Corpus Callosum.
33. HARRELL, KM Color-word Inhibition in Agenesis of the Corpus Callosum.
34. HILLEARY, SM Factor Analysis of Computerized Bimanual Motor Coordination Reveals Independent Aspects of Motor and Interhemispheric Performance in Young Adults.
35. HODGES, KA Handedness and Lateralized Semantic Priming.
36. JACKSON, CA Patterns of frontal brain asymmetry among children living in low-income households.
37. KIRK, IJ Steroid Modification of Interhemispheric Transfer Time during the Menstrual Cycle.
38. KNUTH, EA The Relationship Between Verbal and Nonverbal Memory and Interhemispheric Functioning in Adults.
39. PAZIENZA, S Alexithymia and Somatization in Agenesis of the Corpus Callosum.
40. POOCK, J Dual-Task Performance Following Right vs. Left Hemispherectomy: A Case Study of Functional Brain Asymmetry.
41. PUENTE, AE Handedness and the Stroop Effect.
42. VAN DYKE, S Gender Differences in Lateralized Semantic Priming.
43. WALLACE, DR Facial EMG in Agenesis of the Corpus Callosum When Viewing Emotional Faces.
44. YI, D Normative Data for the Computerized Bimanual Coordination Task (cBCT) and its Relationship to Standardized Motor Performance.

Memory

45. ARENTOFT, A High Plasma BDNF Levels Are Associated with Decreased Explicit Memory in Females with Insulin Resistance.
46. ATKINSON, TM A Normative Taxonomy of the Wide Range Assessment of Memory and Learning – Second Edition.
47. HAUT, JS The Family Pictures Subtest of the Children's Memory Scale: A Measure of Visual <i>and</i> Verbal Memory in Pediatric Patients with Intractable Temporal Lobe Epilepsy.
48. BEST, T The Impact of Saccharide Supplementation on Cognition and Mood in Middle-Aged Adults.
49. BROWN, FC Brown Location Test and WMS-III Performance Following Anterior Temporal Lobectomy for Medically Intractable Epilepsy.
50. CHAN, RC Validation of the Chinese versions of two prospective and retrospective memory questionnaires in healthy elder people.
51. CHANG, Y * Medial Temporal and Frontal Lobe Involvements in Associative Memory.
52. CHAYTOR, NS The Impact of Symptom Validity Test Performance on the Ecological Validity of Memory Assessment.
53. CHRISTMAN, S Individual Differences in Ability to Simulate Malingering.
54. CHRISTMAN, S Individual Differences in Performance on the Everyday Memory Questionnaire: Effects of Degree of Handedness.
55. CRAMOND, AJ Memory Stability in Individuals with Autism Spectrum Disorder.
56. EBERT, PL Heightened Memory Interference in Amnesic Mild Cognitive Impairment.
57. HAASE, L Association Between Brain Activation and Learning Trials of the COLT and CVLT in Individuals with and without the $\epsilon 4$ Allele: An fMRI Study.
58. FLACHSBART, CE The Everyday Memory Survey (EMS): Psychometric Properties of a Standardized Survey Instrument.
59. KARANTZOULIS, S Retrospective Memory Failures May Underlie the Prospective Memory Deficit in Amnesic Mild Cognitive Impairment.
60. KRAMER, ME Developmental Differences in the Neural Networks Supporting Associative Memory Encoding.
61. MACÉ, AL Are False Memory Effects in Short Term Memory Associated with Verbal Output?
62. MCFARLAND, CP Frontal Lobe Involvement in a Task of Time-based Prospective Memory.
63. PANOS, SE Memory and Schizophrenia.
64. PARK, A Verbal versus Visual Memory loss in Amnesic-Mild Cognitive Impairment: Prediction Value of Conversion to Dementia.
65. PERSSON, CM Effects of ApoE Genotype on Cognitive Performance in Memory Clinic Patients.
66. PINEDA, AS Victimization History and Posttraumatic Stress Disorder: Learning and Memory Performance.
67. RISS, RH Oscillatory Encoding and Retrieval Patterns following Traumatic Brain Injury: Evidence for Functional Cortical Reorganization.

68. SEINO, K Comparison of the conceptual structures of schizophrenic patients and those of healthy adults, using association experiments.
69. CAZA, N False recognition for critical lures and their homophones: Evidence for associative processes.
70. TRAHAN, DE Continuous Visual Memory Test: Sensitivity and Specificity in Patients with TBI, Stroke, and Alzheimer's Disease.
71. TRAHAN, DE Expanded Paired Associate Test - Revised: Development of an Alternate Form.
72. VESTBERG, S Relationship Between Neuroticism and Cortisol in Patients with Memory Complaints.

Visuospatial Abilities

73. MARK, VW Visual Memory and Search Organization During Cancellation.
74. PARSONS, TD * Sex differences in spatial cognition within a virtual environment: Virtual Reality Cognitive Performance Assessment Test (VRCPAT).
75. SPRINGER, US Operating Characteristics of Mindstreams' Visual Spatial Perception Score in Parkinson's Disease.
76. TANAKA, Y Dynamic Spatial Awareness in Unilateral Spatial Neglect.

Psychopathology: Schizophrenia

77. KAMATH, V A Disconnect between Self-report Questionnaire and Clinical Interview Assessment of Schizotypal Personality: Influence on Cognitive Endophenotype Expression.

1:15–2:45 PM

Paper Session 11 ADHD/Learning Disabilities Room: King's Ballroom

1. WALDIE, KE Reading the Wrong Way with the Right Hemisphere.
2. BROCKI, KC Are early effects of inhibitory control on later ADHD symptoms mediated by maturation in working memory?: A longitudinal study.
3. NIKOLAS, M Moderating Effects of Dopamine Transporter Genotype on the Relationship Between Executive Function and ADHD Symptoms in Adolescence.
4. SEIDENBERG, M Attention Deficit Hyperactivity Disorder in New Onset Pediatric Epilepsy.

1:15–2:45 PM

Symposium 14 Neuropsychological Practices in Several Asian Countries Chair: Daryl Fujii, Discussant: Tony Wong Room: Monarchy Ballroom

1. KUMAR, K Neuropsychology in India.
2. ISOMURA, A Neuropsychology in Japan.
3. CHEY, J Neuropsychology in a Rapidly Aging Country.
4. LOPA-RAMOS, M Neuropsychology in the Philippines.
5. COLLINSON, S Neuropsychology in Singapore: Current and Emergent Challenges.
6. RATANADILOK, K Neuropsychology in Thailand.
7. CHE DIN, N Neuropsychology in Malaysia.
8. CHE DIN, N Neuropsychological Practices in Several Asian Countries.

1:15–2:45 PM

Symposium 15 Chemobrain: Cognitive Impairment Associated with Cancer Treatment Chair: Bart Brigidi Room: Queen's Ballroom

1. BRIGIDI, BD Chemobrain: Cognitive Impairment Associated with Cancer Treatment.
2. BRIGIDI, BD Assessment of Neurocognitive Impairment and Quality of Life in High Grade Glioma (HGG) Patients Treated with Bevacizumab (Avastin®).
3. SAYKIN, AJ Chemotherapy-associated changes in brain structure on voxel-based morphometry and diffusion tensor MRI: Preliminary results from a prospective study of breast cancer patients.
4. CORREA, DD Neuropsychological Assessment in Primary Central Nervous System Lymphoma (PCNSL) Patients Treated with Chemotherapy and Whole Brain Radiotherapy.
5. UNVERZACT, FW The Indiana University Telephone-Based Assessment of Neuropsychological Status (IU-TBANS): A new method for large scale neuropsychological assessment.

Abstracts Presented at the Thirty-Sixth Annual Meeting International Neuropsychological Society

February 6-9, 2008
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WEDNESDAY AFTERNOON, FEBRUARY 6, 2008

Paper Session 1

4:45–6:15 p.m.

Aging

D.J. SCHRETLEN, S. TESTA, J.M. WINICKI & B. GORDON. **Abnormal Neuropsychological Test Performance by Normal Healthy Adults.**

Objective: Ingraham and Aiken (1996) applied the binomial probability distribution to estimate how many abnormal scores normal, healthy individuals will produce on cognitive test batteries of varying length using different cut-offs to define abnormality. When healthy individuals produce abnormal test scores, these are viewed as false-positive findings that result from chance.

Participants and Methods: We tested this model in 316 neurologically intact adult participants in a study of normal aging who were 18–92 years old. We first identified the raw scores on each measure that corresponded to each of three cut-offs commonly used to define abnormal test performance (>2 , >1.5 , and >1 SD below the mean). We then computed how many abnormal scores each participant produced and examined how these correlated with various subject characteristics. Finally, we repeated these analyses after deriving demographically-adjusted T-scores for each measure.

Results: Rates of abnormal test performance: (1) increased as more tests were administered, (2) decreased as T-score cut-offs were lowered from >1 to >2 SDs below the mean, and (3) correlated significantly with age, estimated premorbid IQ, education and race, but not with sex. Adjusting the T-scores for these demographic characteristics did not reduce the rates of abnormal scores, but it did eliminate the association of these variables with abnormal test performance.

Conclusions: Neurologically normal adults produce abnormal test scores in proportion to the number of tests administered, cut-off used to define abnormality, and selected demographic characteristics, although using regression-based norms can eliminate the contribution of demographic variables. Practical and theoretical implications of these findings are discussed.

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Y. CHANG, R.M. BAUER, D.W. LORING, M. MARSISKE, K.M. HEILMAN, T. KERKHOFF & L. ABRAMS. **Associative Memory in Normal Aging and Individuals with Mild Cognitive Impairment.**

Objective: The purpose of this study was to examine the effect of incidental and intentional learning on the associative memory performance in healthy young (HY), healthy old (HO) and mild cognitive impairment (MCI) groups. This study was based on the notion that the hippocampus is involved in both automatic and controlled associative processing. Hippocampal compromise seen in MCI should thus impair performance in both incidental and intentional learning conditions. It was hypothesized that (a) individuals with MCI would show poor associative memory in both learning conditions, even in the face of comparable item memory; (b) the HO group would show improved associative memory performance in the intentional learning condition, and (c) the HY group would demonstrate equivalent and superior performance in both conditions.

Participants and Methods: Fifty-one participants were recruited (20 HY, 20 HO, and 11 MCI). Two word-pair lists were used and the participants were instructed to remember single item or pairs. Using intact and recombined pairs, they were asked to recall both item and associative memory in the two learning conditions.

Results: The results revealed a significant group \times condition effect [$F(2,45) = 4.03, p < .05$] and demonstrated that HO, but not MCI, showed significant improvement in recognition discriminability for associative memory in the intentional, but not the incidental, learning condition, even after controlling item memory. As a result of the improvement, the difference in associative memory found between HY and HO in the incidental condition disappeared. The HY group performed at the similar levels in both conditions.

Conclusions: These findings suggest that the MCI group had disproportionate deficits in associative memory. Associative memory appears to form in an automatic way although controlled process as evident in the HO group also facilitates learning associative information.

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V. DOTSON, S.M. RESNICK & A.B. ZONDERMAN. **Age, Depressive Symptoms, and Longitudinal Cognitive Decline in Older Adults.**

Objective: Longitudinal studies provide evidence that depressive symptoms measured at baseline predict subsequent cognitive decline in older

adults. There is cross-sectional evidence that the adverse impact of depression on cognition increases as a function of age; however, it is unclear whether there is a similar interactive effect of age and depression on longitudinal cognitive decline. This study investigated the effect of concurrent, baseline, and average depressive symptoms on cognitive functioning and decline, and examined the interactive effect of age and depressive symptoms on cognition.

Participants and Methods: 1,550 dementia-free adults 50 years of age and older from the Baltimore Longitudinal Study of Aging participated in this study. Cognitive performance and depressive symptoms were measured at 1-2 year intervals for up to 26 years. Cognitive testing included measures of learning and memory, attention and executive functions, verbal and language abilities, visuospatial functioning, and general cognitive status.

Results: After controlling for demographic variables and vocabulary scores, increased depressive symptoms, as measured by the Center for Epidemiologic Studies Depression Scale, were associated with poor cognitive functioning and cognitive decline in multiple domains. Average depressive symptoms, a measure of chronic symptoms, showed the most widespread effects on cognitive abilities. Effects of depressive symptoms on some frontal functions were greater with advancing age.

Conclusions: Depressive symptoms are associated with cognitive decline, particularly with advancing age. The greater sensitivity of average depressive symptoms in detecting this association suggests that clinicians should consider the chronicity of depressive symptoms when evaluating cognitive functioning in older adults.

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G.E. SMITH, R.F. KENNISON, R.M. RUFF, K. YAFFE & E.M. ZELINSKI. The IMPACT Study: A Randomized Controlled Trial of a Brain-Plasticity-Based Training Program for Age-Related Cognitive Decline.

Objective: There have been no large-scale, randomized, controlled, clinical trials in normal age-related cognitive decline of training programs demonstrating improvements in standardized cognitive measures generalizing beyond task-specific learning. This trial evaluated the efficacy of a brain-plasticity based, computerized cognitive training program (Brain Fitness Program, Posit Science) in adults ≥ 65 with normal cognition. It employs adaptive exercises targeting auditory/language systems that are designed to drive generalized improvements in cognition by improving the speed/accuracy of information processing and engaging neuromodulatory systems.

Participants and Methods: This was a multi-site, randomized, controlled, double-blind trial. Normal older individuals were randomized to either experimental training or active control (computer-based training modeling treatment-as-usual educational content approach) groups. Training was matched at 1hr/day, 5 days/wk, for ~40hrs. A predefined data analysis plan specified an intent-to-treat population and primary and secondary endpoints distinct in design and content from the training exercises. The sample ($N=437$) had a mean age: 74.9 (6.3), education: 15.8 (2.6); estimated IQ: 114.3 (7.7).

Results: There were no baseline group differences. After 10 weeks, significant group by time interaction in favor of the experimental group was seen on the primary endpoint (RBANS Auditory Memory, $p=0.011$). Multiple secondary endpoints showed significance differences favoring experimental group (RAVLT trials 1-5, RAVLT delayed, digits backwards, letter-number sequencing all $p < 0.05$; RBMT immediate, delayed both n.s.).

Conclusions: Results demonstrate that the brain-plasticity-based training program studied produces significantly superior improvement in generalized measures of auditory memory than a treatment-as-usual control matched for novelty and intensity.

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S.T. MOELTER, J.M. BUI, P.R. JANIS & C.M. CLARK. Apolipoprotein Genotype Mediates Serial Position Effects in Healthy Older Adults.

Objective: The apolipoprotein E4 (APOE4) allele is a known risk factor for Alzheimer's disease (AD). As a result, healthy carriers may be susceptible to cognitive processing deficiencies, relative to APOE4 non-carriers but this result has not been consistently elicited. We compared the word recall abilities of healthy elderly participants who were APOE4 carriers or APOE4 non-carriers according to the serial position of the word at list presentation. We hypothesized that APOE4 carriers would show reductions in recency relative to primacy regions on the word list due to reduced working memory efficiency.

Participants and Methods: We evaluated serial position effects in 48 healthy elderly controls (29 APOE4 non-carriers, 19 APOE4 carriers). The two APOE groups were matched according to age, sex, education, MMSE score, and CERAD word list delayed recall. Word recall during the first two learning trials was combined and scored according to the serial position of correctly recalled words: CWL items 1-3 were in the "primacy" region, items 4-7 were in the "middle" region, and items 8-10 were in the "recency" region.

Results: Analysis of serial position effects revealed no differences in list learning in the primacy region, $p > .10$, a trend level effect in the middle region, $p < .10$, and significant differences in the recency region, $F(1, 46) = 7.4, p < .01$.

Conclusions: These preliminary results offer compelling evidence that differences in cognitive functioning can be detected between APOE4 carriers and non-carriers. Measures that depend on controlled cognitive processing, including working memory, may be especially sensitive to these differences.

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Paper Session 2

4:45–6:15 p.m.

Multiple Sclerosis

R.S. PRAKASH, E.M. SNOOK, R.W. MOTL & A.F. KRAMER. Material-specific lateralization of memory encoding in Multiple Sclerosis.

Objective: Studies comparing brain activation patterns during encoding of verbal and non-verbal stimuli report differential activation of the Inferior Frontal Gyrus (IFG), such that left IFG is activated in response to encoding of verbal stimuli such as words, whereas non-verbal stimuli activates the homologous region of the contralateral hemisphere in healthy controls. In this study, we investigated the material-specific recruitment of cortical hemispheres in patients with Multiple Sclerosis (MS).

Participants and Methods: Twenty-two patients with relapsing-remitting multiple sclerosis (RRMS) and fourteen healthy controls were presented with blocks of faces and words in a 3T MRI system. During the encoding phase, they were instructed to attend closely to the stim-

uli and were later given a recognition task outside the scanner. Recognition Accuracy was analyzed by subtracting the proportion of false alarms (number of incorrect responses to new faces divided by the total number of new faces (32)) from the proportion of hits (number of correct responses to old faces divided by the number of old faces (32)).

Results: Healthy controls demonstrated the material-specific laterality effects such that encoding of faces was associated with activation of the right IFG, whereas words activated the left IFG. MS participants, in contrast, activated bilateral IFG in response to encoding of faces and left IFG activation in response to attending to words. The contralateral activation observed during encoding of faces in MS patients was negatively correlated with recognition accuracy, such that greater left IFG activation was associated with poor discriminatory power.

Conclusions: Face encoding was associated both with recruitment of additional regions of cortex and poor behavioral performance. These results are potentially important in that they suggest that contralateral recruitment might not always be beneficial for the MS population but in fact may reflect non-selective recruitment of brain regions.

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A. NELSON, M.R. BASSO, V. TRACY, R. SHIELDS, I. SHIELDS, T. WARD, P. CANDILIS, D. COMBS, J. JOHNSON & P. ARNETT. Therapeutic Misconception and Neuropsychological Impairment in Multiple Sclerosis.

Objective: Individuals enrolled in medical research trials often fail to recognize that potentially serious risk is inherent to participation. They also fail to appreciate that they are not the primary beneficiary of medical research, and providers are not necessarily intent upon alleviating disease. This Therapeutic Misconception (TM) may thus have important implications for informed consent procedures. Research involving people with schizophrenia implies that neuropsychological impairment predicts TM in medical research participants (Dunn et al., 2006). The current study investigated this issue in people with multiple Sclerosis (MS). **Participants and Methods:** 32 individuals with MS and 20 control participants were administered a battery of neuropsychological tests. They further completed the MacArthur Competence Assessment Tool for Clinical Research (MacCAT-CR) and a measure of TM (Joffe et al., 2001). The MacCAT and TM were administered twice to determine whether repetition of research information enhanced consent competency.

Results: MS participants were grouped according to level of impairment (mildly impaired versus no impairment) on the neuropsychological tests. TM scores were analyzed in a 3 (group) X 2 (time) ANOVA. The impaired group showed worse TM than the control group. All groups showed improved TM over time, and the impaired MS group no longer differed from the control group. TM scores were predicted by measures of executive function, working memory, and new learning.

Conclusions: The results show that cognitively-impaired MS patients are at increased risk of misunderstanding the difference between clinical research and therapeutic interventions. Consequently, they may be more likely to consent to medical research participation without fully grasping the implied risks and benefits. Patients with impaired executive function, working memory, and new-learning are more likely to manifest the error of TM. Implications of these data for medical researchers are discussed.

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B.J. DEERY, V.A. ANDERSON, R.K. JACOBS, J.L. NEALE & A.J. KORNBURG. Longitudinal Investigation of Attention and Executive Function in Pediatric Multiple Sclerosis and Acute Disseminated Encephalomyelitis.

Objective: A conservative estimate of 2-5% of Multiple Sclerosis (MS) cases occur before age 16, with approximately 10,000 pediatric cases

in the US alone. A recent surge in pediatric MS research has increased awareness of its potential impact on brain development and cognitive function. While cognitive deficits are well elucidated in adult MS, few longitudinal studies exist in children. Because a large number of children with MS are initially diagnosed with Acute Disseminated Encephalomyelitis (ADEM), a similar but monophasic inflammatory demyelinating condition, it also requires close attention regarding its characteristics and impact.

Participants and Methods: This study examined information processing, attentional skills, and executive function in a cohort of pediatric MS (n=9) and ADEM patients (n=9). Both groups were followed-up an average 4.5-5 years later (MS, n=7; ADEM, n=6).

Results: Results show widespread, clinically relevant deficits in processing speed, basic and complex attention, executive functioning, and academic achievement in both groups at time 1. At follow-up, the ADEM group showed resolution of the majority of cognitive impairments, with specific higher-order deficits persisting. The pediatric MS group showed little resolution of cognitive impairments, with even higher rates in most cognitive domains, including skills initially intact at time 1.

Conclusions: Our findings indicate that children with MS commonly experience cognitive decline over time, including skills initially unaffected, while children with ADEM tend to demonstrate recovery, with some persisting higher-order cognitive deficits. Both groups showed impaired academic achievement at follow-up, suggesting an impact on educational functioning. Fatigue was a commonly reported symptom in both groups requiring further investigation.

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L.J. JULIAN, C.E. LANDE & D.C. MOHR. Depression and Cognitive Functioning are Differential Predictors of Disability in Valued Life Activities in Multiple Sclerosis (MS).

Objective: Studies of disability in MS have primarily focused on activities of daily living (ADLs) with less attention to the broader range of functional limitations in other important daily activities. This study evaluated the contributions of depression and cognitive functioning on functional difficulties within a wide range of life activities.

Participants and Methods: Participants included 115 MS patients (72% female, mean age=45.5±10.3, mean education=16.2±2.9). The Katz's Valued Life Activities Scale (VLA) was used to determine functional limitations in obligatory activities (e.g., ADLs), committed activities (e.g., social roles, childcare), and discretionary activities (e.g., hobbies, community participation). Other measures included: Center for Epidemiological Studies-Depression (CESD), Digit Span Test (DSP), Symbol Digit Modalities Test-Oral (SDMT), Letter and Category fluency, D-KEFS Design fluency, Color-Word Interference, Card Sorting, Tower, and Trail Making; California Verbal Learning Test - II (CVLT); and Judgment of Line Orientation. Motor speed control tasks were utilized on Design Fluency and Trail Making Tests.

Results: Participants reported difficulties in 39% of VLAs. Regression analyses revealed that depression and cognitive functioning (CVLT, DSP, SDMT) significantly predicted all three levels of VLA limitations (all ps <.01). Cognitive functioning accounted for 6% of the variance in discretionary activities, 12% in committed activities, and 22% in obligatory activities, compared to the depression contributions of 22%, 21%, and 9%, respectively.

Conclusions: Depression and cognitive functioning differentially predict VLA disability dependant upon the severity of functional limitations. In this study depression was the more robust predictor of less severe VLA difficulties (i.e., discretionary activities), whereas cognitive functioning was more strongly associated with severe VLA difficulties (i.e., ADLs).

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M.R. BASSO, T. WARD, R. SHIELDS, I. SHIELDS, P. CANDILIS, V. TRACY, D. COMBS, A. NELSON, J. JOHNSON & P. ARNETT. **Informed Consent Capacity In Multiple Sclerosis: Some Improvement and Some Residual Incapacity.**

Objective: Medical research subjects must be able to express a choice whether to participate, and they must be able to appreciate, understand, and reason through proposed research details (Grisso & Appelbaum, 1998). Multiple sclerosis (MS) impairs cognitive function, and can compromise an MS patient's ability to consent to research participation. The present study examined whether cognitive deficits diminish informed consent capacity in MS. It further evaluated whether repetition and recognition cueing improve informed consent capacity.

Participants and Methods: Participants were administered a broad battery of neuropsychological tests and a modified MacArthur Competence Assessment Tool for Clinical Research (MacCAT-CR), which is often considered a "gold-standard" measure of consent capacity (Grisso & Appelbaum, 1998). The MacCAT-CR included repetition and recognition cueing of research details. Scores for understanding, appreciation, judgment, and expression of choice were assigned according to rigorous scoring criteria.

If 33% of neuropsychological test scores was impaired, then the person was categorized as impaired. This yielded 43 unimpaired and 12 impaired MS patients, and 24 controls.

Results: MacCAT-CR scores were entered into a 3 group X 2 time (pre- & post-repetition) X 4 (index) ANOVA. Impaired patients performed worse than the other groups on the MacCAT-CR. Groups improved subsequent to repetition and recognition cueing, and the impaired group was generally equivalent to the control group. On reasoning, however, the impaired group did not improve and performed worse than the control group.

Conclusions: Cognitive impairment may compromise capacity of MS patients to provide informed consent to research participation. Although some aspects of consent capacity are remediable, reasoning is refractory to intervention. Collectively, these data imply that only some people with MS are incapable of providing informed consent to research participation. They may remain incompetent despite remediation efforts.

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to examine the neurological disorders, this symposium takes the opportunity to assess its contribution to the clinical neurosciences. The purpose of this series of talks is to offer a critique of the clinical functional imaging literature with special focus on fMRI. The promise of fMRI has been great, with hopes of "mapping" the functions of the human brain, and while there exists steady progress in some areas, considerable work remains. Specifically, there has been scarce work developing research methods tailored to clinical samples and fMRI has made minimal contribution to clinical endeavors such as neuropsychological assessment and neurosurgical intervention. This symposium will address the persistent methodological pitfalls in using fMRI to examine neuropsychological disorders and both the limitations and the unrealized potential for fMRI in diagnosis and treatment. Finally, promising areas of future work using functional imaging are discussed including the integration of functional neuroimaging and human genomics.

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P.A. BANDETTINI. What fMRI can, can't, and might do.

Objective: In the past 16 years, functional MRI has evolved considerably in terms of technology, methodology, and signal interpretation. These advances, having made fMRI a more powerful and robust technique, all have had direct impact on fMRI utility. New and more sophisticated uses of fMRI continue to emerge, with the primary push still being human neuroscience research. The potential for clinical applications continues to grow with the emergence of real time fMRI, and clear methods for identifying and removing artifactual data. New and extremely exciting developments in fMRI in the last few years have included the growth of real time fMRI, the application of new processing methods, such as multivariate analysis, and the focus on "resting state" fluctuations. All of these have the potential advancing fMRI into daily clinical use. In this lecture, I will outline these aspects of fMRI development, and will include a general discussion of what fMRI can and can't do and why. I will also speculate on what future clinical and non-clinical applications of fMRI will be and what specifically will be required to achieve these.

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Symposium 1

4:45–6:15 p.m.

A Critical Examination of fMRI in Neuropsychology: The Assumptions, the Pitfalls, and the Future.

Chair: Frank Hillary

F.G. HILLARY, F.G. HILLARY, P.A. BANDETTINI, A.J. SAYKIN & S.Y. BOOKHEIMER. **A critical examination of fMRI in neuropsychology: the assumptions, the pitfalls, and the future.**

Symposium Description: Functional neuroimaging has served to integrate neuropsychology into multi-disciplinary efforts seeking to examine brain functioning, including previously uninitiated relationships within radiology and nuclear magnetic resonance. Now that nearly a decade has passed since the first studies using functional MRI (fMRI)

A.J. SAYKIN. Computational and Conceptual Challenges in Integrating Neuroimaging and Genomics.

Objective: Capacity to acquire large multi-modal brain imaging data sets has grown but progress in development of analytic methods has been slower. A parallel situation exists in molecular genetics where new single nucleotide polymorphism (SNP) gene microarrays are available that can assay an estimated 90% of the meaningful variance in the human genome. Despite progress in bioinformatics, there is not a consensus as to the most appropriate analytic strategy for genome wide association studies (GWAS). There is great interest in combining imaging with genetic information to examine the basis of individual differences such as disease risk and to better understand brain circuitry. In view of the challenges involved in extracting the most relevant features from imaging and genomic data, the optimal approach to combining these data types warrants investigation. Approaches range from associating candidate genes with ROIs (e.g. BDNF val/met with hippocampal activity) to GWAS including imaging variables. Results from a study of older adults at risk for AD will be used to illustrate a hybrid approach using a targeted pathway array designed by a collaborative multidisciplinary team. This array incorporates molecular pathways related to neurocognition and mechanisms implicated in CNS disorders (e.g., neurodegeneration, neuroinflammation, neurotransmission and receptors, plasticity/repair

and growth factors, and candidate genes associated with cognition and memory/LTP). Computational challenges include data dimensionality, statistical power, risk of false discovery and pathway based interpretation of results. The emerging field of imaging genetics holds great promise for a systems biology of the brain and for clinical applications.

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F.G. HILLARY. Functional imaging in neuropsychological disorders: a call for greater methodological rigor.

Objective: The purpose of this talk is to outline the current methodological and conceptual pitfalls that persist in the literature using functional MRI to examine neurological disorders. Research over the past decade using functional neuroimaging to examine neuropsychological dysfunction has proven informative, documenting basic differences between the healthy and the injured brain. However, for the potential of fMRI to be realized, important advancements are needed in the methods being used to assess cognitive, motor, and sensory dysfunction. This talk outlines several critical points of consideration including: 1.) the need for direct examination of the relationship between behavioral performance fMRI signal change, 2.) dismantling the assumptions associated with cognitive subtraction and fMRI designs, and 3.) the need to examine changes in the baseline fMRI signal due to neurological injury and disease. Current methods are discussed and suggestions are made to maximize the potential for using fMRI in the examination of neurological disorders.

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Poster Session 1: Pediatric Assessment, Language, Emotion

4:45–6:15 p.m.

Child - Assessment

M.A. CATO JACKSON, M. BELKIN & D. HAMMOND. Neurovascular, MRI and Neurocognitive Risk Factors in Sickle Cell Disease: A Case Study with Hb SS and Moyamoya.

Objective: Predictors of neurological and neuropsychological outcomes in sickle cell disease (SCD) are not well understood. Dobson et al. (2002) reported that SCD patients with moyamoya perform worse on neuropsychological evaluations relative to those without moyamoya.

Participants and Methods: Here, we report a child with SCD, status post left hemisphere ischemic stroke with subsequent radiographic evidence of comorbid moyamoya. Neuropsychological testing was conducted two years after the stroke.

Results: Neuropsychological findings included prominent slowed psychomotor speed consistent with MRI evidence of heavily disrupted deep white matter pathways, left hemisphere more than right. Neuropsychological results also included visuospatial deficits, language retrieval deficits and evidence of residual right hemiparesis, but no learning and memory impairment. Bilateral elevated transcranial Doppler ultrasound velocities, the left hemisphere stroke, and the moyamoya findings preceded her neuropsychological evaluation.

Conclusions: This case illustrates the need to further develop clinical algorithms for SCD that include neuropsychological screening. Such an algorithm may more quickly identify children at highest risk for neurological and neuropsychological decline, leading to more rapid detection and intervention.

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R.C. CHAN & C. CHEN. Developmental profile of multitasking performance in healthy school-aged children: A preliminary report.

Objective: The present study aimed to explore the developmental profile of multitasking performance in healthy children and the relationships to the neurocognitive functioning.

Participants and Methods: Sixty-six (36 boys, 30 girls) healthy primary school students were divided into 3 age groups (7, 9 and 11 years old). All children were administered with two tests of multitasking performance (Modified Six Elements Test for Children (SET-C), and the Battersea Multitask Paradigm, (BMP)), two subtests of Tests of Everyday Attention for Children (TEAch), and neurological soft signs.

Results: Results of MANOVA indicated there was a significant main effect of age (Wilks' lambda = 0.374 (F(9, 52)=3.672, p<0.001, partial $\eta^2=0.389$). Older groups performed better than younger groups in all parameters of SET and BMP except SET rule-breaking and BMP Plan. There was also a main effect of education (Wilks' lambda = 0.301 (F(36, 200.353)=2.101, p=0.001), but it was not significant after considering age as a covariate. No main effect of gender was found. After controlling for age, gender, education and IQ, the SET total profile score remained correlated with the BMP Performance (r=0.275, p=0.031), Recount (r=0.263, p=0.039), Remember (r=0.326, p=0.01). The Walk-Don't-Walk subtest was also correlated with BMP Plan and Motor coordination, whereas the Opposite world subtest was correlated with all parameters of the SET, Performance Plan Follow and Recount score of the BMP, and Sensory Integration (p<0.05).

Conclusions: The findings suggest that the multitasking performance of the healthy children advances with age. However, age might not be associated with disinhibition. Better inhibitory control might facilitate their planning and intention maintenance in multitasking performance in normal children. Better sustain attention might only enhance the planning function.

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B. CHODKOWSKI, S. RIMRODT & L. CUTTING. Heterogeneity of Reading Difficulty in Adolescents.

Objective: It has been reported that adolescents who struggle with reading tend to show more heterogeneous types of reading difficulty. In younger children, the most common type of difficulty is with decoding or recognizing single words; however, for older struggling readers it has been reported that only about 10% show deficits in word-level skills (Biancarosa & Snow, 2004).

Participants and Methods: To examine the word-level skills of adolescents categorized as having weaknesses in reading comprehension, all adolescents in an urban county of Maryland who scored within the "Basic" reading level range on the Maryland State Assessment (MSA) were classified by their word-level skills as assessed by the percentile rank from the Test of Silent Word Reading Fluency (TOSWRF). Adolescents were classified by their performance on the TOSWRF into three categories: <26%ile (impaired), 26-39%ile (borderline), and >39%ile (average or above). Participants were 2218 adolescents in grades 5 through 8 who scored "Basic" on the MSA (55.5% males/44.5% females; 60.2% African American/33.2% White/6.6% other; age 12.05±1.06).

Results: Within the sample, 36.6% showed impaired word-level skills, 23.8% scored in the borderline range, and 39.6% showed average or above skills. These percentages were approximately the same within each of the grades ($\chi^2= 3.473$, p =0.748).

Conclusions: These findings suggest that deficits in word-level skills are present in more than 30% of adolescents who struggle with reading; additionally, our findings suggest that other sources of reading comprehension difficulty aside from word-level skills are also present in a substantial number of adolescents. Overall, our findings are consistent with the reported heterogeneity of reading difficulty in adolescent struggling readers and do not support the claim that only a minority of adolescents have word-level difficulties.

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C.R. HALE, J.E. CASEY & P.W. RICCIARDI. A Cluster Analytic Study of the WISC-IV in Children Referred for Psychoeducational Assessment.

Objective: To identify, among a population of children referred for psychoeducational assessment, reliable and meaningful subgroups based on patterns of performance on the WISC IV core subtests.

Participants and Methods: A total of 291 participants between the ages of 8 and 16 were selected for this study from a population of children referred for assessment due to academic and/or behavioural difficulties. Participants' WISC-IV scaled subtest scores were subjected to hierarchical and iterative partitioning cluster analysis. The internal validity (reliability) of the final cluster solution was established using both split-half and multiple-method reliability techniques.

Results: A five-cluster solution was selected as representative of the data. This solution emerged in both split-half samples and was consistently identified across four agglomerative clustering methods (Ward's, Complete Linkage, Average Linkage Between Groups, Average Linkage Within Groups). Three of the five split-half correlations were significant; one approached significance ($p < .07$). All of the clusters derived by the four hierarchical methods were significantly correlated with the exception of one method on one cluster. Four of the derived clusters comprise subtest profiles consistent with previous research. The interpretability of one profile was complicated in that Picture Concepts was not associated with the other subtests of the Perceptual Reasoning Index.

Conclusions: Reliable patterns of WISC-IV core subtest scores can be identified in children referred for psychoeducational assessment. Additional research is needed to assess the external validity of the derived taxonomy, to explore the significance of the obscure profile that emerged, and to elucidate the cognitive processes that underlie the Picture Concepts subtest.

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N.J. HERRERA, M.R. PATEL, T.M. DAVIDSON, A. MAGIT, A. SANDFORD, P.E. GILBERT & C. MURPHY. Neuropsychological and Behavioral Performance in Children with Sleep Disordered Breathing.

Objective: Sleep disordered breathing (SDB) ranges from primary snoring to obstructive sleep apnea (OSA). OSA affects 1-3% of children, with up to 10% being primary snorers, and is associated with significant morbidity. SDB has serious sequelae in adults; however, few studies have examined SDB morbidity in children. One sequela suggested in the pediatric SDB literature is a neurobehavioral deficit. Other potential negative sequelae in children are deficits in neuropsychological functioning. Furthermore, the relationship between SDB and olfaction has not been investigated in children.

Participants and Methods: The present study examined the effects of SDB on neurobehavioral, neuropsychological, and olfactory function before and after surgical intervention for children with SDB. The surgical patients included 26 male and 16 female children. Age and gender match

controls were recruited from the surrounding community. Children 4-12 years of age were tested using standardized neurobehavioral, neuropsychological, and psychophysical tests. Surgical and control subjects underwent a multi-channel home sleep test the night of their testing session.

Results: Analysis of variance, using repeated measures, revealed significant neurobehavioral differences between the SDB and control groups. Trends toward poorer performance for the surgical groups were detected when compared to the control group on neuropsychological indices, though in this sample size the effects were not statistically significant.

Conclusions: Thus, the findings from the present study suggest that further investigation of neuropsychological deficits in pediatric SDB patients is warranted.

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J. HOLDNACK, S. KEMP, M. KORKMAN & L. DROZDICK. Development of Parent-Education Adjusted Norms for NEPSY-II Subtests.

Objective: The goal of the current study is to develop parent-education adjusted norms for selected subtests from the Executive Functioning, Language, Memory, Visual-Perceptual, Motor and Social Perception domains of the NEPSY-II.

Participants and Methods: The sample consisted of 1200 cases ages 3 to 16 years from the NEPSY-II standardization sample. The sample is stratified by 4 parent education levels: less than 12 years, 12 years, 13-15 years, and 16 or more years. The sample was stratified by parent-education, ethnicity, and region based on the 2003 census data.

Education corrected norms were derived using linear or non-linear (e.g. quadratic and cubic polynomials) regression techniques. The model for each score was selected on maximizing predictive power. T-scores were generated for 23 NEPSY-II scores controlling for systematic prediction errors.

Results: Parent-education had a low but significant correlation with NEPSY-II scores across subtests. There was considerable variability in the correlation of parent-education among the domains and subtests. The correlation between parent-education and NEPSY-II subtests by domain ranged as follows: Executive Functioning (.08 - .25); Language (.15 - .34); Memory (.09-.26); Visual-Perceptual (.13-.25); Motor (.08); and Social Perception (.14).

Conclusions: Parent-education level has significant low correlation with NEPSY-II subtests. Parent-educational level may serve as one indicator of the developmental socio-economic background of the child. T-score conversion equations are provided for clinical use. Parent-education adjusted norms enable the clinician to estimate if socio-economic factors may have influenced a child's test performance to refine their diagnostic hypotheses.

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C.E. JOHNSON, H. TAYLOR, D. DROTAR, N. MINICH, H. FRIEDMAN & M. HACK. Executive Functioning and Adaptive Behavior in 2 year-old Children with VLBW.

Objective: Few studies have examined the effects of very low birth weight (< 1500g, VLBW) on specific cognitive skills in young children. Research has also failed to examine associations of cognitive abilities in young children with adaptive behavior and socialization.

Participants and Methods: To fill this gap in the literature on outcomes of VLBW, we conducted a pilot study of 19 VLBW children at a mean corrected age of 21 months. The mean birth weight of the sample was 1124g and the average gestational age was 29 weeks. The pur-

pose of the study was to determine if a measure of executive functioning, the A-Not-B task, predicted adaptive behavior (as measured by the Vineland Adaptive Behavior Scales) independently of the Bayley Scales of Infant Development. The sensitivity of A-Not-B was also examined in relation to markers of neonatal risk.

Results: Results revealed that the A-Not-B task predicted the Vineland Adaptive Behavior Composite, even after taking birth weight and neonatal complications into account ($R^2 = .32$, $P < .05$). A-Not-B and the Bayley Mental Development Index predicted unique variance in all adaptive behavior domains, with between 56% and 87% of the variance accounted for by these two variables. The A-Not-B task was also related to neonatal risk factors.

Conclusions: The findings highlight the feasibility and importance of assessing executive functioning in young children with VLBW.

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J. KATZENSTEIN, B. LEJEUNE & K. JOHNSON. Cognitive and Linguistic Catch-Up Among Internationally Adopted Children.

Objective: Due to early deprivation, cognitive and linguistic delays are common among internationally adopted (IA) children. The purpose of this study was to examine cognitive and linguistic catch-up among IA children.

Participants and Methods: In total, 35 IA children were tested at baseline (5-14 months after adoption into the U.S.) and 12-months later. Average age at adoption was 13.54 months ($SD = 4.41$). Average age at baseline was 21.59 months ($SD = 4.53$). Prior to adoption, 60% were institutionalized, 6% were in foster care, and 34% received a combination of care. The Mullen Scales of Early Learning (MSEL) was administered at both time points.

Results: Children improved an average of 15.34 points ($d = 1.02$) on the MSEL Early Learning Composite (ELC), $t(34) = 41.85$, $p < 0.001$. There was an average improvement of 12.57 points ($d = 1.25$) on Receptive Language, $t(34) = 21.74$, $p < 0.001$, and 7.54 points ($d = 0.75$) on Expressive Language, $t(34) = 29.70$, $p < 0.001$. Improvements were not predicted by country of origin or pre-adoption care. Children were divided based upon change in ELC score over time, with 23 improving, 7 stable, and 5 decreasing. A one-way ANOVA indicated a significant difference among these groups, $F(2, 34) = 7.97$, $p < 0.01$, with children who scored lowest at baseline experiencing the greatest improvements.

Conclusions: Over a relatively short follow-up period, IA children demonstrated significant gains in cognitive abilities that may not have occurred had they remained in the deprived conditions of their country of origin.

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E. MOES & C. ARMENGOL. Predictors of Reading Speed and Comprehension in Mexican Elementary School Children.

Objective: To assess the relative contribution of sociodemographic variables, phonological decoding, vocabulary, rapid naming, immediate and delayed memory for stories, and non-verbal reasoning in predicting reading speed and comprehension in Mexican elementary schoolchildren.

Participants and Methods: Three hundred and thirty-nine Mexican elementary school children, grades one through six, from one public and one private school (with 15 boys and 15 girls per grade from each school) were assessed. Measures included sociodemographic information obtained from parents, and the Peabody vocabulary test in Spanish, Word Attack from the Bateria Woodcock Muñoz, color and word naming speed

from the Stroop Interference test, immediate and delayed recall of stories developed for this study, and the Matrices subtest from the Kaufman Brief Intelligence Test (K-BIT). Reading speed and comprehension were measured with the Brigance Diagnostic Assessment of Basic Skills.

Results: Results from a stepwise regression using reading speed and comprehension as dependent variables indicated that vocabulary scores, word reading speed, and memory for main ideas (but not number of items recalled) predicted both reading speed and comprehension. Phonological decoding and scores on Stroop interference were not predictive of those reading measures. Children from lower socioeconomic backgrounds performed worse than those from higher socioeconomic backgrounds.

Conclusions: Implications for theories of reading proficiency, particularly as they related to Spanish-speaking children, are discussed, as well as the need to incorporate cognitive functions beyond those traditionally considered in the assessment of reading (e.g. memory).

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M. RYAN, L. CUTTING, S. EASON, A. MATEREK & E. MAHONE. Elithorn Mazes in Children: What does it Measure?

Objective: Elithorn Mazes (EM) is a visually-based subtest of the WISC-IV Integrated in which the individual must complete a maze while connecting a predetermined number of dots. The present study examined which elements of executive function (EF) contribute to successful performance on EM in children.

Participants and Methods: Sixty-nine children (46 boys) ages 10-14 participating in study of reading disorders and/or ADHD completed EM and other performance-based EF measures assessing working memory (WISC-IV Digit Span, Letter-Number Sequencing, Spatial Span), planning (Matrix Reasoning, D-KEFS Tower), and shifting (D-KEFS Trail-making Number-Letter Switching), as well as non-EF measures (WIAT-2 Word Reading, Pseudoword Decoding). Additionally, behavior ratings of EF (BRIEF Working Memory, Plan/Organize, Inhibitory Control, Shift), and non-EF functions (CBCL Anxiety/Depression) were completed by parents.

Results: Multiple regression using the performance based measures accounted for 47% of the variance in EM ($p < .001$), with only spatial working memory (Spatial Span) contributing significantly to prediction of EM ($p = .002$). Multiple regression using behavior ratings accounted for 23% of the variance in EM ($p = .01$), with only BRIEF Working Memory ($p = .001$) emerging as a significant predictor.

Conclusions: Parent rating and performance measures of working memory appear to be strong predictors of performance on EM, while other EF functions (planning, shifting, inhibitory control) and non-EF functions are less associated with EM performance, thus highlighting the convergent and discriminant validity of the test. EM appears to have a strong spatial (but not verbal) working memory demand, while its validity for predicting planning skills in children is less clear.

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J. SALVADOR, E. MELCHOR, L. MESTAS, D. LÓPEZ & V. ZUÑIGA. Analysis of neuropsychological process the preschoolers need to consolidate and acquisition before reading/writing learning.

Objective: The study of the transition period of preschool and elementary education provides the knowing basis of the needed prerequisites for the acquisition of reading and writing in Mexican children. Objective. To know which neuropsychological processes the preschoolers need to consolidate before reading/writing learning.

Participants and Methods: The Evaluation Battery of Necessary Abilities for Reading and Writing Learning (BENHALE, Bateria Evaluadora

de las Habilidades Necesarias para el Aprendizaje de la Lectura y la Escritura) and the Rey Complex Figure were applied to 50 five year old preschoolers, 50% boys and 50% girls. A semi structured interview about the learning environment (adapted by Neurman, Copple and Bredekamp, 2001), to both grades teachers

Results: Are analyzed in a quantitative and qualitative way. It has been observed that children need more support from their educators in the next areas: fine motor development, motor memory, temporal-spatial structuring and visual-motor coordination, nevertheless a third part of them need support in verbal abilities: vocabulary and articulation.

Conclusions: This means that it is necessary that the requirements of the reading/writing must be developed because the majority present a developmental level below the abilities that are necessary for the children's educational and emotional success. Also, thinking about the need to carry out studies with an ecological focus in the children's socio-cultural context involving the parents at both preschool and elementary school levels to support the development of: ambient alphabetizer, linguistic, phonological abilities, of the knowledge and the understanding. Correspondence: *Judith Salvador, Ph. D., Posgrado, FES Zaragoza, UNAM, Cda. Gorrion 17, Rinconada de Aragón, México 55140, Mexico. E-mail: salvadcf@yahoo.com*

M. SEBREE & D. WABER. Working Memory: Association Between Cognitive Measures and the BRIEF Scale Among Participants in the NIH MRI Study of Normal Brain Development.

Objective: The correspondence between behavioral measure executive functioning in everyday settings and laboratory measures of the same constructs has often been problematic. We hypothesized that cognitive measures of verbal and spatial working memory would be related specifically to the Working Memory subscale of the Behavioral Rating Inventory of Executive Function (BRIEF) but not to the other subscales.

Participants and Methods: Data were obtained from 320 children, aged 6-16 years, who participated in "The NIH MRI Study of Normal Brain Development." Participants had been screened for genetic, medical, neurological, developmental, and psychiatric disorders. Measures included the following: BRIEF Parent version, WISC-III Digit Span digits forward (DSF) and digits backward (DSB); Cambridge Neuropsychological Test Battery (CANTAB) Spatial Working Memory (SWM, number of between errors) and Spatial Span (SSP, length of span). Analyses were based on raw scores for all measures. Hierarchical linear regression analyses tested models in which the cognitive tests predicted each of the BRIEF scales.

Results: After controlling for age and gender, cognitive tests of working memory accounted for significant variance in the BRIEF Working Memory (WM) scale but not the other seven scales, although the amount of variance accounted for was small ($r^2 = .09$). Of the four cognitive variables, only Digits Forward and CANTAB Spatial Working Memory significantly predicted BRIEF WM.

Conclusions: The BRIEF Working Memory scale shows a specific association with cognitive measures of the same construct in a typically developing population.

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M. SOUBBOTINA, J.E. CASEY & T.L. WHITLOCK. The WCST as a Measure of Executive Functioning.

Objective: Although often included in neuropsychological examinations, the capacity of standardized tests of executive function (EF) to predict functional status of children is questionable. The present study examined the relationship between children's performance on a neuropsychological test of EF, the Wisconsin Card Sorting Test (WCST), and daily behaviours associated with EF as measured by parental report on the Behaviour Rating Inventory of the Executive Function (BRIEF).

Participants and Methods: A convenience sample of 32 children of both genders aged 7-14 years with confirmed ADHD, maltreatment associated with trauma/subthreshold PTSD, or both was studied. Correlations were conducted between the BRIEF composite scores and the WCST Percent Perseverative Errors and Percent Conceptual Level Response scores.

Results: None of the correlations between WCST and BRIEF scores was significant.

Conclusions: The present findings are consistent with those of other studies reporting a lack of relationship between cognitive and behavioural measures of EF (e.g., Vriezen & Pigott, 2002). Considering the abundant evidence supporting the sensitivity of both WCST and BRIEF to EF deficits in various clinical populations, it is proposed that the WCST and the BRIEF address different dimensions of the EF construct. The lack of association between cognitive and behavioural markers of EF raises the question of ecological validity of the WCST as a measure of EF generally. Inclusion of both behavioural and cognitive measures in clinical assessment is necessary for a comprehensive evaluation of the EF construct.

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Emotion

B.A. AUDINO, P.R. JANIS, E.J. GOLUB & S.T. MOELTER. Negative Emotion Increases Oral Communication Disturbances in Healthy Students.

Objective: We investigated the role of emotion in the incidence of communication disturbances in healthy college students. We hypothesized that expressive speech with negative emotional content results in more speech errors than speech with positive or neutral content.

Participants and Methods: Nineteen healthy college students completed a structured interview that asked them to think about, take notes on, and then describe five stories in 2 negative emotion conditions (fear and sadness), 2 positive emotion conditions (happy and surprised), and one neutral condition. Emotion condition was counterbalanced. Responses were tape-recorded, transcribed, and coded for six types of errors using the Communication Disturbances Index. Error scores were calculated as the average number of communication disturbances per 100 words produced.

Results: Our results indicated that negative emotion conditions were associated with more instances of communication failure ($M = 1.1$, $SD = 0.7$) than positive ($M = 0.4$, $SD = 0.5$), $t(18) = -4.6$, $p < .005$, or neutral ($M = 0.7$, $SD = 1.0$), $t(18) = -2.1$, $p = .05$, conditions. There was no difference in CD between the neutral and positive conditions, $t(18) = 1.5$, $p > .10$.

Conclusions: These preliminary results support models of affective reactivity that propose mechanisms by which negative emotional valence may disproportionately compromise mechanisms of controlled cognitive processing.

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T.A. BARBOUR, L. YANG, M.M. MANDE & L.L. SYMONDS. A New Paradigm to Evoke Spiritual Feelings in the fMRI Environment.

Objective: Many studies have documented the association between spirituality/religion and health/quality of life, suggesting the importance of exploring the biological mechanisms of this relationship. Although a few

neuroimaging studies report activation patterns in highly spiritual experienced practitioners (e.g., monks), there are no studies investigating spirituality in a non-religious context or in the general population. This study developed a paradigm compatible with the fMRI environment to evoke common “everyday” spiritual feelings.

Participants and Methods: Initially 386 potentially spiritual pictures were collected from the Internet. Nineteen individuals from various religious backgrounds, ages 20 – 65, rated the images as either “likely” or “unlikely” to evoke spirituality/happiness/sadness. Forty-five pictures receiving the most “likely” votes for spirituality were assembled into PowerPoint presentations with previously identified happy and sad pictures. Eighteen women, mean age 56.2, from a breast cancer survivor support group viewed the presentations and rated the pictures on 5-point Likert scales for the extent to which it evoked spiritual, happy and sad feelings.

Results: Friedman’s non-parametric repeated measures ANOVA and Dunn’s post-hoc tests indicated 35 spiritual pictures successfully evoked spiritual feelings ($P < 0.05$). Mean ratings of all 35 spiritual pictures was significantly greater than either sad or happy ratings ($P = < 0.003$). These pictures were then assembled into a blocked fMRI experimental design, now used to collect data from 10 subjects.

Conclusions: The results suggest that it is possible to induce the spiritual feelings by using pictures in a visual presentation and that the construct of spirituality is likely to be separate from that of an emotion, such as happiness.

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D.E. COX & D.W. HARRISON. Neuropsychological and Psychophysiological Correlates of Anger Expression Styles.

Objective: The current research was conducted to determine if anger expression style (anger-in/anger out) demonstrates different patterns of cerebral lateralization. Differences in scores on verbal and figural fluency measures, changes in systolic blood pressure in response to these tasks and grip strength in response to a cold pressor were predicted.

Participants and Methods: 74 right-handed male participants, scoring in the top third on a hostility measure were selected from undergraduate students at Virginia Tech. Participants were placed in groups based on anger expression style (STAXI). Baseline systolic blood pressure and heart rate data were collected and participants then completed either verbal (COWAT) or figural (RFFT) fluency. Immediately following completion of the fluency measure participants’ blood pressure and heart rate were taken as measures of physiological reactivity to the task. Then the second measure was administered followed by immediate physiological measures. Grip strength was then measured before and after 30 second exposure to a cold pressor.

Three ANOVAs were conducted to compare scores on the neuropsychological measures, the effects of anger expression style on cardiovascular regulation as a function of the cognitive stressor. A fourth ANOVA was conducted to examine grip strength measures following the cold pressor.

Results: Anger-in was associated with poorer scores on non-verbal fluency ($F=15.55$, $p < .001$), greater systole increases in response to these tasks ($F=7.08$, $p < .05$), and significantly increased grip strength at the left hand ($F=9.91$, $p < .05$) following the cold pressor. Anger out was associated with poorer scores on verbal fluency ($F=6.22$, $p < .05$) and greater systole increases in response to these tasks ($F=7.41$, $p < .05$)

Conclusions: Anger expression style demonstrated patterns of lateralization. Anger in impacting right hemisphere functions and anger out associated with decrements in left hemisphere processes.

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C. GOJMERAC, A. ANDERSON & D.T. STUSS. Age-related Changes in Emotion Regulation.

Objective: The purpose of this study was to investigate age-related changes in emotion regulation. Neuroimaging studies have implicated frontal lobe regions in voluntary emotion regulation. Since aging is associated with neural changes in the frontal lobes, it is possible that aging would impact the ability to regulate emotion.

Participants and Methods: Ninety six participants (48 older, 48 younger) took part in a startle modulation paradigm. Negative and neutral pictures were paired with the following regulation instructions: decrease, look, increase (Jackson et al., 2000). The original paradigm was modified to 1) include subjective ratings following the different regulation instructions, and 2) contrast the effects of two specific regulation strategies, cognitive re-appraisal and attentional focus.

Results: Planned polynomial contrasts were conducted to assess the effect of each regulation instruction. For ‘decrease’, all participants, except older males, showed a negative linear trend in the magnitude of startle eyeblink across probe time. Attentional focus was more effective for younger participants whereas cognitive re-appraisal was more effective for older participants. For ‘increase’, only females showed a positive linear trend in the magnitude of startle eyeblink across probe time. There were no strategy differences. Emotion regulation as measured by subjective ratings revealed no age-related differences.

Conclusions: This study is the first to show age- and sex-related differences in negative emotion regulation using antecedent-focused strategies. Age differences are present in emotion regulation if measured objectively, rather than through self-report questionnaires. These results argue against a prominent viewpoint that emotion regulation improves with age.

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C.J. HAYES, R.J. STEVENSON & M. COLTHEART. Olfactory Disgust in Preclinical Huntington’s Disease.

Objective: Findings of impaired perception of disgust in the olfactory modality in patients with Huntington’s disease (HD) (Hayes, Stevenson, & Coltheart, 2007; Mitchell, Heims, Neville, & Rickards, 2005) are of interest because they suggest that difficulty recognizing disgusted facial expressions in HD patients (Sprenghelmeyer et al., 1996) might reflect an underlying deficit in the experience of disgust. An alternative possibility is that aberrant olfactory disgust in these patients is simply an artifact of the impairment in olfactory acuity that occurs in symptomatic HD. The study sought to address this question by investigating the odor hedonic responsiveness of presymptomatic HD gene-carriers.

Participants and Methods: Seventeen individuals positive for the HD gene, and 12 gene-negative controls participated in tasks of olfactory identification and hedonic processing. Video taped recordings of the assessment allowed for the later analysis of facial expressiveness.

Results: While odor-induced facial responses did not expose differences between mutation positive and mutation negative individuals, the self-report data was more revealing. The hedonic ratings of mutation positive subjects differed significantly from those of gene-negative controls.

Conclusions: While the finding was not entirely uncomplicated by variation in olfactory acuity, the effects were consistent with a disgust-specific process: mutation-positive subjects reported less dislike for disgusting smells, but responded normally to a pleasant odor. The results are consistent with accumulating evidence of impairment in the processing of stimuli signaling disgust in HD.

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E.A. LONG, P.K. SHEAR & M.P. DELBELLO. Facial Affect Labeling and Interpretation in Bipolar Adolescents.

Objective: Impaired affect processing has been shown in adults with bipolar disorder; however, much less is known about these abilities in adolescents. In addition, no research has examined the social interpretation of affective information in this population. Thus, this study examined facial affect labeling and interpretation in adolescents with bipolar disorder.

Participants and Methods: Fourteen adolescents with bipolar I disorder (mean age 14.8, SD=1.9) and 9 healthy volunteers (mean age 14.0, SD=2.0) were administered a forced choice facial affect labeling task, a forced choice affect interpretation task, and a line scale affect interpretation task. For each task, accuracy as well as reaction time was measured. In addition, participants were also compared on demographic variables, estimated intelligence, and facial recognition ability.

Results: Relative to the controls, participants with bipolar disorder were more impaired at labeling angry facial expressions ($F=4.225$, $p=0.026$) but not fearful, happy, or neutral expressions. In addition, analysis revealed a trend in participants with bipolar disorder to have slower reaction times when labeling happy faces than healthy participants ($F=2.82$, $p=0.05$). There were no group differences in performance on tasks that required them to indicate how likely they would be to ask individuals with different emotional expressions for help if they were alone.

Conclusions: These results suggest that, similar to adults with bipolar disorder, adolescents have deficient affective labeling abilities with respect to angry emotions. Though no interpretive deficits were found on the tasks that were administered, reduced ability to recognize angry expressions holds the potential to contribute to the impaired social functioning that is well documented in this population.

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A.E. MIKOS, B. SKOBLAR, U.S. SPRINGER, I.L. KELLISON, A. NISENZON, H. FERNANDEZ & M.S. OKUN. Emotion Self-Perception in Parkinson Disease: Beyond the Masked Face.

Objective: A "masked" expressionless face is one of the hallmark features of Parkinson disease (PD). However, it is not known whether PD patients are fully aware of their muted emotional expressivity. The purpose of the present study was to learn: (1) how accurately PD patients rate their levels of expressivity relative to their spouses, (2) whether PD patients differ from healthy participants in their emotional self-perceptions, and (3) whether expressivity in PD is related to clinical or disease characteristics.

Participants and Methods: 31 non-demented PD patients and 22 controls completed two self-report measures: the Emotional Expressivity Questionnaire (EEQ) and the Affect Intensity Measure (AIM-s). Spouses of both PD and controls also completed EEQ and AIM-S ratings describing the study participant. Mood measures included the Beck Depression Inventory (BDI-2) and the Apathy Evaluation Scale (AES). Clinical disease characteristics included UPDRS total motor score and levodopa equivalent dosage (LED).

Results: Aim 1: PD ratings of their expressivity did not significantly differ from spouse ratings of the patient's expressivity. Aim 2: On the EEQ, PD patients rated themselves as significantly less expressive than did controls, with no group differences on the AIM-s. Aim 3: For PD patients, greater withholding of emotion (AIM-s) was associated with higher UPDRS motor scores and higher levels of apathy but was not related to depression. Reduced expressivity (EEQ) was related to higher UPDRS motor scores.

Conclusions: PD patients viewed themselves as less expressive than controls, and their self-appraisals corresponded to those of their family members. Thus, non-demented PD patients demonstrated awareness of deficits in emotional expressivity and these deficits were related to severity of motor symptoms and apathy symptoms. These findings will be discussed in light of a growing literature suggesting that anosognosia is not a primary characteristic of idiopathic PD.

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H.K. RAU, Y. SUCHY, P. WILLIAMS, S. THORGUSEN & A. SIMON. Neuroticism and the Influence of Emotional Distractors on Cognitive Task Performance.

Objective: High neuroticism (N) has been shown to be associated with slowed performance on cognitive tasks (Lolas & de Andraca, 1977), increased reactivity to and difficulty orienting away from negative emotional stimuli (Derryberry & Reed, 1994), and a unique profile of brain activation during cognitive-affective tasks (Canli, 2004). This study examined the effect of emotional distractors on cognitive control among participants with different levels of N.

Participants and Methods: 177 undergraduates (age 18-30) were administered the Revised NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1992) and spatial and verbal attentional tasks that utilized background emotional stimuli (happy and sad faces) as distractors.

Results: A mixed design ANOVA yielded a three-way interaction between N (high, middle, low), distractor (neutral, happy, sad), and task (spatial, verbal) [$F(4,348)=2.93$, $p=.021$], with low N participants exhibiting faster performance on happy, as compared to sad, trials [$t(41)=2.32$, $p=.025$], but only for the spatial task. Additionally, low-N participants performed faster than high-N participants on happy trials for both spatial [$t(98)=2.40$, $p=.013$] and verbal [$t(98)=2.17$, $p=.032$] tasks. Examination of mean values suggested that high-N participants may be slower than low N participants across all tasks, but this did not reach significance.

Conclusions: These results support previous findings that high-N is associated with slowed performance. However, in contrast to prior research, our results suggest that slowing may be particularly prominent during positive emotional distractors. Future research examining various types of positive and negative emotional distractors may help to further delineate the relationship between N and affective bias.

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H.K. RAU, Y. SUCHY, P. WILLIAMS, S. THORGUSEN & A. SIMON. Attention, Executive Control, and Neuroticism: The Effect of Verbal Versus Nonverbal Threats.

Objective: Prior research suggests that high neuroticism is associated with poorer performance on tasks of attentional and executive control, thought to be associated with their presumed difficulties disengaging from threatening stimuli (Eysenck, 1992; Williams et al., 1997; Derryberry & Reed, 1994). This study sought to examine the relationship between high, middle, and low neuroticism (N) and attentional bias for verbal and non-verbal threats.

Participants and Methods: 214 undergraduates (age: 18-30) completed the Revised NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1992) and two attentional bias tasks: the face probe detection task (Bradley et al., 2004) which requires that participants orient away from neutral or angry faces, and the word probe detection task (MacLeod et al., 1986) which requires that participants orient away from neutral or threatening words.

Results: A paired samples t-test showed that high-N participants took longer to orient away from angry compared to neutral faces [$t(69)=2.30$, $p=.025$], but were faster at orienting away from threatening compared to neutral words [$t(69)=2.17$, $p=.034$]. Low-N participants also took longer to orient away from angry faces [$t(82)=2.70$, $p=.042$], but did not differ on performance for word trials [$t(82)=1.99$, $p=.137$]. The middle-N group showed no difference in performance on face or word trials.

Conclusions: These results support the notion that high-N is associated with attentional bias for threatening faces but not words. Interestingly, low-N was also associated with bias for threatening faces which could reflect a curvilinear relationship. Future research examining various forms of threatening stimuli may help further differentiate the relationship between N and attentional bias toward threat.

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T. SUZUKI, C. UENO, A. SAITO, H. OKAMURA, J. ITO & T. KINOSHITA. Vocal Expression of Emotion in Schizophrenic patients.

Objective: Difficulty of emotional expression plays a crucial role for schizophrenic patients in communicating with others. The purpose of this study is to investigate the features of vocal expression of emotion in schizophrenic patients measured by physical characteristics of speech.

Participants and Methods: Thirty-nine schizophrenic patients and 23 healthy subjects participated in this study. Subjects were asked to say “Kocchi-he irasshai” (come here) six times, each time expressing one of the six different emotions as cued by a tester; surprise, joy, sadness, fear, relax and anger.

The recorded voices were analyzed using speech-analysis software (‘praat’). Three vocal features, pitch range, intensity, and speech duration were extracted and compared the patient group with the controls. Twenty listeners were asked to judge the intended emotional expressions of the recorded voices.

Results: There were no differences in vocal parameters (pitch range, intensity, and speech duration) between the patient group and the controls. On the contrary, the expression of joy and anger by the patients were more misjudged than those of controls. The expression of relax by patients was apt to be misjudged compared to those of controls.

Conclusions: Although the vocal expressions of emotion did not differ between the schizophrenic patients and healthy controls measured by three physical parameters (pitch range, intensity, speech duration), some emotions expressed by patients were more misjudged than those by controls. These results suggest that the difficulty of emotional expression in schizophrenic patients are not based on the vocal parameters measured in this study.

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L.B. ZAHODNE, I. KELLISON, M.S. OKUN, H.H. FERNANDEZ & D. BOWERS. Changes in Apathy and Depression over Time among Patients with Parkinson’s Disease.

Objective: Although apathy may be a core neuropsychiatric feature of Parkinson’s disease (PD), little is known about its progression over time. In this study, we examined apathy and depression over shorter (4 months) and longer intervals (2 years). We hypothesized that apathy would worsen over longer intervals in line with progression of disease state.

Participants and Methods: We administered the Apathy Evaluation Scale (AES) and the Beck Depression Inventory (BDI) to an unselected convenience sample of 84 idiopathic PD patients from the UF Movement Disorders Center. Ss were retested after a 4-month (N=69) or 2-year interval (N=15). On average, patients were 67yo, moderately affected by their disease (mean UPDRS=28.6) and on dopaminergic therapy (mean LED=503.8) at time of initial testing. AES scores ranged from 0 to 31 (X=14.00) and BDI scores ranged from 0 to 40 (X=9.58).

Results: Over a 4-month interval, there were no changes in either apathy (p=.923) or depression scores (p=.315), with significant test-retest correlations for each measure (AES: r=.84, p<.001; BDI: r=.79, p<.001). Over a 24-month period, apathy scores increased significantly (t=-4.28, p<.01). In contrast, BDI scores did not change during the same period (p=.649). These differences were unrelated to antidepressant medication changes.

Conclusions: Our findings confirm the test-retest reliability of AES and BDI in PD patients. Our findings also raise the intriguing possibility that apathy may progressively worsen in PD, relative to depression, and further support the separability of these neuropsychiatric states. Larger longitudinal studies are needed to confirm these observations of changes in apathy over time.

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L.B. ZAHODNE, S. YOUNG, A. NISENZON, C. JACOBSON, H.H. FERNANDEZ, M.S. OKUN & D. BOWERS. Profiles of Apathy among Parkinson’s Patients in the United States.

Objective: Although several scales exist for measuring apathy, few provide information about different components of apathy (i.e. interest, activity, and emotional blunting). The Lille Apathy Rating Scale (LARS) is a semi-structured interview with four subscales validated in French Parkinson’s disease (PD) patients. Our objective was to determine its concurrent validity in a US sample by comparing it to the Apathy Evaluation Scale (AES).

Participants and Methods: We administered LARS, AES, and the Beck Depression Inventory (BDI) to a convenience sample of 47 PD patients at a single Movement Disorders Center. On average, PD patients were in their mid-sixties, moderately affected by their disease, and on dopaminergic therapy. AES scores ranged from 1 to 37 (X=14.1) and BDI scores ranged from 0 to 29 (X=11.2).

Results: Total LARS scores correlated with AES (r=.65; p<.001) and BDI (r=.39; p<.05). Patients endorsed similar levels of apathy across the four subscales. Controlling for each of the other subscales with partial correlations, AES correlated significantly with Intellectual Curiosity (r=.37; p<.05) but not with the other subscales: Action Initiation (r=.23; p=.14), Self Awareness (r=.06; p=.69), Emotion (r=.06; p=.71), and BDI correlated with Action Initiation (r=.39; p=.05).

Conclusions: Consistent with findings with a French sample, we found that the Intellectual Curiosity subscale of LARS was most highly related to AES in a sample of US PD patients, which suggests AES may best reflect cognitive aspects of apathy. Results also suggest that depression may be most highly related to behavioral aspects of apathy. The LARS represents a promising new measure for assessing apathy that provides more information about apathy “profiles” including cognitive, behavioral, and emotional components.

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Imaging: Functional

N. DAVIS, C. CANNISTRACI, L. FUCHS, B. ROGERS, W. SCHRADER, A. ANDERSON, C. GATENBY & J. GORE. An fMRI Study of the Neural Correlates for Exact and Approximate Calculations in Children.

Objective: Few studies have investigated the neural correlates of mathematical ability in children. Consequently, the precise neural basis of mathematical skill in children remains uncertain. The present study uses functional magnetic resonance imaging (fMRI) of a group of third grade children to identify the neural correlates of calculation ability.

Participants and Methods: Functional MRI scans were obtained on 29 children with average math skill. Functional data gathered during exact and approximate calculation tasks were used to create a statistical activation map for each task. Anatomical locations were determined from the local maxima of the activations. From these maps, regions of interest (ROI) were created with a minimum cluster size of 50mm³ and p value < .05 (corrected).

Results: Results from the functional imaging showed robust bilateral activation in parietal and medial frontal lobes during simple estimation tasks. Bilateral parietal activation was also found during performance on the simple exact calculation task along with activation in the left hemisphere frontal lobe, cingulate gyrus, and posterior insula cortex.

Conclusions: Interpretation of our findings including the functional roles of the anatomical regions and their possible implications for future research will be discussed in this presentation. Our results provide important information on the neural correlates of mathematical skill in children. This information strengthens our understanding of the diverse brain regions involved in simple mathematical processes in children. Correspondence: *Nicole Davis, Ph.D., Vanderbilt University, PO Box 330674, Nashville, TN 37203. E-mail: Nikki.Davis@Vanderbilt.Edu*

Language: Aphasia

P.M. BEESON, S.D. CARNAHAN, M.L. HENRY, K. RISING, E.S. KIM & S.Z. RAPCSAK. Lexical-Semantic and Sublexical Influences on Reading and Spelling in Acquired Alexia and Agraphia.

Objective: Previous research in individuals with acquired alexia and agraphia has demonstrated robust effects of word frequency, imageability, as well as influences of sound-spelling regularity in relation to lesion location. The current investigation used a group study approach and item-based analyses to further explore the unique influences of lexical-semantic and sublexical variables on single-word reading and spelling.

Participants and Methods: Reading and spelling data were examined from 32 alexic/agraphic individuals, including 14 with damage to left perisylvian cortex due to stroke and 18 with damage to left extrasyllvian cortex (11 with vascular events affecting temporo-parieto-occipital cortex; 7 with progressive aphasia associated with temporal lobe atrophy). In order to perform multiple regression analyses, 60 single-syllable words used as stimuli were characterized by continuous measures of word frequency, imageability, sound-spelling regularity (phoneme-grapheme/grapheme-phoneme contingencies), body-rime/rime-body consistency, and word length.

Results: Significant influences of word frequency, regularity, and imageability were observed for reading and spelling for the group as a whole. Analyses by lesion location (perisylvian vs. extrasyllvian) confirmed that frequency contributed to reading/spelling performance in both groups. By contrast, imageability significantly influenced reading/spelling performance only in perisylvian patients, whereas regularity influenced reading/spelling performance only in extrasyllvian patients. Word length significantly influenced spelling for both groups, but consistency had no significant effect.

Conclusions: The findings from this study demonstrate that reading/spelling performance of individuals with left perisylvian damage is moderated primarily by lexical-semantic (but not sublexical) features of stimuli, whereas individuals with left extrasyllvian damage are strongly influenced by sublexical features of sound-spelling regularity.

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R.S. MARSHALL & J.S. LAURES-GORE. A Single Subject Study of Unilateral Nostril Breathing in Aphasia.

Objective: Unilateral nostril breathing is one of the specific yoga breathing practices called pranayama. Previous research has demonstrated increased verbal abilities in individuals who complete right nostril breathing and enhanced spatial abilities with left nostril breathing (Jella & Shannahoff-Khalsa, 1993). Werntz et al., (1987) also suggested that unilateral nostril breathing could influence cognitive function in the contralateral hemisphere in non-brain damaged individuals. The purpose of the current study was to apply this technique to a patient with the

hypothesis that right nostril breathing may increase verbal abilities in patients after left hemisphere stroke and aphasia. Increased mood and language abilities would suggest a potential low cost intervention for rehabilitation, which would be easy to teach to patients while they are in the hospital.

Participants and Methods: TS was a 35-year-old female who was three years post stroke with moderate to severe Broca's aphasia and verbal apraxia. This single subject study was conducted as an ABAB design with probes collected on language, motor speech, and depression.

Results: Improvements in mood and language were noted following 4 weeks of training and home practice. We observed decreases on the Geriatric Depression Scale and increases in Correct Information Units (CIUs) for describing a complex picture. Overall increases on formal language assessments were observed as well; however changes were not observed for motor speech production.

Conclusions: Based on the findings of this study, it appears that unilateral nostril breathing was useful for increasing language production and decreasing depression for this individual. Future studies should be conducted to replicate these findings.

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J.D. RICHARDSON & R.S. MARSHALL. Massed Practice in Aphasia: Necessary, but not Sufficient?

Objective: Though behavioral and neural results following constraint-induced aphasia therapy (CIAT) are promising, a more complex understanding of the efficacy of this therapy is needed. This could be supplied via analysis of CIAT principles, which are massed-practice, constraint of alternative methods of communication, and participation in behaviorally relevant activities. The aim of this pilot study is to determine if individuals who participate in an individualized traditional therapy program that adheres to the massed practice principle of CIAT (i.e., 3h/day for 10 consecutive weekdays) will demonstrate similar outcomes to those reported in the CIAT literature.

Participants and Methods: A single-subject design (ABA) was utilized. The participant presented with chronic Broca's aphasia and apraxia of speech. She was assessed with standardized measures and repeated measures of target behaviors.

Results: Change of practical significance ($d \geq .5$) occurred on the singing subtest of the ADP following therapy. Utilizing guidelines for reporting effect sizes for single subject design, the repeated measures for which practically significant improvement was observed were correct information units (small; $d = 2.84$) and total number of words (medium; $d = 5.44$) for a spontaneous speech sample. The latter findings are consistent with visual inspection of the data.

Conclusions: The informativeness of the participant's speech did improve as a result of treatment; however, the participant did not demonstrate outcomes similar to those reported in the CIAT literature. The application of the massed practice principle alone is likely inadequate for leading to significant improvements in behavioral performance. Replication of this study is in progress.

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S.Z. RAPCSAK, P.M. BEESON, M.L. HENRY, E.S. KIM & K. RISING. Are Dissociations between Reading and Spelling Common in Individuals with Acquired Alexia and Agraphia?

Objective: Dissociations between reading and spelling performance in neurological patients are often cited as evidence for the independence of the cognitive systems that mediate these two written language tasks. In this study we examined the frequency and reliability of dissociations in a large group of patients with acquired alexia/agraphia.

Participants and Methods: Fifty-three patients with alexia/agraphia due to left-hemisphere stroke or progressive aphasia participated in this investigation. Reading and spelling scores for irregular words (reflecting the status of the lexical route) and non-words (reflecting the status of the non-lexical route) were compared. Correlations between tasks were used to test the strength of association between reading and spelling performance. Individuals with scores >1SD below the group mean on one task and scores >1SD above the mean on the complementary task were considered to show a “strong” dissociation, and cases with scores >1SD below the mean on one of the two tasks a “weak” dissociation.

Results: Significant positive correlations were demonstrated between irregular word reading and spelling scores and between non-word reading and spelling scores ($p < .0001$). By contrast, dissociations between tasks were rare (4/53 or 7.5%) and were attributable either to peripheral visual processing deficits causing disproportionate impairment in reading (1 case) or to task difficulty effects leading to more severe impairments in spelling (3 cases).

Conclusions: The reliability of associations and the paucity of theoretically meaningful dissociations in this large sample of patients with acquired alexia/agraphia are more consistent with models that postulate shared cognitive components for reading and spelling.

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S.Z. RAPCSAK, P.M. BEESON, M.L. HENRY, K. RISING, E.S. KIM & H. CHO. Cognitive Mechanisms of Phonological Dyslexia and Dysgraphia.

Objective: Phonological dyslexia and dysgraphia are characterized by a disproportionate difficulty in processing non-words compared to real words, giving rise to an exaggerated lexicality effect in reading and spelling. The purpose of this study was to determine whether these written language disorders reflect the breakdown of central phonological representations that are also used in spoken language tasks or whether they are attributable to a selective impairment of sublexical phoneme-grapheme conversion procedures.

Participants and Methods: Twenty-two patients with CT/MRI evidence of focal damage to perisylvian cortical regions implicated in phonological processing (Broca’s area, precentral gyrus, insula, superior temporal gyrus, supramarginal gyrus) and sixteen controls were administered tests of word and non-word reading and spelling. Spoken language tasks included repetition of words and non-words, and a battery of phonological awareness tests that required the identification, maintenance, and manipulation of sublexical phonological information (rhyme judgments/production, phoneme deletion, segmentation, blending, and substitution).

Results: Patients showed enhanced lexicality effects in reading and spelling compared to controls, consistent with phonological dyslexia/dysgraphia. However, patients also demonstrated increased lexicality effects in oral repetition tasks. Furthermore, reading and spelling performance for both words and non-words was significantly correlated with scores on phonological awareness tests that did not require orthographic processing. Quantitative differences between reading and spelling performance reflected the greater vulnerability of spelling to phonological impairment.

Conclusions: Phonological dyslexia and dysgraphia in patients with perisylvian lesions are attributable to a central or modality-independent phonological deficit rather than to a selective impairment of cognitive components specific to reading or spelling.

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A.D. RODRIGUEZ, S.E. NADEAU, D.L. KENDALL, J.C. ROSENBEK, K.M. HEILMAN & L.J. GONZALEZ ROTH. Is Boston Naming Test and Action Naming Test Performance Comparable in Individuals with Aphasia?

Objective: Anomia, or the inability to retrieve content words such as nouns and verbs, is a common finding in aphasia. Evidence suggests that posterior lesions result in more difficulty producing nouns, while anterior lesions result in more difficulty producing verbs. The question we sought to address in this study was: how common is it to see substantially different noun and verb retrieval success in aphasia?

Participants and Methods: A convenience sample of 94 right-handed, native English speakers with left hemisphere stroke and chronic aphasia provided the basis for this study. The Boston Naming Test (BNT) and the Action Naming Test (ANT) were used to assess noun and verb retrieval, respectively. BNT and ANT scores were retrieved from an IRB-approved research database. Means and standard deviations were calculated for the BNT and ANT.

Results: BNT and ANT mean (standard deviation) were 30.9 (16.1) and 34 (16.6), respectively. In 73 participants (78%), performance on the BNT was within 0.5 SD of performance on the ANT. In 20 participants (21%), the performance discrepancy on the two tests was between 0.5 and 1 SD, 10 with better ANT performance and 10 with better BNT performance. In one subject, ANT performance was 1.02 SD better than BNT performance.

Conclusions: ANT and BNT performance are typically comparable. However, in a substantial minority of subjects, there is a discrepancy, suggesting that noun and verb retrieval advantages widely reported in the literature are likely genuinely reflective of the attributes of aphasic populations and not simply a result of studying highly selected subpopulations.

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M.F. SCHWARTZ, M.R. BARTLETT, R.B. FINK, G. TRUE, J.S. LOWERY & M.C. LINEBARGER. Assistive Technology for Spoken Language in Aphasia: Test of a Portable Enhancement of the SentenceShaper® Program.

Objective: Research shows that aphasic speech produced with the aid of the SentenceShaper® computer program contains more structure and information than comparable unaided samples. Recent enhancements enable the aphasic user to play her SentenceShaper productions from a handheld computer. In this study, we sought to: (1) determine the feasibility of a training protocol that features rehearsal and self-cueing from the handheld; (2) test for aided effects in self-cued face-to-face productions; and (3) measure attitudes toward this training and technology.

Participants and Methods: The participant, L2, has chronic non-fluent aphasia with agrammatism. With training, she learned how to use the handheld to rehearse her downloaded SentenceShaper narratives, to cue herself with partial playback, and to retell the narrative to an unfamiliar listener with the aid of the handheld and the self-cueing technique. An N-of-1 multiple baseline design was used to compare the informativeness of L2’s self-cued aided retellings to her baseline unaided (i.e., spontaneous) retellings. Qualitative methods (questionnaire and guided interview) were used for attitudes assessment.

Results: For each of two assessed narratives the change in percent informative words, measured from repeated (unaided) baselines, was statistically significant, as measured by the C-statistic. Furthermore, L2 expressed a highly favorable impression of the training and technology, and an interest in using it to convey information in real-world person-to-person interactions.

Conclusions: This case study, one of an ongoing series, supports the effectiveness and acceptability of the enhanced SentenceShaper system for face-to-face communication in aphasia.

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G.A. STEFANATOS, W.Q. JOE, Y. IEUJI & A. GERSHKOFF. Auditory Attention to Speech in Aphasia: Response to Pharmacologic Treatment.

Objective: Neuropharmacologic studies of acquired aphasia have suggested that the outcome of speech/language therapy can be enhanced by adjuvant treatment with low doses of dextroamphetamine (DEX). The nature of this effect and its physiological basis are unclear. We examined whether DEX influences auditory attention to speech in individuals with aphasia.

Participants and Methods: Utilizing a double blind, placebo-controlled, crossover design we compared the effects of two dose levels of DEX on performance of a dichotic listening test in individuals with mild to moderate aphasia resulting from infarction in the distribution of the left middle cerebral artery.

Results: Laterality indices were calculated for each of the three attention conditions Non-Forced (NF), Forced-Right (FR), and Forced-Left (FL). A 3x3 repeated measures ANOVA, comparing effects attention Condition (NF, FR, FL) and Dosage (placebo, 10 mg, 20 mg) on the laterality indices, revealed a main effect of dosage ($F = 4.10, p = 0.04$). A Left-Ear Advantage (LEA), thought to reflect greater involvement of the right hemisphere in processing speech processing, was found across all conditions. However, the greatest LEA was evident on placebo, and left laterality decreased with both 10 and 20 mg doses.

Conclusions: Medication effects appeared to result in an increase in the role of left hemisphere in mediating attention to and perception of speech. We suggest that this effect may, in part, reflect enhanced function of dopaminergic areas of auditory association cortex.

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Language: Other (e.g., Naming, Fluency, Reading)

E. ANDRESEN, H. CRAIN, C. ALT & D. OSMON. The Prototypicality of Three Priming Tasks.

Objective: Priming is one of the most prolific areas of research in psychology. Three types of priming that have received much attention in the word-recognition literature are semantic, phonological, and orthographic. Despite the extent of these literatures, few studies have been done in which all three types of priming are given to the same pool of subjects. Doing so would allow a more direct comparison of the effects of these priming types.

Participants and Methods: Three priming tasks, one semantic, one orthographic, and one phonological, were created. Each task was designed to be as prototypical of its current literature as possible. Additionally, in order to be able to directly compare the effects of the different types of priming, the word targets were held constant across experiments. Participants completed all priming tasks in the same session. Order of tasks was counterbalanced across subjects.

Results: In order to determine the representativeness of each priming task, effect sizes (Cohen's d) were calculated and compared to past meta-analyses from each priming area. Initial data show that the orthographic task had a moderate effect, at $d = .56$; the phonological task had a small effect, at $d = .37$; and the semantic task had a small effect, at $d = .32$.

Conclusions: Initial data are promising. The orthographic and the semantic effect sizes are indeed roughly equivalent to effect sizes previously shown in the literature. The phonological effect, however, is smaller than what is typically found in the literature. It is possible that as more subjects participate, this effect will change. These data also show that, in this sample, subjects demonstrate more benefit from orthographic priming than from either phonological or semantic priming.

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S.H. EASON, A. ALBERSTADT, J. SABATINI, K. BRUCE & L.E. CUTTING. Children with Specific Reading Comprehension Impairments: Deficits in Contextual but not Isolated Word Reading Speed?

Objective: Reading comprehension difficulties are typically associated with deficits in reading words accurately and quickly; however, some children have difficulty with reading comprehension despite being able to read isolated words accurately (Reading Comprehension Deficit-Only; RCD-Only). Nevertheless, while children with RCD-Only are able to recognize/decode words accurately, it is not clear if they are able to read words quickly in both isolation and context.

Participants and Methods: To examine this issue, three reader types, those of average reading ability ($N=25$; mean age $11.07+1.14$), with a word reading deficit (WRD; $N=21$; mean age $11.46+1.51$), and with RCD-only ($N=12$; mean age $12.04+1.04$) read aloud both single words and paragraphs. Accuracy and speed were combined to create a measure of words correct per minute.

Results: Results revealed that the WRD group read single words and paragraphs less efficiently than the control and RCD-Only groups (all comparisons $p < .007$). The RCD-Only and control groups had similar mean scores for isolated words ($p = .206$); however, a statistically significant difference emerged when reading words contextually (in paragraph form; all comparisons $p < .015$), suggesting that the RCD-Only group is less efficient than controls when reading words in context.

Conclusions: As expected, WRD was associated with weaknesses in both isolated as well as contextual word reading. Findings also indicated that RCD-Only is associated with being able to read words in isolation not only accurately, but also quickly. Nevertheless, despite being able to read isolated words quickly, the RCD-only group showed deficits in contextual reading speed. These findings suggest that a dichotomy may exist between isolated and contextual reading speed, with the latter drawing more upon comprehension processes.

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P. GAUR, A.M. CLEMENTS-STEPHENS, D.K. CARMICHAEL & L.E. CUTTING. The Neurobiology of Single Word Reading in Adolescents with Varying Degrees of Reading Ability.

Objective: Reading difficulty is typically characterized by weaknesses in recognizing/decoding isolated words; however, for older children, the origin of this difficulty is more heterogeneous. Of interest is that some adolescents have been found to have reading comprehension deficits (RCD), despite appearing to score within the normal range on tests of isolated word reading (RCD-only). The nature of RCD-only is not clearly understood; two hypotheses are that it emerges from: 1) subtle deficits present in single word reading ability that are not detectable (sub-threshold) or 2) deficits present in other areas thought to contribute to reading comprehension (i.e., executive function, working memory). To date, no investigation of the neurobiological processes associated with RCD-only has occurred.

Participants and Methods: A single word reading fMRI task was utilized with 36 adolescents 10-14 years old: 12 with word reading deficits (WRD), 8 RCD-only, and 16 controls.

Results: Findings revealed that both RCD-only and Control groups showed activation typically seen in skilled readers (e.g., left inferior temporal and parietal lobes) whereas the WRD group showed more diffuse activation, including substantial right hemisphere activation. Between-group analyses showed that the WRD group had greater right hemisphere activation than Controls, whereas both RCD-only and Control groups showed greater left hemisphere activation compared to the WRD group, including inferior temporal and occipital lobe activation. The RCD-only and Control groups were not significantly different from each other.

Conclusions: Findings suggest that the RCD-only group processes words more similarly to Controls than the WRD group, supporting the specificity of RCD absent of WRD for some adolescents.

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S.L. RIMRODT, A. VENKATADRI, P. GAUR, A.M. CLEMENTS-STEPHENS & L.E. CUTTING. Multi-modal sentence processing reveal common language network.

Objective: A window into understanding the essential components of comprehension may be provided by examining which cortical regions are co-activated and which are distinctly activated when sentences are processed visually (reading) versus aurally (listening).

Participants and Methods: Ten adult skilled readers (Age 22.41 ± 1.08) completed two sentence-processing tasks, one per modality. Participants had to decide whether each sentence that they heard or read was meaningful.

Results: Results of a one-sample t-test for auditory sentences revealed bilateral activation in middle and superior temporal cortex in addition to left inferior frontal and right medial frontal gyri. For the visually presented sentences, results revealed more diffuse left-hemisphere activation including the frontal lobe, temporal lobe, and cerebellum with additional activation seen in bilateral occipital lobes. Results of the conjunction analysis indicated that both modalities activated left inferior frontal lobe and left middle temporal gyrus. Activation specific to visually presented sentences was found in bilateral visual cortex, as well as right inferior parietal lobe and left superior parietal lobe, whereas specific activation for auditory sentences was found in bilateral middle and superior temporal lobe, including auditory cortex.

Conclusions: Findings suggest that despite the differences in activation associated with input modality (presumably reflecting basic sensory processing), adult skilled readers have similar higher level processing mechanisms for visual and aural sentence comprehension. Regardless of modality, temporal lobe and inferior frontal gyrus (components of language circuits) were consistently important for sentence processing. These findings are consistent with results from other functional neuroimaging studies of sentence processing that also emphasize the importance of these language regions.

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N.A. HAUGRUD, S. LANTING & M. CROSSLEY. The Effects of Healthy Aging and Alzheimer's Disease on Strategy Use During Performance on Verbal Fluency Tests.

Objective: We tested a two component model of verbal fluency production. This model has been supported by sex (Weiss et al., 2006), age category (Troyer et al., 1998) and dementia subtype (Troster et al., 1998) differences in strategy use (e.g., clustering and switching) during phonemic and semantic tasks.

Participants and Methods: The current study examined clustering and switching strategies during phonemic and semantic verbal fluency tests for healthy males and females in young, middle-aged, and older age groups (n = 193), and for participants with early stage Alzheimer's disease (n = 26).

Results: Using a 2 (sex) X 4 (age group) factorial design, age related differences were found in total word production (phonemic $p < .01$, semantic $p < .01$) due to age-related switching decreases (phonemic $p = .04$, semantic $p < .01$). Healthy males produced larger cluster sizes than females (phonemic $p = .08$, semantic $p < .01$), while females switched more frequently than males (phonemic $p = .02$, semantic $p = .02$). Previously reported sex differences found with a young age group were extended to the middle and older age groups, and age-related reductions in switching rates were evident by the middle years. Using a 2 (sex) X 2 (cognitive status) ANOVA, AD patients produced fewer words than

healthy older adults (phonemic $p = .01$, semantic $p < .01$), primarily due to decreased cluster size (phonemic $p = .02$, semantic $p = .01$).

Conclusions: Clustering and switching strategy differences provide additional support for a two component model of verbal fluency.

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M. IAMPIETRO, J. GIDLEY LARSON, K. COULEHAN, K. ERICKSON, F.R. LITMAN, M.D. AHRONOVICH & I. BARON. Intact Performance in Extremely Low Birth Weight Children (< and > 750 grams) on Noun Fluency and Clustering Strategy at Age Six.

Objective: Preterm birth is associated with lifespan neuropsychological impairment and frontostriatal and cerebellar-frontal damage, disruptions associated with executive function (EF) deficit. Extremely Low Birthweight (ELBW; <1000 g) children are at greatest risk, especially infants born <750 g. EF assessment in young preterm children is made difficult by the paucity of appropriate methodology and normative data. Using standardized fluency scoring guidelines and a reliable novel scoring system concurrently, we examined noun fluency and strategy generation in a sample of ELBW children.

Participants and Methods: Noun fluency data were collected from 63 ELBW children born in 1998-2001 (mean age=6.68 years; mean gestational age=26.56 weeks; mean birth weight=786 g; 63.5% male). These data were scored using D-KEFS Verbal Fluency Test scoring guidelines and the Baron Fluency Scoring System, a developmental modification of adult scoring systems. The results for children born <750 g (N=21) were compared to those born >750 g (N=42).

Results: Total number of correctly produced words was not significantly different between children born <750 g (T=41.35) and those born >750 g (T=45.20). Further analyses of number of clusters, mean cluster size, cluster ratio, perseverations, and rule break errors yielded no significant results between groups, even without Bonferroni corrections.

Conclusions: Equivalency of results irrespective of birthweight suggests that continued expectation for poorer function at the lowest birthweight may be misguided, and that these most at-risk infants may experience age appropriate EF function. Developments in neonatal care for ELBW infants may contribute to these findings.

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C.J. PATRICK, J. FLYNN & D.C. OSMON. Reading Ability Moderates the Word Letter Phenomenon (WLP): Support for a Dual Route Model.

Objective: The WLP is an established effect in word recognition demonstrating that participants identify a target letter more accurately if presented as part of a word than alone. The superiority for words appears to depend upon bi-hemispheric processing. Research has found a reversal of the WLP in a reading impaired population with results suggesting that the WLP relies on access to visual word forms. The current hypothesis is reading ability will be found to moderate the WLP. Measures more sensitive to orthography will be more predictive than phonological measures.

Participants and Methods: All 50 participants were undergraduate students. Participants completed a WLP task designed in accordance with the Riecher-Wheeler paradigm. The WLP stimuli were presented at three different stimulus durations: 30ms, 40ms and 50ms. The participants also completed reading measures from the Woodcock-Johnson Psycho-educational Battery, 3rd Edition. The current hypothesis was tested using simultaneous and hierarchical regression analyses.

Results: A WLP was found for the 30ms and 40ms conditions but not the 50ms condition. In the 30ms condition a simultaneous regression produced a significant model ($R^2 = .254$; $p = .003$). A hierarchical re-

gression found that only Reading Fluency significantly accounted for variance in the model ($R^2 = .222$; $p = .001$). In the 40ms condition a simultaneous regression produced a significant model ($R^2 = .221$; $p = .009$). A hierarchical regression found that a phonological factor accounted for the most variance in the model ($R^2 = .221$; $p = .009$).

Conclusions: Reading ability was found to predict the WLP. A time course factor was found in which WLP performance depends upon fluent reading ability, potentially a visuo-perceptual factor, followed by phonological processes with increased stimuli duration. These findings can be interpreted as consistent with a dual route model. Further research examining the relationship between the WLP and reading ability, especially bi-hemispheric aspects of word recognition is warranted. Correspondence: *Cory J. Patrick, M.S., Psychology, University of Wisconsin - Milwaukee, Garland Hall Rm. 224, 2441 E. Hartford Ave., Milwaukee, WI 53211. E-mail: cpatrick@uwm.edu*

C.J. PATRICK, J. FLYNN & D.C. OSMON. Reading Ability Moderates Removal of the Word Letter Phenomenon (WLP) in Lateralized Stimuli Displays: Elucidating the role of the Right Hemisphere.

Objective: The WLP is an established effect demonstrating participants identify a target letter more accurately if presented within a word. The WLP can be removed with lateralized stimuli presentations. Research has found a reversal of the WLP in a reading impaired population with results suggesting the WLP relies on access to visual word forms. The exploratory aim was to investigate if reading measures moderate the removal of the WLP in lateralized stimuli displays.

Participants and Methods: All 50 participants were undergraduate students. Participants completed a WLP task consistent with the Riecher – Wheeler paradigm. The stimuli were presented at three durations (30ms, 40ms, 50ms) and in three visual fields (CVF, LVF, RVF). The participants completed reading measures from the Woodcock-Johnson Psycho-educational Battery, 3rd Edition. Data was analyzed using simultaneous and hierarchical regression.

Results: A WLP was found in CVF at 30ms and 40ms but not 50ms. The WLP was removed in lateralized displays. In the LVF 30ms condition Reading Fluency ($R^2 = .142$; $p = .007$) and Rapid Picture Naming ($R^2 = .224$; $p = .031$) produced a significant model. In the LVF 40ms condition regression failed to produce a significant model. The results found a significant Letter Effect in the LVF 50ms condition, and Reading Fluency produced a significant model ($R^2 = .160$; $p = .004$). In the RVF 30ms condition a phonological factor produced a significant model ($R^2 = .098$; $p = .027$). In the RVF 40ms condition Reading Fluency produced a significant model ($R^2 = .117$; $p = .015$).

Conclusions: The results indicate the right hemisphere has a role in naming speed and fluent reading. The left hemisphere displayed a time course in which phonology moderated performance followed by fluency at increased stimuli duration. The WLP may provide a measure of different aspects of reading at different stimuli durations in different visual fields. Further research examining the relationship between the WLP and reading, especially hemispheric aspects, is warranted.

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A.M. RAYMER, T. PROKUP, B. THOMASON, K. REFF & J. STROBEL. Errorless Spelling Training in Acquired Dysgraphia.

Objective: The influence of error production during training has been examined in rehabilitation of memory and word retrieval impairments in brain impaired individuals. Spelling is an inherently error-prone process, especially in patients with acquired dysgraphia, who often attempt to self-correct when they use preserved reading abilities to recognize spelling errors and re-attempt spellings. The purpose of this study

was to compare effects of errorless versus errorful training for spelling in individuals with dysgraphia.

Participants and Methods: Four individuals with dysgraphia subsequent to left hemisphere stroke and at least a high school education participated. In a single participant crossover design, we provided phases of errorless and errorful spelling training in counterbalanced order, with extended baseline phases across participants. We examined performance for spelling to dictation of matched sets of trained and untrained words, and spelling subtests of the Western Aphasia Battery (WAB).

Results: Improvements in spelling to dictation (large effect sizes) were evident for trained words in all participants following both errorful and errorless training phases; minimal generalization was noted for untrained words, evident primarily in one participant following errorful training. At one month post-treatment, two patients had greater decline in spelling performance for words trained in an errorless manner, while two others maintained spelling performance for both lists. All four increased performance on WAB spelling subtests.

Conclusions: Although this study shows no clear advantage of errorful or errorless training, participants preferred the less-frustrating errorless training protocol.

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S. TLUSTOS & C. CHIU. Neural Correlates of Sentence Comprehension under Degraded Speech.

Objective: Sentence comprehension tends to decline with age. It is unclear to what extent this observed decline can be accounted for by hearing and peripheral auditory processing resources, versus more central functions, such as working memory. By presenting degraded speech to normal hearing adults while in an fMRI scanner, we can begin to distinguish between these explanations.

Participants and Methods: We explored in 9 healthy adults with normal hearing the neural substrate of comprehension of degraded sentences using an event-related fMRI protocol called HUSH with scanner-silent intervals to reduce scan time. Participants rested or heard short sentences across trials; half were semantically acceptable and half were semantically ambiguous. Participants responded by pressing one button if the sentence “made sense” and another if it did not. Sentences were either presented clear and unprocessed, or digitally processed to decrease intelligibility. Participants were also tested for accuracy of sentence comprehension out of the scanner afterwards.

Results: Preliminary analyses revealed that participants showed a relative activation decrease in medial prefrontal cortex (MPC) to process the degraded speech as compared to the clear speech sentences, with heightened activation in posterior areas including inferior parietal and occipital lobes. Differences in activation in auditory processing regions were not observed. Correlation analyses revealed that individuals with higher word-recognition accuracy had higher activity in prefrontal cortex, including anterior cingulate, and left inferior parietal cortex than those with poorer word-recognition.

Conclusions: These results suggest a role for a central component to sentence comprehension. A lack of cortical activation differences in auditory areas suggests that factors other than peripheral auditory processing may play an important role.

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M.S. TROCHE, L. ALTMANN, L. HUDSON, K. WALLACE & C. SAPIENZA. Effects of Task and Grammatical Complexity on Sentence Production in Parkinson's Disease.

Objective: The expressive language abilities of person's with Parkinson's disease (PD) have not been well described in the literature, although deficits in single word production are well documented. Given that this population has documented frontal lobe deficits, we predicted that their language would deteriorate when producing more complex sentences, and this would be exacerbated in a sentence generation task as opposed to a sentence repetition task.

Participants and Methods: 20 non-demented persons with PD between the ages of 60 and 80 completed two tasks, sentence repetition and picture description. The stimuli in both tasks were designed to vary in grammatical complexity (one vs. two clause sentences). Responses were digitally recorded, transcribed verbatim, and scored for error frequency. Error Types included completeness, fluency, grammaticality, and gist meaning.

Results: Significant main effects of task, error type and sentence complexity occurred. Participants produced more errors in the sentence generation task than the sentence repetition task. As grammatical complexity increased, errors increased in both tasks. Significant interactions were found between task and error type and error type and grammatical complexity. Participants were equally good at reproducing gist meaning in both tasks; however, they showed significant impairments in completeness and grammar in the picture description task. Fluency was poor in both tasks and was severely affected by sentence complexity.

Conclusions: These results demonstrate that the effects of PD are pervasive in speech-language production, and the severity of the impairment is related to both task and the grammatical structures produced. We attribute the task and stimulus complexity effects to a general resource limitation secondary to the frontal lobe impairments that accompany PD.

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H.H. WRIGHT & G.J. CAPILOUTO. Altering Instructions: Impact on Discourse Performance.

Objective: The purposes of this study were to: (1) investigate the impact of varying task instructions on linguistic processing for healthy older adults in response to pictured stimuli and (2) identify cognitive factors contributing to any linguistic processing differences found.

Participants and Methods: Participants included 24 healthy older adults. Participants were assigned to one of two groups based on task instruction – picture description (PD) and storytelling (ST). Participants in the PD group received the following instructions: "Tell me what you see happening in the picture(s)". Participants in the ST group received the following instructions: "I want you to look at the picture and tell me a story that has a beginning, a middle and an end". Stimuli included two single pictures and two picture sequences. Language analyses included lexical and syntactic analyses, as well as, proportion of main events produced. A main event was operationally defined as an event of sufficient importance to the story as a whole as well as its independence from the other events in the story.

Results: Preliminary results indicated that the ST group produced a significantly higher proportion of main events and total number of words as compared to the PD group. Proportion of main events produced correlated significantly with lexical diversity for both groups. Results of the syntactic analysis indicated that the ST group produced significantly more past tense verbs compared to the PD group.

Conclusions: Application of results to a discourse processing framework will be discussed in further detail.

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Learning Disabilities/ADHD

L.L. BRAUN, J.G. GUNNELL, L.I. REICKER & T.N. TOMBAUGH. Information Processing Speed in Adults with ADHD and/or LD.

Objective: This study investigated the ability of two new tests of information processing speed, the Computerized Tests of Information Processing (CTIP) and the Adjusting-PASAT, to identify Attention Deficit/Hyperactivity Disorder (ADHD) in adults. The CTIP consists of three reaction time tasks that progressively increasing in processing complexity (simple, choice, semantic) and the Adjusting-PASAT is a modified version of the original PASAT designed to better isolate the speed component of performance.

Participants and Methods: Along with the CTIP and Adjusting-PASAT, a battery of tests including the Conners' Continuous Performance Test (CCPT-II) was administered to adults with ADHD (N=8), combined ADHD and Learning Disability (ADHD/LD; N=14), LD (N=11), and controls (N=21). This design allowed for the impact of the frequently occurring co-morbidity of LD with ADHD to be examined.

Results: ANOVAs with post-hoc comparisons were used to determine whether the groups significantly differed. For the CTIP, the ADHD/LD and LD groups performed worse than controls on the choice task and the ADHD/LD group performed worse than the ADHD and Control groups on the semantic task. On the Adjusting-PASAT, the ADHD/LD group performed worse than controls. Of the four major CCPT-II outcome scores, groups differed only on mean reaction time with the LD group performing worse than controls.

Conclusions: These results suggest impairments in processing speed were primarily due to the combination of ADHD and LD, but not to either disorder alone. This finding underlines the importance of separating individuals with ADHD according to the presence of a LD. Furthermore, the CCPT-II lacked sensitivity to the effects of ADHD.

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M. BUELOW, J. SUHR, E. ZIMAK, L. FOX & T. RIDDLE. The Relationship of Smoking to Self-reported ADHD Symptoms in Young Adults.

Objective: College students often present for concerns that they have Attention Deficit Hyperactivity Disorder (ADHD) and score high on self-report ADHD instruments. However, "ADHD" symptoms are frequently endorsed by those with other disorders, who may have personality characteristics similar to ADHD. For example, smokers have higher scores on personality measures of sensation seeking and impulsivity. We evaluated whether smoking was related to self-reported ADHD symptoms, after controlling for ADHD diagnosis.

Participants and Methods: Participants were 630 undergraduates (220 male, age 18-33) who completed a demographic questionnaire and the Conners Adult ADHD Rating Scale: Long Form (CAARS) as part of a larger study. Participants were divided into smokers or nonsmokers, based on self-report.

Results: Hierarchical linear regressions for each CAARS subscale were conducted, with self-reported childhood ADHD diagnosis by a physician entered in the first block and smoking status in the second block. ADHD diagnosis was significant for all CAARS subscales (all ps < .01) except self concept. However, smoking status accounted for a significant portion of the variance in every CAARS subscale score, beyond the variability accounted for by ADHD diagnosis (all ps < .001 except self concept, p < .05).

Conclusions: Smokers scored higher on CAARS subscales than nonsmokers, even after taking into account prior ADHD diagnosis. Findings indicate that self-report measures of ADHD symptoms may reflect disorders and/or personality/psychological characteristics other than ADHD. Reliance on these self-report measures for ADHD diagnosis, in the absence of other information about potential contributions to high scores, may result in false diagnoses of ADHD in young adults.

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A.G. CAPOVILLA, N.M. DIAS, B.T. TREVISAN & F.C. CAPOVILLA. Efficacy of an Intervention Procedure in Developmental Dyslexia.

Objective: Dyslexia is related to reading disabilities of single words, usually reflecting impaired abilities of phonological processing. Studies have shown the phonic method as an efficient intervention for the treatment and prevention of dyslexia. This study aimed to verify the efficiency of an intervention procedure that included metaphonological training and grapheme-phoneme correspondence teaching.

Participants and Methods: A unique patient with 12 years old participated, attending third grade of elementary school, with diagnoses of bilateral temporo-parietal cortical dysplasia, dyslexia and dyspraxia, carried out by a neurologist. The study was consisted in three steps: pre-test, intervention and pos-test. It was used the following instruments in the pre and pos assessments: Phonological Awareness Test by Oral production, and Competency of Words and Nonwords Reading Test. It was still used an intervention procedure to develop phonological awareness and to teach grapheme-phoneme Portuguese correspondences. It was carried out 72 sessions, twice a week, with duration of one hour.

Results: Comparison of the results in pre and pos assessments showed that the intervention promoted better performance in phonological awareness, revealed by the systematic increase of the scores in subtests which involves manipulation of syllables, rhymes, alliterations and phonemes. Increases in the reading test performance were also observed. The analysis of the subtests scores in the reading test suggested specific development of the phonological reading.

Conclusions: Results suggest that the intervention was efficient in supply better performance in phonological conscience and phonological reading. Such evidences corroborate the literature, revealing the efficacy of the phonic method in the intervention in dyslexia.

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S.C. DELLAMEA & G.E. GETZ. The Effect of ODD on Language Skills in ADHD.

Objective: Previous research has demonstrated that language deficits can cause difficulty with frustration tolerance and problem solving, which can contribute to inattention, social withdrawal, and aggression. A delay in vocabulary skills may be associated with oppositional behaviors in some children with Attention Deficit Hyperactivity Disorder (ADHD). Children diagnosed with ADHD and co-morbid Oppositional Defiant Disorder (ODD) are more impulsive and have lower levels of social functioning suggesting increased language difficulties. The present study investigated the effect of ODD on language skills in ADHD.

Participants and Methods: Twenty-one children with ADHD were compared to 15 children with co-morbid ADHD and ODD on the Vocabulary, Comprehension and Similarities subtests of the Wechsler Intelligence Scale for Children-IV (WISC-IV) and the Controlled Oral Word Association Test (COWAT) as part of a larger assessment battery.

Results: There were significant differences between the groups in the performance on the Vocabulary subtest ($t = 2.34$; $p < .027$), but no statistical differences occurred in Comprehension ($t = 1.24$; $p = .272$), Similarities ($t = .073$; $p = .79$), or the COWAT ($t = .34$; $p = .74$).

Conclusions: These results indicate that children with co-morbid ADHD and ODD may demonstrate weaker vocabulary skills than ADHD-only children. Decreased vocabulary skills suggest poor language development consistent with lower levels of social functioning in this population. Limitations in vocabulary skills likely contribute to difficulties with frustration tolerance and problem solving in co-morbid ADHD and ODD as these children are less effective in communicating needs and labeling emotional states.

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Z. ERIC, J. SUHR, L. FOX & T. RIDDLE. ADHD Diagnosis, ADHD Symptoms, and Risky Behavior.

Objective: 60% of children with ADHD manifest significantly impairing symptoms in adulthood, but nearly 30% of young adults who have never received ADHD diagnosis report high levels of current ADHD symptoms; at least some of the latter group may have missed diagnosis, but the majority may have personality characteristics similar to individuals with ADHD. Diagnostic differences between these groups are important but remain unstudied. We examined risk-taking in adults with history of ADHD (ADHDDX), adults who report current symptoms but without history of ADHD (ADHDSX), and controls (NC).

Participants and Methods: Based on stringent diagnostic criteria, young adult participants from a larger study were divided into ADHDDX ($n=18$), ADHDSX ($n=20$), and NC groups ($n=32$). Participants completed self-report and neuropsychological measures of risk-taking and risky personality.

Results: Both ADHDDX and ADHDSX reported significantly more risky ethical, recreational, substance use, and health behaviors and had more impulsive sensation-seeking personality (all $p < .01$) relative to NC, although they were not different from one another on any of these variables. On neuropsychological measures, ADHDDX were more risky relative to both other groups on the BART, which led to financial gain, while ADHDSX were more risky on the IGT relative to both other groups, which led to financial loss.

Conclusions: Though ADHDDX and ADHDSX show higher levels of risky behavior than NC, consequences associated with their risky decisions may be more deleterious for ADHDSX than ADHDDX. Findings could have important implications for assessment of adult ADHD, as self-report and neuropsychological measures of risk-taking may have utility for differentiating ADHDDX, ADHDSX, and NC.

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L. FOX, J. SUHR, E. ZIMAK & T. RIDDLE. The Utility of Neuropsychological Assessment in Discriminating Between ADHD-Diagnosis and ADHD Symptom-Reporting Groups.

Objective: Research has identified neuropsychological deficits in adults with ADHD. However, little research has examined neuropsychological differences between adults with a credible history and diagnosis of ADHD (ADHDDX) and adults who currently report high levels of ADHD symptoms but do not have an ADHD diagnosis (ADHDSX). Given the large number of adults referring themselves for concerns about ADHD, such studies are needed. We examined neuropsychological performance of young adults with ADHDDX, with ADHDSX, and controls (NC).

Participants and Methods: Based on stringent diagnostic criteria, young adult participants were divided into an ADHDDX ($n=16$), ADHDSX ($n=22$), and NC group ($n=31$). Participants completed a battery of neuropsychological tasks emphasizing executive functioning, processing speed, response inhibition, verbal learning/memory, and attention.

Results: Group differences were observed in processing speed and executive functioning. Specifically, ADHDDX demonstrated poorer performance on Trailmaking Test-A, Digit Symbol Coding, and Stroop-Color/Word relative to NC ($p < .05$), and poorer performance on the Stroop-Word relative to ADHDSX ($p < .05$). No significant differences were observed between ADHDSX and NC on any tasks. No significant differences were observed among groups in attention, response inhibition, working memory, and verbal learning/memory.

Conclusions: Consistent with prior research, results suggest that adults with ADHD perform more poorly on tasks of processing speed and executive functioning relative to controls. However, in general, neuropsychological tasks did not discriminate between ADHDDX and ADHDSX groups. Such results have important implications for the evaluation of adults presenting for ADHD assessment.

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R.E. FRYE, S. LANDRY, P. SWANK & K. SMITH. Neuropsychological Characteristics Associated with Reading Ability in Full Term and Prematurely Born Adolescents.

Objective: Premature birth is associated with an increased risk of cognitive dysfunction. However, the investigation of the specific neuropsychological mechanisms responsible for cognitive dysfunction and how they are associated with important components of academic achievement, particularly reading, has received limited attention.

Participants and Methods: Two hundred and sixteen participants born at term ($n=74$) and prematurely ($n=142$) from a low socioeconomic population were studied using the Woodcock-Johnson test of achievement, Stanford-Binet, Comprehensive Evaluation of Language Fundamentals, a continuous performance test and the Tower of London during 3rd, 5th and 7th grades. Children born prematurely were divided into low and high risk groups. Woodcock-Johnson word attack scores over the testing period were used to divide the sample into three reading ability clusters.

Results: Better reading ability was associated with better verbal and non-verbal neuropsychological scores. Birth group demonstrated fewer and weaker independent associations with such scores. Stronger executive function was associated with full term birth and better reading ability, but important interactions between reading ability and birth group indicated that the level and growth of executive function was particularly weak in children that were born prematurely and had poor reading ability.

Conclusions: Better verbal and non-verbal neuropsychological function appears to be strongly associated with better reading ability independent of prematurity. Poor executive function appears to be associated with premature birth and good executive function appears to be associated with good reading ability. The relationship between executive function, reading and premature birth deserves closer study. Executive function may be an important area for intervention in prematurely born children.

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R.E. FRYE, B. NOVAK, B. MALMBERG, D. STRICKLAND & J. LIEDERMAN. Context Dependent Impulsivity in Young Adults with Compensated Reading Disability.

Objective: Neuroimaging studies have demonstrated that individuals with reading disability (RD) recruit frontal areas to augment left hemisphere systems when processing written language. If frontal lobe resources are used in RD individuals during reading what happens to the functions typically subserved by the frontal lobe? In other words, what are the consequences of using these cortical areas for processing written language?

Participants and Methods: Young adults with (HRD) and without (NL) a history of RD underwent standard neuropsychological language testing with an evaluation of executive function including the Test of Variables of Attention (TOVA), a standardized commercial continuous performance task (CPT). Participants also performed a CPT based lan-

guage task, called the Impulsive Language Task (ILT), which presumably required frontal lobe resources. The parameters of the ILT were designed to be essentially identical to the TOVA. The ILT included a semantic and lexical decision task. ILT scores were compared using a repeated measure ANOVA.

Results: The battery of executive function tasks, including the TOVA, demonstrated that attention and executive function was well within the normal range for all participants. HRD individuals were moderate to well compensated for their RD. HRD individuals were significantly more impulsive than NL on the ILT. No difference was seen between groups for reaction time or omissions on the ILT.

Conclusions: Overall, these results are consistent with the prediction that frontal lobe function, as measured by impulsivity, may be selectively compromised in HRD individuals during reading. This suggests that the use of cortical compensatory mechanisms for reading could have cognitive and behavioral consequences.

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C. GOPIN, A. SANTRA, D.J. MARKS & J.M. HALPERIN. Persistence and Predictive Utility of Motor Dysregulation in Preschool ADHD.

Objective: Studies have found that while hyperactive/inattentive preschoolers exhibit significant impairment in most aspects of neuropsychological functioning, we found that the only domain in which deficits remained after co-varying for full scale intellectual abilities (FSIQ) was motor inhibition/control, as measured by the NEPSY Statue subtest. Although this measure of motor inhibition seems to have concurrent discriminant utility, it is unclear whether this difficulty will remain stable and/or predict the persistence of Attention Deficit/Hyperactivity Disorder (ADHD) symptoms. We hypothesized that motor inhibition deficits will persist and have predictive utility over a one-year period.

Participants and Methods: 39 hyperactive/inattentive (HI) and 25 control (NC) preschoolers were evaluated twice, one-year apart, using the NEPSY. Parent and teacher ratings were also obtained at each time point, as were solid-state actigraph recordings of the children's activity level during the assessment.

Results: Statue subtest scores were submitted to a repeated-measures ANCOVA comparing HI and NC preschoolers, while controlling for IQ. The HI group performed significantly lower than the NC group on Statue at both time points ($p<.05$). Hierarchical linear regression analyses were conducted, assessing the relationship of baseline Statue to follow-up behavioral ratings and ankle and waist actigraph recordings after controlling for baseline ratings/recordings. Statue subtest scores accounted for a significant proportion of the variance (R Square = .240, $p<.01$; R Square = .187, $p<.05$; R Square = .342, $p<.001$, respectively).

Conclusions: Not only do HI preschoolers present with persistent motor inhibition deficits as measured by the NEPSY Statue subtest, but Statue scores are predictive of changes in behavioral functioning one year after the baseline assessment.

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R. GUPTA & B. KAR. Multiple Pathway Model: Predictor for Error Monitoring in ADHD.

Objective: To examine the relationship between the components of executive function and motivational aspects in ADHD.

Participants and Methods: Stop Signal Task (SST) and Delay Aversion Task (DAT) were administered on 30 normal children and 30 children with ADHD combined type. SST required inhibition of a motor response. The extent of slowing following successful (stopped) and failed

(non-stopped) inhibition was compared across groups. We also measured the time required to inhibit a response, called stop signal reaction time (SSRT). Participants were required to collect as many points they could on DAT. They could choose a small (1 point) or large (6 point) reward. Participants could earn short delay reward (%SDR) (after 1 sec.) or large delay reward (%LDR) (after 20 sec.).

Results: ADHD participants showed significantly less slowing following non-stopped responses and had significantly higher SSRT, %SDR, and commission error (CE) than controls. In normal children slowing after inhibition error was significantly positively correlated with different components of executive function such as mean go reaction time (RT), error + 1 RT and with SSRT but not with %LDR and %SDR. In contrast, in ADHD children slowing was significantly positively correlated only with %LDR and negatively correlated with %SDR.

Conclusions: Results indicate that delay aversion is associated with error monitoring in ADHD. These results confirm that multiple pathway model could be a better predictor for error monitoring than unified model in ADHD. Future studies are needed to ensure the underlying mechanism of error monitoring in different subtypes of ADHD.

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C.R. HALE, J.W. DELUCA & J.E. CASEY. Halstead Category Test and WCST Performances of Children with ADHD and Children with NLD.

Objective: Children with Attention-Deficit Hyperactivity Disorder (ADHD) and children with Nonverbal Learning Disabilities (NLD) often present with similar academic, behavioral, and social problems. We investigated the extent to which these groups differ on two measures of higher order reasoning and executive functioning.

Participants and Methods: Participants included 32 children (16 ADHD and 16 NLD), who ranged in age from 9 to 16, were medication-free at the time of testing, and had no relevant psychiatric, neurological, or medical histories. All participants were diagnosed based on an extended Halstead Reitan Neuropsychological Battery including behavioral inventories and an extensive history. The groups' mean Halstead Category Test (HCT) Total Error T-scores and mean Wisconsin Card Sorting Test index scores were compared via t-tests for independent samples.

Results: The ADHD group performed within the average range on all indexes of both measures; the NLD group evidenced impaired performance on all indexes with the exception of Perseverative Errors and Failure to Maintain Set on the WCST. The ADHD group made significantly fewer Total Errors on the HCT and performed significantly better than the NLD group on most WCST indexes (Total Errors, Categories Completed, Perseverative Errors, Nonperseverative Errors, and Conceptual Level Responses.) The groups did not differ on Learning to Learn and Failure to Maintain Set indexes of the WCST.

Conclusions: HCT and WCST performances can help differentiate ADHD and NLD. These results have theoretical and practical implications for both psychology and education.

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L. HOKKANEN, E. HIETARINTA, S. LEPPAMAKI, P. TANI & M. LAASONEN. Executive Dysfunction in Adults with ADHD or Dyslexia.

Objective: The aim was to examine the deficits in executive functioning and attention among adults with either attention deficit / hyperactivity disorder (ADHD) or dyslexia, and to determine whether it is possible to distinguish between the two developmental disorders with neuropsychological tests tapping these domains.

Participants and Methods: The study was conducted as a part of a project DyAdd - Adult Dyslexia and Attention Deficit Disorder in Finland. Subjects were adults (18 to 55 years) with diagnosed dyslexia (n=41), ADHD (n=32), or neither (controls n=41). Exclusion criteria included e.g. other neurological or psychiatric diagnoses and medication, and the examiner was blind to the group of the subject. There were no differences in age, education levels or gender between the three groups. Assessment included tests of set shifting, inhibition, planning, verbal fluency, sustained attention, working memory, and processing speed: Color Trails, Dual Task, Verbal Fluency, Stroop, WAIS-III Digit Symbol and Arithmetic, WMS-III Digit Span, Spatial Span and Letter-Number Sequencing, Conners' CPT II, and parts of CANTAB. Both raw test data and factor scores were analyzed.

Results: In preliminary analysis with general linear model and pair-wise comparisons, both the dyslexia and the ADHD groups were impaired in inhibition, verbal fluency, and processing speed compared to the control group ($p < .05$) and the dyslexia group had additional impairment in auditory working memory ($p < .01$). In CPT and in Stroop the dyslexia group performed slower than the ADHD group ($p < .01$) while there was a tentative trend of more CPT commission errors in ADHD.

Conclusions: Results reinforce the notion that adults with dyslexia and ADHD share many impairments in executive functioning and attention. Differences emerged in processing speed but the neuropsychological features characterizing ADHD remain elusive. The different types of errors in inhibitory control may give hints in differentiating between the two developmental disorders.

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L.G. JOHNSON & T. GUALTIERI. CNSVital Signs (CNSVS) as a Tool to Screen for ADHD/LD in Student Athletes.

Objective: To estimate the incidence of ADHD and learning disabilities in freshman student athletes.

Participants and Methods: Forty-six entering student athletes at a Division I University were screened in groups (6-10 per group) using a computerized cognitive battery (CNSVS), the screening subtests of the Scholastic Abilities Test for Adults, and rating scales (Brown ADD Scale, Wender-Utah Rating Scale). The testing took approximately 90 minutes per group.

Results: Twenty-eight (61%) were identified as having ADHD and/or a learning disability on the basis of the screening. Their diagnoses were subsequently confirmed by formal neuropsychological evaluations and steps were taken to provide appropriate treatment services. Only four of the 28 had been previously evaluated and diagnosed with ADHD or a learning disability. All of the 46 students were successful during their first few semesters in college. With the addition of Supplemental Instruction, a systematic educational approach used in core academic subjects, the LD/ADHD students did almost as well as the non-disabled students.

Conclusions: A brief, group administered battery can be used to screen for ADHD and learning disabilities in at-risk college students. The incidence of these disorders appears to be higher in student athletes than in the general population.

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L. LESUEUR & K. BEKKEN. Further Considerations of the LD Diagnoses: How Neuropsychological Data Can Help Us Understand How the Brain Learns.

Objective: We continue investigation of the diagnostic parameters for learning disorders given persistent confusions regarding overlapping symptoms and diagnostic categories. This investigation broadens the chosen variables beyond the standard Wechsler scales and includes subjects with only marginal or narrow diagnoses (e.g., auditory processing disorder, sensory integration dysfunction).

Participants and Methods: For this investigation, we expanded the selection within our pool of 150 subjects diagnosed with the broad range of autistic spectrum and attention disorders, as well as those administered tests other than the standard measures considered central to the spectrum diagnoses. In addition, we culled only variables that consistently showed predictive power in these diagnostic categories, leaving us 75 subjects and 23 variables.

Results: We found abundant shared symptoms, and no evidence for clearly demarcated diagnostic categories with “necessary and sufficient conditions,” nor did the standard criteria hold up as key indicators of dysfunction. Score patterns suggest broader patterns beyond the narrow diagnoses of auditory processing and even ADHD. Pervasively low Rey scores continued to show the strongest predictive power by far.

Conclusions: This investigation confirms our suspicions that the current diagnostic categories and criteria are misleading and misled. We consider clues in these results for formulating a theoretical approach that will better inform not only our clinical practices, but influence perspectives in cognitive neuroscience regarding how the brain learns to navigate experience in the world.

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G.R. MESMAN, A.E. MOLNAR & M.Y. KIBBY. A Comparison of the Double Deficit and Dual Route Theories of Dyslexia.

Objective: Theories suggest that rapid naming or orthographic functioning may play a role in dyslexia along with phonological processing. However, limited research has compared the respective theories.

Participants and Methods: Participants included 103 children, 8 to 12 years old, with dyslexia, ADHD, co-morbid dyslexia/ADHD, or controls. Participants completed a neuropsychological evaluation as part of a larger study (R03 HD048752). The CTOPP was used to measure phonological awareness (PA) and rapid naming (RN). Orthographic and Homophone Choice scores were combined into an overall score (OG). Children were categorized with poor PA, RN, or OG when their score was more than one standard deviation below the mean.

Results: Initially participants were placed into groups following the Double Deficit model [poor PA, poor RN, double deficit (DD), neither deficit (double asset; DA)]. Chi-square was used due to small sample size and was significant. Three children without dyslexia had DD, but 11 children with dyslexia had DA, suggesting lack of sensitivity. Subsequently, participants were classified following the Dual Route model [poor PA, poor OG, DD, DA]. Chi-square was significant. This model was more sensitive (1 child with dyslexia had DA) but lacked specificity as 5 children without dyslexia had DD. Finally, participants were re-grouped utilizing both models. Chi-square was significant, and only 1 child with dyslexia had a triple asset and 1 child without dyslexia had a triple deficit.

Conclusions: Integrating the Double Deficit and Dual Route models allowed for better classification than either one alone. When testing children for dyslexia, neuropsychological batteries should include measures of RN and OG.

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J.D. OYLER, J.E. OBRZUT & A.E. ASBJORNSEN. Verbal Memory Impairments in Reading Disabled Adolescents.

Objective: There is substantial agreement in the literature that reading problems in children between the ages of 6-11 years can be attributed to difficulties in coding linguistic information. One explanation for this is that reading disabled (RD) students have impaired verbal memory ability. However, the specific mechanisms underlying these memory impairments are not well understood, especially in adolescents. The purpose of the current study was to examine the memory performance of

RD and normal adolescent readers on a newly developed verbal learning task. The Bergen-Tucson Verbal Learning Test, English version, modeled after the CVLT, was designed to measure the acquisition and retention of information, as well as the ability to organize and retrieve the information from memory according to phonological (surface) and semantic (lexical) features of words.

Participants and Methods: Twenty RD and 20 control subjects with a mean age of 15.2 years matched for gender, ethnicity, and Full Scale IQ participated in the study. Three primary areas of verbal learning were assessed: recall and recognition, memory organizational skills, and use of learning strategies.

Results: Analysis of variance with repeated measures indicated that the RD group learned significantly fewer list items and did so at a slower rate than controls. Although there were no group differences on the brief and delayed recall trials or on the recognition trial, differences emerged on serial position effects. Also, the RD group recalled fewer words in both the semantic and phonetic cued recall conditions, however, the effect size was significantly greater when cued for phonetic features of words.

Conclusions: Taken together, the data suggest that RD students have less efficient encoding and rehearsal mechanisms but normal retention. Retrieval also appears normal except under conditions that require information to be retrieved based on phonetic codes.

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D. PFLUGRADT, J. APPS & M. JANDRISEVITS. A Functional Comparison of the Behavior Assessment System for Children and the Behavior Rating Inventory of Executive Function.

Objective: Today, ADHD is one of the most commonly diagnosed mental health conditions and is seen by clinicians in a variety of treatment settings. In the United States, approximately 3-7% of school-age children are believed to have the disorder. ADHD has been primarily diagnosed by clinical observation and parent report measures in the past. Two widely used parent report measures are the Behavior Assessment System for Children (BASC) and the Behavior Rating Inventory of Executive Function (BRIEF). Both these measures have high reliability and validity but have not been widely studied in complex clinical populations. This study examined whether the BASC and BRIEF were able to differentiate ADHD from non-ADHD in a complex clinical population (psychiatry/behavioral medicine center at a Mid-west Children's Hospital)

Participants and Methods: Data from seventy children who received neuropsychological evaluations for diagnostic clarification was analyzed for this study.

Results: Results indicated that in this complex clinical population the BASC and BRIEF did not differentiate those with ADHD from those with other disorders. However, when analyzed individually, the scales on both measures slightly discriminated the disorders as well as addressed individual symptoms and offered insight into individual treatment needs.

Conclusions: This study may provide insight into which scales are most important when trying to identify an ADHD diagnosis. This study may also provide a guideline as to when to utilize these report measures without increasing assessment time.

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A.S. PRESTON, A. PALAV, A. EVANS & J. WILSON. Verbal and Visual Memory in Children with Dyslexia.

Objective: Previous research demonstrates that children with dyslexia have deficits in verbal working memory. The current study attempted to

determine whether these children also have deficits in verbal learning and memory. It was hypothesized that children with dyslexia would have more difficulties than a clinical control group in verbal memory but not visual memory. It was also hypothesized that verbal memory performance would be correlated with reading fluency and comprehension.

Participants and Methods: Participants included a clinical sample of 43 children diagnosed with Dyslexia and 156 clinical controls, ages 7-15. There were no significant group differences in age or gender. Controls included children with other learning, emotional, and behavioral disorders. Children were administered a digit span test as well as tests of verbal and visual memory. Additionally, children with dyslexia were administered tests of reading fluency and reading comprehension.

Results: Independent Samples t-tests compared group performance differences on tests of digit span, verbal memory, and visual memory. As in past research, children with dyslexia performed significantly lower on digit span. Additionally, children with dyslexia performed significantly lower than clinical controls on verbal memory, but not on visual memory. No significant correlations were found between verbal memory scores and reading rate, accuracy, or comprehension.

Conclusions: The current study demonstrates that children with dyslexia have difficulties not only with verbal working memory, but also verbal learning/memory. Verbal memory performance was not related to reading performance, suggesting that children with dyslexia may have additional difficulties with encoding oral language that are independent of reading skills.

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L.E. SANTERRE-LEMMON, H.D. BARNARD, E.G. WILLCUTT & B.F. PENNINGTON. Do Patterns of Cognitive Deficits Differ Across ADHD Subtypes?

Objective: Research on the neuropsychological deficits underlying subtypes of ADHD has found that individuals with Inattentive and Combined subtypes show similar deficits on measures of executive functioning and cognitive processing speed. Deficits underlying the Hyperactive/Impulsive subtype are much less clear. This study sought to examine rates of cognitive deficits in ADHD and assess whether particular deficits are predictive of the Hyperactive/Impulsive subtype.

Participants and Methods: Participants included 128 children (ages 8-18) with Inattentive-type ADHD, 26 children with Hyperactive/Impulsive type, 57 children with Combined-type, and a comparison group of 180 children. Tasks corresponding to domains including response inhibition, working memory, response variability, naming speed, cognitive processing speed, delay aversion, object reversal, and decision-making were completed.

Results: Impairment on a domain was defined as a score below the 10th percentile of the comparison group. The proportion of individuals demonstrating significant impairment on each domain was calculated for ADHD subtypes. Approximately 30% of individuals with Inattentive and Combined subtypes showed deficits in inhibition, working memory, and/or response variability with somewhat smaller proportions for the Hyperactive/Impulsive subtype. Cognitive processing speed emerged as a deficit in approximately 50% of Inattentive and Combined type individuals as compared to only 9% of Hyperactive/Impulsive. In contrast, 40% of Hyperactive/Impulsive type individuals showed deficits on object reversal and decision-making tasks, compared to only 13% of Inattentive type.

Conclusions: Results suggest that deficits in decision-making and object reversal tasks may underlie the Hyperactive/Impulsive ADHD subtype and help to differentiate it from Inattentive-type ADHD. Implications of these results for the neuropsychology of ADHD subtypes will be discussed.

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A. SCHLENZ, J.G. ALOIA & K. VOELLER. Rapid Naming Deficits May Simply Be Processing Speed Deficits in Children Diagnosed with Developmental Dyslexia.

Objective: Rapid naming (RN) deficits have been found in children with developmental dyslexia, however, dyslexia in these studies is often poorly defined and RN deficits are not specific to dyslexia, having been found in populations that are not reading impaired. Additionally, rapid naming deficits tend to be present only with a concurrent deficit in phonological processing (double deficit), raising the question of whether RN contributes unique variance to reading ability independent of phonological processing (Vukovic, 2006). Our sample sought to examine rapid naming in a clinical sample of children diagnosed with dyslexia.

Participants and Methods: Dyslexia was defined as performance below one standard deviation on single word reading tasks in children between the ages of 8 and 16. Group classification revealed a unique sample with only 11% of subjects (N = 2) showing a phonological deficit alone, 22% (N = 4) showing a double deficit, and the largest percentage, 56% (N = 10) showing only RN deficits. Therefore, using data from this subsample of children who exhibited RN, but not phonological awareness deficits, we investigated what variables contribute them most variance to RN.

Results: Results of a linear regression revealed that processing speed accounts for the majority of variance in rapid naming ($\text{AdjR}^2 = .386$, $p = .01$), with phonological processing contributing a small but insignificant amount of additional variance to RN.

Conclusions: Though findings are limited by a small sample size, results are consistent with previous criticisms on rapid naming research and suggest that rapid naming deficits do not represent a core deficit dyslexia, but rather may be another measure of impaired processing speed and/or phonological processing deficit.

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J.L. WALKOWIAK & M. SEMRUD-CLIKEMAN. Comparing Inhibition and Planning Performance in Children with ADHD/C and ADHD/PI.

Objective: Performance of children with ADHD on tasks of executive functioning has historically revealed mixed results. In particular, this study will examine the performance of children with ADHD/C and ADHD/PI with that of controls on tasks of inhibition and planning.

Participants and Methods: Participants- Three groups, aged 8-15 years old, were evaluated (ADHD-Combined (N=20), ADHD-Predominantly Inattentive (N=20), and controls (N=20). No comorbid diagnoses were present. Method- In addition to a measure of overall cognitive functioning (WASI) and behavioral reports (Parent and Self BASC), each participant completed the Delis-Kaplan Color-Word Interference and Tower tasks

Results: Means for Condition 3 and Condition 4 of the Color-Word Interference task revealed poorer performance by both ADHD subtypes as compared to controls on tasks of inhibitory control. Results of a MANOVA indicate statistical significance and the eta squared indicated medium effect size. Results of the ANOVA did not indicate that tasks of inhibition were useful in differentiating between the ADHD subtypes. Although mean performance on the Tower task indicated that children with ADHD/C perform more poorly than children with ADHD/PI, ANOVA results were not significant.

Conclusions: Impaired executive functioning has long been hypothesized as a central deficit in children with ADHD. Results from this study did not support the use of these tasks, in particular tasks of inhibition and planning, in the differentiation of the ADHD subtypes; however,

tasks of inhibition were supported in the differentiation of children with ADHD from controls.

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J.L. WALKOWIAK, M. SEMRUD-CLIKEMAN & R. NAIDOO. Comparing Working Memory Performance in Children with ADHD by DSM-IV Subtype and Gender.

Objective: Research exploring working memory task performance in children with ADHD/C and ADHD/PI has historically revealed mixed results. We sought to explore these heterogeneous results by exploring possible gender differences in working memory task performance.

Participants and Methods: Participants- Three groups, aged 8-15 years old, were evaluated (ADHD-Combined (N=20), ADHD-Predominantly Inattentive (N=20), and controls (N=20). No comorbid diagnoses were present.

Method- In addition to a measure of overall cognitive functioning (WASI) and behavioral reports (Parent and Self BASC), each participant completed the WJ-Cognitive Working Memory Cluster (Numbers Reversed and Auditory Working Memory subtests).

Results: Means on the Auditory Working Memory subtest revealed the poorest performance by the children with ADHD/PI. In addition, children with ADHD/C performed more poorly than controls. However, performance on the Numbers Reversed subtest differed as the children with ADHD/C performance was the poorest, with the ADHD/PI group subsequently performing more poorly than controls. Results from the MANOVA were nonsignificant.

Conclusions: Conflicting performance by the ADHD subtypes on the working memory tasks and the lack of significant results has been well documented. A possible explanation may have been detected from the results from this study as gender differences were consistently noted by the groups with the ADHD girls consistently performing better than ADHD boys on tasks of working memory, regardless of subtype. The purpose of this poster is to draw attention to this possible gender difference in hopes of stimulating more research in this area.

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M.D. WEISS, G.L. IVERSON & B.L. BROOKS. Clinical Normative Data for the Weiss Functional Impairment Rating Scale in ADHD.

Objective: A core feature of Attention-Deficit Hyperactivity Disorder (ADHD) is impairment in functional abilities. The purpose of this study is to provide clinical normative data on the Weiss Functional Impairment Rating Scale Parent Version (WFIRS-P).

Participants and Methods: Functional ratings were collected for 209 children (mean age=8.5, SD=1.6, range=6-11) from multiple pediatric sites who were not on medication at baseline (i.e., medication wash out or no previous treatment). Follow-up data involved 150 children who completed a 3-month open-label medication study. Functional ratings were collected using the WFIRS-P, which consists of 50 items, rated on a Likert scale, across six domains: Family, Learning & School, Life Skills, Child's Self-Concept, Social Activities, and Risky Activities. Scores for each domain are summed and a total score is created.

Results: The mean total score at baseline was 53.9 (SD=20.7, range=16-112). At follow-up, the mean total score was 30.9 (SD=18.5, range=4-105). Clinical normative data was created using the natural distribution of scores in the untreated and treated groups. At pre-treatment, a child who scores 90 on the WFIRS-P would be at the 95th percentile.

At post-treatment, a child who scores 71 on the WFIRS-P would be at the 95th percentile.

Conclusions: The normative tables will allow the clinician to describe the nature and extent of an individual child's functional problems in relation to a large sample of children with ADHD.

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N.J. WILDE, K.E. WALDIE & I.J. KIRK. Auditory Discrimination in Poor Readers and Children with Phonological Dyslexia.

Objective: One prominent theory of dyslexia is that it is, in part, caused by a temporal processing deficit (i.e., inadequate processing of rapidly changing or successive auditory information.) However, results remain equivocal. Furthermore, a relationship between temporal processing and phonological competency has been proposed, given findings of similar auditory discrimination performance of children with dyslexia in comparison to reading-age matched controls. The goal of the present study was to assess whether temporal processing problems are related to the nature or severity of the reading deficit.

Participants and Methods: Participants included 33 children (13F, 20M) ranging in age from 7-13 years (M=10.12, SD=1.41). Children were divided into 3 groups based on reading task performance: Control children (n=13), "poor readers" (at least 1 year below expected level but not meeting criteria for dyslexia, n=9), and children with phonological dyslexia (n=10). There was also a normal adult control group (N=16). The auditory discrimination task required same/different pitch judgements and was presented in two blocks of 36 trials each: Long tones (175 ms) followed by short tones (75 ms), with random ISIs in each block (10, 50, or 150 ms).

Results: Both groups of children with reading impairments showed significantly poorer performance on the auditory discrimination task, relative to control children. All children performed significantly more poorly than normally reading adults on the task, particularly when the stimuli were presented very quickly (10 ms ISI).

Conclusions: Our data support previous claims that children with reading impairments exhibit a developmental lag in auditory temporal processing. Furthermore, the data suggest that all those who fall below the mean of the normal distribution of reading ability (regardless of diagnosis) may share the same underlying temporal processing deficits.

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Other

T. HITSMAN, C. DEMOPOULOS, J. DORFLINGER & A.V. DAVIS. The Relationship between Recommendation Follow-Through and Client Satisfaction in a Sample of Survey Responses in a Pediatric Neuropsychology Clinic.

Objective: The perceived value of clinical service by clients is one of the most valuable indicators in assessing the quality of the services a clinician provides. Just as empirical research is used to inform clinical practice, so should patient satisfaction data be considered to guide service delivery.

Participants and Methods: An anonymous patient satisfaction survey was mailed to all pediatric neuropsychology clinic patients three months following their feedback appointments. Patients rated their ex-

periences on a scale from one to four (one being the least satisfied, four being the most satisfied) in the following service areas: intake process, hospital/ facility, evaluation process, feedback/follow-up process, and recommendations/report.

Results: The return rate for this survey was approximately 30%, consistent with the return rate of other survey studies reported in the literature. Although overall feedback rating was high with 74 % of the participants expressing satisfaction with the neuropsychological evaluation process, overall satisfaction was not found to be related to recommendation follow-through. Only 36% of the survey respondents reported

that they followed through with all of the recommendations, and an additional 30% followed through with at least 75% of the recommendations. For the recommendations that the participants did follow, 55% rated them to be effective.

Conclusions: Future research may want to focus on the correlation between specific diagnoses given to patients and recommendation follow-through. Other future implications are discussed as well.

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THURSDAY MORNING, FEBRUARY 7, 2008

Paper Session 3

9:00–10:30 a.m.

Pediatric Neuropsychology/Autism

C.J. HOOPER, P.F. COLLINS, R. MUETZEL, K.O. LIM & M. LUCIANA. Adolescent Development of the Orbitofrontal Cortex Assessed by Reversal Learning Performance and Diffusion Tensor Neuroimaging.

Objective: Neuropsychological studies reveal distinct contributions of lateral versus orbital frontal regions to behavior. Many executive function measures used clinically recruit lateral prefrontal regions. This multidisciplinary study examines neuropsychological and brain correlates of a reversal learning (RL) task in a developmental sample. RL has been shown by lesion and neuroimaging studies to depend on the orbitofrontal cortex and could be readily incorporated into neuropsychological assessments.

Participants and Methods: Healthy adolescents (N=129) age 9 to 23 years completed a computerized RL task, which requires discrimination between objects on the basis of learned contingencies. Once the contingencies are learned, they are reversed. Behavior must be adjusted accordingly. Simple and probabilistic reward contingencies were used. Performance differences between age groups were examined. Correlation and multiple regression analyses examined performance in relation to other neuropsychological tasks and measures of white matter microstructure obtained using diffusion tensor neuroimaging (DTI).

Results: Behaviorally, performance was unrelated to IQ. Simple RL performance matured by age 12. The probabilistic task was more difficult, but performance matured by age 15. Females outperformed males. Associations with attention and working memory were found. During adolescence, DTI studies yield evidence of increased myelination and organization of white matter pathways throughout the brain. Younger versus older participants showed different DTI correlates of RL. Performance was significantly associated with white matter integrity in the region of the orbitofrontal cortex in younger participants. Older participants appeared to rely more on posterior brain regions.

Conclusions: Results are discussed in relation to assessment of functions mediated by different prefrontal regions during development.

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J. BAPP NEWMAN, A. GUSTAFSON-DEBASTOS, S. MEACHEN, J. PERRY, D. BATTON & S. RAZ. Neuropsychological Outcome in Preterm-Birth Preschoolers Is Linked to Gestational Age but Not to History of Bronchopulmonary Dysplasia.

Objective: We examined the association between bronchopulmonary dysplasia (chronic lung disease), a condition thought to be associated with hypoxic insult, and neuropsychological outcome in preschool children born prematurely.

Participants and Methods: Thirty seven preschoolers born between 26 and 32 weeks gestation (mean = 28.9 ± 1.12) with history of bronchopulmonary dysplasia (BPD), defined as oxygen supplementation ≥ 28 days, were individually matched to 37 children without BPD (oxygenation < 21 days). Matching criteria included sex, gestational age (± 2 weeks) and birth weight (± 175 g). The subjects were identified from an ongoing follow-up study of preterm-birth preschoolers who had been served by William Beaumont Hospital's Neonatal Intensive Care Unit between 1996 and 2001. Children were evaluated between the ages of 3 and 6 on tests of cognitive (WPPSI-R), language (PLS-3), memory (WJ-III and NEPSY), attention (NEPSY), and motor skills (PDMS-2).

Results: MANCOVA analyses with SES and gestational age as covariates (adjusting for group differences remaining on the latter variable despite matching) revealed no significant relationship between a history of BPD and neuropsychological outcome in any assessed domain. In contrast, gestational age was significantly associated with verbal IQ (F [1, 70] = 4.14, p < .05) and receptive language skills (F [1, 70] = 5.28, p < .05).

Conclusions: The presence or absence of bronchopulmonary dysplasia appears to be less important for explaining outcome variance in verbal and language skills than gestational age, at least in the preschool age.

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H.M. CONKLIN, S. HELTON, J. LAWFORD, B. JASPER, W.E. REDDICK, R. BROWN, M. BONNER, S. WU, X. XIONG, R.K. MULHERN & R.B. KHAN. Prediction of Clinical Response to Methylphenidate in Long-Term Survivors of Childhood Cancer.

Objective: There is accumulating evidence to support the efficacy of Methylphenidate (MPH) in addressing attention and learning problems experienced by some childhood cancer survivors. The current study investigated the ability to predict MPH response in this population using demographic, clinical, cognitive and behavioral indices.

Participants and Methods: Childhood cancer survivors (N=106; brain tumor= 51 and acute lymphoblastic leukemia= 55) identified as having attention deficits and learning problems participated in a 3-week, home cross-over, double-blind trial consisting of: placebo, low-dose MPH (0.3 mg/kg; maximum dose, 10 mg bid) and moderate-dose MPH (0.6 mg/kg; maximum dose, 20 mg bid). Teachers and parents completed the Conners' Rating Scales each week.

Results: Clinical response was defined as a Reliable Change Index greater than 1.96 on the ADHD (45.28%) and Hyper (42.45%) Scales of the Conners' Teachers Rating Scale for the moderate-dose condition. There was a high correlation for response classification across scales ($r=.68$, $p<.001$). Logistic regression indicated that more problems endorsed prior to the medication trial on the Conners' (Teacher)- ADHD and Hyper Scales, Child Behavior-Checklist (Parent)- Thought Problems or Social Skills Rating Scale (Parent)- Problem Behaviors was significantly predictive of a positive medication response ($p<.05$). Demographic (e.g., age and gender), clinical (e.g., diagnosis and treatment intensity) and cognitive (e.g., IQ) indices were not predictive of medication response.

Conclusions: A higher level of endorsed attention and behavior problems at baseline was found to be predictive of MPH response, while demographic, clinical and cognitive variables were not. Parent and teacher report may assist in identifying those children most likely to respond to MPH such that prescribing may be optimally targeted.

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N.M. KLEINHANS, T. RICHARDS, O. LIANG, A. WILLIAMS, J. GREENSON, G. SCHELLENBERG, G. DAWSON & E. AYLWARD. 5-HTTLPR Genotype is Associated with Biochemical Abnormalities in the Amygdala in Autism Spectrum Disorders.

Objective: Alterations in the serotonin system have been suggested to contribute to clinical and behavioral features of individuals with ASD. We investigated whether genotypic variations in the serotonin transporter gene (5-HTTLPR) were associated with biochemical abnormalities in the amygdala, a component of the limbic system critically involved in socioemotional processing. ASD individuals who were homozygous for the short allele (S/S) were predicted to show significantly different biochemical alterations in the amygdala than ASD individuals who were homozygous for the long allele variant (L/L).

Participants and Methods: Thirty individuals with ASD received proton magnetic resonance imaging (MRS) and genetic analysis of the promoter region (5-HTTLPR) of the serotonin transporter gene. Four individuals were excluded due to excessive motion during the brain scan. The remaining group included 6 S/S, 8 L/L and 12 heterozygous (S/L) participants. Only those who were homozygous (S/S or L/L) were included in the study ($N=14$). Single-voxel MRS data were collected from both the right and left amygdalae.

Results: Independent samples t-tests were conducted between the S/S and L/L ASD participants for the following metabolites: n-acetyl aspartate (NAA), creatine/phosphocreatine (Cre), choline/choline containing compounds (Cho), and Myoinositol (MI). The S/S group had significantly lower concentrations of Cho than the L/L group in the amygdalae bilaterally [Right: L/L $M(SD)=2.17(0.24)$, S/S $M(SD)=1.82(0.17)$, $p=.03$; Left: L/L $M(SD)=2.24(0.26)$, S/S $M(SD)=1.87(0.26)$, $p=.02$]. No significant differences were found for the other metabolites.

Conclusions: This preliminary study suggests that allelic heterogeneity of 5-HTTLPR may be associated with alterations in metabolism and membrane turnover in the amygdala in ASD.

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W. DAVIS, T.J. ABILDSKOV, J. PETRIE, E.D. BIGLER & J.E. LAINHART. The Claustrum in Autism and Typically Developing Male Children: A Quantitative MRI Study.

Objective: The claustrum (Cl) is a subcortical gray-matter structure housed between the external capsule medially and the extreme capsule laterally. Due to its extensive reciprocal connections throughout the brain, it has been implicated in consciousness and other higher order functions

including linking behavior and emotion. Such linkage may be important in understanding the neurobiology of autism since other cortical and subcortical regions including the spatially and ontologically related basal ganglia, as well as limbic structures, have been implicated in the disorder.

Participants and Methods: Participants were males with autism ($n=10$) and typically developing (TD)($n=12$) matched for head circumference and age. The Cl and other structures were identified in 3-Tesla MRI scans using ANALYZE®, then segmented and volume quantified. Four Cl volumes were traced (i.e., right, left, right ventral, left ventral) first in axial plane then in coronal plane for entire Cl visualization.

Results: Two-tailed single sample t-tests revealed right Cl differences approaching significance ($p=.056$) when correcting for age and total intracranial volume. Right Cl volume was found to be significantly larger than left within each of the groups (Autism, $p=.001$, $r=.874$; TD, $p=.002$, $r=.792$) and between groups ($p<.001$, $r=.854$).

Conclusions: These preliminary results demonstrate that the Cl can be consistently identified in vivo using ROI tracing with apparent right-versus-left asymmetry documented. The trend findings of smaller right claustral volume in autism suggest that larger-scaled studies should be performed to examine the role of claustrum volume in autism.

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Symposium 2

9:00–10:30 a.m.

Cognitive Rehabilitation in Persons with MS: Cognitive and Pharmacological Approaches to Treatment

Chair: Yael Goverover

Y. GOVEROVER, R. BENEDICT, Y. GOVEROVER, J. DELUCA, M. BASSO & C. CHRISTODOULOU. Cognitive rehabilitation in persons with Multiple Sclerosis: Cognitive and pharmacological approaches to treatment.

Symposium Description: Multiple Sclerosis (MS) has been associated with a variety of cognitive impairments and, as a result, with impaired functioning in everyday activities. Therefore, ways to improve functional outcomes associated with cognitive impairments should be a major goal of MS research and practice. There is a lack of research focusing on cognitive rehabilitation interventions in individuals with MS, as most of the research has focused on brain-injury. The aim of this symposium is to examine the current literature on rehabilitation efforts to improve cognitive and everyday functioning (i.e., activity and participation) in persons with MS.

We will present and discuss research studies investigating the effectiveness of cognitive rehabilitation, both cognitive and pharmacological approaches, in persons with MS. In the first talk, an updated review of evidence-based research on cognitive rehabilitation in individuals with MS will be presented. The next two talks will focus on cognitive strategies that have been found to be beneficial in improving the learning and memory in persons with MS. Specifically, an established memory rehabilitation protocol, The Story Memory Technique, will be discussed, followed by data on a strategy for increasing new learning abilities, the

generation effect. Finally, current pharmacological interventions for cognitive deficits in persons with MS will be reviewed. Current status of and ideas for future work in cognitive rehabilitation in individuals with MS will be discussed. It is hoped that this symposium will generate increased enthusiasm for research and practice of cognitive rehabilitation in persons with MS.

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A. O'BRIEN, Y. GOVEROVER, N. CHIARAVALLI & J. DELUCA. An Evidence Based Review of Cognitive Rehabilitation for Persons with Multiple Sclerosis.

Objective: To present an evidence-based review of cognitive rehabilitation interventions conducted in persons with Multiple Sclerosis (MS), classify level of evidence for the existing studies and generate recommendations for interventions in this area.

Participants and Methods: Study Selection: Studies were chosen if: 1) it was an intervention; 2) detail was available to evaluate the intervention effectiveness or validity; 3) the article focused specifically on adults with MS; 4) it was a peer-reviewed, and 5) it was available for review in English. A total of 16 articles met these criteria and underwent a full review.

Data Extraction: All articles were reviewed independently by 2 persons and abstracted according to predetermined criteria.

Results: The current review of the literature yielded 4 Class I studies, 5 Class II studies, 2 Class III studies, and 5 Class IV studies.

Conclusions: Two intervention methodologies in the area of verbal learning and memory received support for a Practice Guideline and Practice Option, respectively. Significantly more methodologically rigorous research is needed to determine the effectiveness and efficacy of various cognitive rehabilitation interventions in MS. Specific recommendations for future research will be discussed.

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N. CHIARAVALLI & J. DELUCA. Treating Learning Impairments Improves Memory Performance in Multiple Sclerosis: A Randomized Clinical Trial.

Objective: Funded by the National Multiple Sclerosis Society (NMSS), this randomized clinical trial utilized established techniques to improve new learning and memory performance in Multiple Sclerosis (MS) participants with learning impairment.

Participants and Methods: Participants were 29 individuals with clinically definite MS with documented learning deficits, randomly assigned to the experimental or control group. The experimental group underwent 8 sessions of the Story Memory Technique (SMT), while the control group participated in 8 sessions of memory exercises. Neuropsychological assessment was conducted at baseline, immediately following treatment and 5 weeks later to assess outcome.

Results: When stratifying participants by degree of learning deficits, a significant treatment effect was noted. MS participants with moderate-severe impairment in learning showed a significant improvement in learning abilities when compared to controls, ($t(19)=3.32, p<.01$) evident in 88% of participants in the experimental group. Little improvement was noted in MS participants with mild learning impairments. Significant self-reported improvements in memory were noted in MS participants that underwent treatment, but not those that did not undergo treatment ($t(26)=2.55, p<.01$).

Conclusions: Results indicate that learning and memory deficits in MS can be effectively treated through a memory rehabilitation program uti-

lizing context and imagery to improve new learning. Appropriate patient selection is important, with moderately-severely impaired individuals showing significantly greater benefit from treatment. A large randomized clinical trial further examining this technique in MS is currently underway, funded by the NIH.

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M. BASSO. Self-Generated Encoding in Multiple Sclerosis: A Promising Rehabilitative Method.

Objective: Memory dysfunction commonly occurs in multiple sclerosis (M.S.), but few effective interventions exist to treat this difficulty. One method which may ameliorate forgetfulness in M.S. is self-generated encoding. Relative to didactic learning, self-generated encoding results in enhanced recall, retrieval, and retention in neurologically normal individuals. Yet, little is known concerning self-generated learning in clinical samples, especially MS.

Participants and Methods: In this symposium segment, three experiments involving patients with MS will be reviewed. Patients were classified according to severity of memory impairment with standardized measures of memory. They were then administered several experimental learning tasks. These tasks compared self-generated and didactic encoding strategies, and they involved material pertinent to activities of daily living.

Results: Across these experiments, patients with MS tended to recall less information than a control group. Yet, even memory-impaired MS patients experienced enhanced memory with self-generated encoding, in some instances, recalling almost as much as a control group. These effects were observed on recall and recognition memory measures.

Conclusions: Self-generated learning enhanced recall of amnesic M.S. patients inasmuch as it did controls, suggesting potential efficacy in rehabilitation settings. Granted, their overall level of recall tended to be less than the control group, but this is to be expected. Current theorizing asserts that amnesic individuals will unlikely achieve normal memory function. Rather, an amnesic patient's remaining capacity to learn and recall information may be maximized to its fullest potential. As such, self-generation may serve as an effective intervention to use in people with MS.

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C. CHRISTODOULOU. Pharmacological Treatment of Cognitive Impairment in Multiple Sclerosis.

Objective: Cognitive impairment affects about half of all persons with multiple sclerosis and is a leading cause of disability in the disorder. Research into pharmacological treatments for cognitive impairment in MS is still in the early stages. This presentation will review previous as well as ongoing studies and discuss future directions for pharmacological interventions to improve cognition in MS.

Participants and Methods: The relevant pharmacological interventions can be divided into two types: 1) disease modifying therapies (DMT) that alter the course of the disease and might therefore have consequences for cognition, 2) symptomatic treatments that target cognitive symptoms specifically. Studies of DMTs to date have generally been large industry sponsored randomized clinical trials with cognitive variables sometimes included as secondary outcomes. Studies of symptomatic treatments for MS cognitive impairment have tended to be quite small in contrast to the large DMT trials. A variety of medications have been assessed, including anti-fatigue medications, potassium channel blockers, and acetylcholinesterase inhibitors.

Results: The results for the DMT studies have been mixed. There are some supportive results for interferon therapy, though benefit to cognition appears modest.

Given the small, underpowered nature of the symptomatic treatment studies to date, it is not unexpected that results have been mixed. Results for acetylcholinesterase inhibitors have been the most promising of the symptomatic therapies to date.

Conclusions: At this time, it is premature to recommend the clinical use of any such medication. Additional pharmacological treatment studies are planned or are in progress.

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Invited Symposium

9:00–10:30 a.m.

Transdisciplinary Research Strategies For Neuropsychology

Chair: Elizabeth Kozora

E. KOZORA, I. GRANT, L. RYAN, T. HART, R. PAUL & R. BILDER. Transdisciplinary Research Strategies For Neuropsychology.

Symposium Description: Transdisciplinary (TD) research has been described as the development and application of a shared, conceptual framework based on discipline-specific theories and methods. Instead of working in parallel, investigators collaborate across levels of analysis and intervention to develop a comprehensive understanding of the problem at hand. The goal of TD research is to integrate and transcend each respective disciplinary perspective by understanding the world in a framework that is larger than disciplinary research. This symposium will examine various strategies of TD research in neuropsychology by presenting the overall design and mechanisms of three ongoing funded neuropsychological studies. Each presentation is structured to answer the following questions: What is the scientific problem you are studying that demands a TD approach? Describe briefly the background and development of the idea behind your TD project? Why have previous disciplinary approaches been unsuccessful? What is the new approach and what is the “transdiscipline” being defined? How does your role as a neuropsychologist serve as the central node? What is the nature of connections with rest of team? How did connections develop? Who is on your research team? What strategies are used to foster transdisciplinary interaction and team coherence? How is the research funded? Finally, what has been greatest challenge on your TD project and how has it been approached/resolved? The three presentations will be followed by a roundtable discussion led by senior neuropsychologists in the TD arena and NIH program staff.

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T. HART. Opening the “Black Box”: The Content and Process of Learning in Traumatic Brain Injury Rehabilitation.

Objective: Rehabilitation has developed sophisticated measures of case mix (e.g., demographics; types of impairments and their severity) and

outcomes at the level of activity and societal participation. But what comes between a disabling condition and its outcome—the treatments included in rehabilitation—remain inside a “black box” of largely unknown and unmeasured ingredients. Differences in theoretical orientation and treatment labeling among the multiple disciplines in the rehabilitation team may compound the difficulty of “measuring the independent measure,” and may foster communication gaps among disciplines and between treaters and consumers. In this project, funded by the National Institute on Disability and Rehabilitation Research, a Participatory Action Research model was applied to a project whose objectives were (1) to develop transdisciplinary priorities, labels and definitions for central and important content and process factors in traumatic brain injury (TBI) rehabilitation, and (2) to develop reliable measures of these putative “active ingredients” based on observable events. Principles derived from Neuropsychology (implicit and explicit learning; goal setting and feedback, etc.) served to anchor the activities of a 7-member interdisciplinary research team and define the scope of inquiry. Both qualitative and quantitative research methods were employed. In addition to overviews of the methods and results obtained, this presentation will focus on the manner in which transdisciplinary research goals were developed and achieved, and the strategies used to foster team interaction and coherence. Challenges engendered by the transdisciplinary approach will also be described, as well as how they were addressed.

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R. PAUL. Quantified Tractography in Older Individuals at Genetic Risk for Microvascular Disease.

Objective: Historically efforts to define the etiology and evolution of age-related cognitive decline have been restricted by the limitations of research focused within specific scientific disciplines. Combining expertise and methodology from diverse disciplines into single studies (i.e., inter-disciplinary efforts) have achieved new milestones in the field of cognitive aging as well as other areas of research. However, it is possible to achieve even greater yield when entirely novel approaches and/or disciplines are developed from these collaborations. In this presentation I will review a novel scientific approach using quantified diffusion tensor imaging that was developed within the context of an initial interdisciplinary team. This approach allows for the application of theoretical models based on animal studies using in vivo human neuropsychology and neuroimaging, and we are currently funded by the National Institute of Neurological Disorders and Stroke to apply this approach in the field of cognitive aging. Our study incorporates a newly developed concept of quantified diffusion tensor imaging, genetics of microvascular disease and inflammation, and neuropsychological principles in order to address questions that were previously unattainable using conventional interdisciplinary methods. This presentation will briefly review the literature supporting the need for this novel approach, the evolution of our interdisciplinary team, and the application of the approach that evolved from these efforts. Some suggestions for developing initial collaborations that involve transdisciplinary and inter-disciplinary research will be provided.

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R. BILDER. Consortium for Neuropsychiatric Phenomics.

Objective: The Consortium for Neuropsychiatric Phenomics (CNP) at UCLA advances the NIH Roadmap Initiative using transdisciplinary research to address major unsolved challenges in research on behavioral disorders. The CNP leverages the new discipline of phenomics - the systematic study of phenotypes on a genome-wide level - by integrating basic, clinical and information sciences. Neuropsychiatric disorders

have enormous public health significance, and there is a broad chasm between basic and clinical research strategies used to study these syndromes. The CNP breaks down boundaries between syndromes by studying important brain-relevant phenotypes across diagnoses, and bridges basic and clinical sciences by studying phenotypes across species. The CNP comprises 8 grants and 52 investigators representing diverse disciplines. The CNP team will execute five interlocking research projects supported by two research infrastructure cores and a coordinating center. Three research projects focus on clinical and laboratory approaches to understanding brain mechanisms underlying memory, response inhibition, and other behavioral functions disrupted in Schizophrenia, Bipolar Disorder, and Attention-Deficit/Hyperactivity Disorder. These projects examine variations in genetics, brain structure, brain function, and behavior in 2000 healthy people and 300 suffering from one of the target syndromes, and conduct basic science experiments to unravel biological mechanisms underlying these phenotypes. Development of new genome-wide analysis methods will capitalize on the large Northern Finland Birth Cohorts. Novel web-based software will be developed to visualize, model, and test interdisciplinary hypotheses spanning many levels of investigation. Collectively, the CNP establishes a new paradigm for transdisciplinary research to overcome obstacles in the study of complex biomedical disorders.

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Poster Session 2: Medical Disorders, Subcortical Dementia, Stroke

9:00–10:30 a.m.

Agnosia/Disordered Representations

J. BANOS, P. TAYLOR-COOKE, G. WESTHAFFER & X. ZHOU. Exploring Awareness after Right and Left Hemisphere Stroke: The Potential Role of Feedback and Generalization.

Objective: Awareness of hemiparesis and functional limitations after stroke was explored. Based on previous work, it was hypothesized that in RHL, awareness deficits could be partially accounted for by altered magnitude estimation (ME), as measured by the exponent of a power function derived from a line bisection task.

Participants and Methods: Participants were 12 stroke patients with left hemisphere lesion (LHL) and 21 with right (RHL) undergoing bedside neurobehavioral status examinations during inpatient rehabilitation. Awareness data included self-estimation of strength (compared to physiatrist rating) in the affected upper (UE) and lower (LE) extremities, clinician ratings of awareness in response to four standardized questions about functional limitations, and three about problem solving in hypothetical safety scenarios.

Results: As anticipated, a lower power function exponent was found in RHL patients (i.e., diminished ME). Consistent with this, RHL patients overrated LE strength while LHL patients underrated. Ratings were comparable for UE strength. With the exception of a few RHL outliers, both groups demonstrated mildly (but comparably) diminished awareness of day-to-day functional limitations (i.e., walking, eating, toileting) but RHL performed significantly worse when asked to generalize awareness to an untried activity (driving a car). This was unrelated to altered ME. Both groups performed more poorly (but comparably) on problem solving questions, also unrelated to ME.

Conclusions: Although data are admittedly limited, results suggest ME may play a role in the “comparator” component of awareness models. Although altered ME may attenuate task-specific feedback that shapes global awareness, ability to extrapolate to new situations may be a distinct deficit in RHL.

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C.E. GLEASON, M. DOWLING, M.L. RIES, D.A. BAKER, N. YASUI, N.J. LANE, W. WHARTON, C.M. CARLSSON, S.C. JOHNSON & S. ASTHANA. Anosognosia for Memory Problems Increases with Age and Language Deficits in a Sample of Community Dwelling Older Adults.

Objective: Anosognosia or the impaired awareness of deficits is an aspect of several cognitive disorders that interferes with identification and treatment cognitive deficits. We examined the relationship between an estimate of anosognosia for memory (Anosognosia Ratio (AR)) and other cognitive domains, and with characteristics such as age and mood.

Participants and Methods: AR was derived for memory abilities in 218 older community-residing adults, average(SD) age 78(8.19) years (range: 51-96). Of the 195 participants overestimating their memory abilities, 13(7%) carried a dementia diagnosis. In another 88 (45%) an undiagnosed cognitive disorder was suspected. Two modeling approaches were employed to regress AR on cognitive domain composite scores including language, executive attention, orientation, construction, and reasoning/judgment; and a measure of mood, while covarying for age, education, gender, and medical history.

Results: A composite language score and age were the best predictors of memory AR. Participants evidencing greater overestimation of their memory abilities performed more poorly on language tests ($p < 0.001$) and were older ($p < 0.05$) than subjects more accurately estimating their memory abilities. Regression tree modeling showed a cluster pattern in which age ≥ 80.5 years and Geriatric Depression Scale-Short Form score > 5.5 were associated with greater overestimation of memory abilities.

Conclusions: Our findings suggested a relationship between language deficits and older age, and anosognosia for memory deficits. Interestingly, our data suggested that depression symptoms were associated with overestimation of memory abilities. The ability to accurately perceive our abilities may like other cognitive skills decline with age, concomitant with language changes.

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Aneurysms

B.J. DIAMOND, J. DELUCA & O. NOSKIN. Visual and Verbal Memory and Awareness in Anterior Communicating Artery Aneurysm: During and After Confabulation.

Objective: The three primary objectives of this case study were to determine: (1) whether changes in the operations mediating visual-spatial and verbal memory tasks predict changes in the course of confabulation; (2) whether changes in visual and verbal intrusions parallel changes in confabulation; (3) what are the implications of these findings for theories of confabulation.

Participants and Methods: FP was a 62-year-old right-handed female who suffered a ruptured ACoA aneurysm. She was assessed during and after confabulation with performance compared to seven amnesic, non-confabulating ACoA's and three non-amnesic, non-confabulating ACoA's as well as eight healthy participants.

Results: During confabulation, FP's REY copy score was below average ($Z = -1.88, p = .03$); explicit recall was poor; recognition was bet-

ter than recall; and performance on cued, procedurally-based visual-spatial memory tasks was better than recall. FP emitted numerous visual (67) as well unrelated verbal intrusions (12). After confabulation, the copy score was still compromised. However, there were improvements on immediate recall and non-recall measures ($Z = 6.8, p = .001$), and a reduction in figural (eight) and unrelated verbal intrusions (zero)

Conclusions: After confabulation there were improvements in associative and automatically driven memory processes and in self-monitoring, executive search and retrieval as well as an enhanced ability to differentiate internal from externally generated information. The current findings provide support for theories of confabulation that emphasize the role of retrieval, associative processes and executive monitoring in mediating confabulation.

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J.A. FIELDS, L.M. RILLING, L.H. LACRITZ, K. SAINÉ, B. ALLEN, D. SAMSON & C.M. CULLUM. Post-Surgical Self-Report of Symptoms in Patients Recovering from Cerebral Aneurysm Surgery.

Objective: To examine the effects of brief psychoeducational intervention on patients recovering from cerebral aneurysm surgery.

Participants and Methods: 39 good-outcome surgical cerebral aneurysm patients (M age=52), including 23 treatment as usual (TAU) and 16 who underwent brief psychoeducational intervention. A 56-item self-report survey of symptoms pertaining to physical well-being, emotional well-being, daily activities, and cognitive functioning was completed at 2 weeks, 3 months, and 6 months post surgery.

Results: Examination of the total sample showed that complaints regarding appetite decreased over time (51% vs. 15% vs. 12%, $p=.002$), although problems with energy (80% vs. 58% vs. 54%, $p=.13$), depression (56% vs. 44% vs. 44%, $p=.763$), and anxiety (62% vs. 50% vs. 48%, $p=.37$) declined over time, but were not statistically significant overall. Complaints of misplacing things increased (15% vs. 31% vs. 54%, $p=.003$), and reports of difficulties remembering appointments (18% vs. 23% vs. 31%, $p=.26$) and maintaining focus (32% vs. 39% vs. 44%, $p=.32$) showed slight but non-significant increases. There were no statistically significant differences between TAU and intervention groups at any point, although 93% of the psychoeducational group reported that the intervention was helpful.

Conclusions: Patients with good surgical outcome reported more cognitive problems over time, while depression, anxiety, and most of their physical symptoms were stable or improved. Despite being well-received by the majority of patients, our brief psychoeducational intervention did not appear to have a systematic effect upon the reporting of symptoms over time in this good outcome neurosurgical population. Intervention in patients with poorer surgical outcome remains to be examined.

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A.J. HRICIK, P. SHERWOOD, E. CRAGO, L. HOFFMAN, M.B. HOROWITZ & C. BENDER. Prevalence of Cognitive Dysfunction 1 year Following Subarachnoid Hemorrhage.

Objective: Aneurysmal subarachnoid hemorrhage (aSAH), bleeding into the subarachnoid space of the brain due to a ruptured blood vessel, occurs in approximately 30,000 Americans per year and has a 40% morbidity rate. Although much is known about physical dysfunction following aSAH, little is known regarding post-injury neuropsychological function, which often affects patients' ability to resume previously held roles. The purpose of this study was to compare multiple domains of neuropsychological function between persons with aSAH and general population norms.

Participants and Methods: As a part of an ongoing NIH funded study (RO1NR04339), 70 persons with aSAH (diagnosed via cerebral an-

giography and computed tomography) were recruited from an urban neurovascular ICU. Subjects completed a comprehensive neuropsychological assessment at 12 months following the initial bleed. Neuropsychological deficit was defined as a score one standard deviation (SD) or more below normative values.

Results: Almost all subjects 98% displayed at least one deficit. Regarding specific domains, 29% were below 1 SD in learning and memory, 23% in global cognitive functioning, 40% in attention, 36% in mental flexibility, 48% in language, and 63% in psychomotor speed.

Conclusions: Results indicate a high prevalence of neuropsychological dysfunction following aSAH, data which can be used to tailor interventions aimed at improving the lives of persons with aSAH. As the majority of aSAH survivors are likely to endure long-term dysfunction, steps should be taken prior to discharge to ensure adequate rehabilitation therapy.

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S. PEERY, H.A. BENDER, J.C. BOROD, S. ASSURAS, J. SCHMIDT, J. CLAASSEN, K.T. KREITER, N. OSTAPKOVICH & S.A. MAYER. Risk Factors for Poor Neuropsychological Outcome after Subarachnoid Hemorrhage.

Objective: Subarachnoid hemorrhage (SAH) often results in lasting cognitive impairments. We evaluated SAH survivors to identify which medical complications and demographic factors showed the most impact on neuropsychological recovery over the first year.

Participants and Methods: Eighty-two participants (M = 51.0 years, SD = 13.3) with SAH were enrolled. Hospital course and complications (e.g., infarction) were recorded prospectively. Evaluations conducted at 3 and 12 months after SAH included seven domains of neurocognitive functioning: global mental status, reaction time, motor coordination, executive functioning, visuospatial perception, visuoconstruction, and verbal and visual memory. A composite cognitive index was derived based on factor analysis. Repeated-measures MANCOVAs controlling for education were conducted to evaluate the impact of age, sex, aneurysm location, clinical grade, SAH amount, infarction, vasospasm, and cerebral edema on recovery.

Results: Repeated measures MANCOVAs revealed that older age ($p < .05$) and worse clinical severity ($p = .03$), as measured by Hunt Hess grade, predicted poorer overall neuropsychological outcome after SAH. Men ($p = .02$) showed poorer cognitive outcome after SAH on measures of verbal ($p < .01$) and visual ($p = .04$) memory.

Conclusions: While medically-related complications may modify the course of recovery in individuals, variables available within 24 hours are the most robust determinants of outcome. Clinically, these findings suggest that only age, clinical grade, and sex have prognostic value for cognitive status after SAH. Although demographic data are readily available, structured questioning (e.g., presence of headache, lethargy, stupor, and/or coma post-SAH), or directed medical record review may be useful in determining clinical grade of SAH.

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S. PEERY, H.A. BENDER, J.C. BOROD, S. ASSURAS, J. SCHMIDT, K.T. KREITER, J. CLAASSEN, N. OSTAPKOVICH & S.A. MAYER. Neuropsychological Outcome after Anterior Communicating Artery Aneurysm Rupture.

Objective: Though there are memory and executive deficits following anterior communicating artery (AComm) aneurysm rupture, impairments are also observed after subarachnoid hemorrhage (SAH) from other cerebral arteries. The literature remains equivocal as to the precise nature of this brain-behavior relationship. We examined the roles of age, sex, and neuropsychological variables in outcome after AComm SAH.

Participants and Methods: A comprehensive neuropsychological battery was administered to 82 SAH survivors, aged 19-87 years, at 3 and 12 months. It included the Telephone Interview for Cognitive Status (TICS), which is a measure of global mental status with robust construct validity in this population, and measures of reaction time, motor coordination, executive functioning, memory, visuospatial perception and construction. One-way ANOVAs were conducted to evaluate the effects of sex, age, and aneurysm location on mental status. Chi square analyses were performed to evaluate sex differences for aneurysm location.

Results: One-way ANOVAs yielded a significant effect of sex ($p=.02$); women ($M=34.0\pm 6.8$) scored significantly higher than men ($M=29.9\pm 8.4$) on the TICS. Men (61.1%) suffered significantly more AComm aneurysms than women (38.9%, $p=.01$); women suffered significantly more aneurysms in the posterior circulation (85.7%) than men (14.3%). Frontal aneurysms, compared to other locations, reduced executive function domain scores significantly more ($p=.04$) for patients with low (<31) than high TICS scores. Older individuals (>51 years) had significantly ($p=.05$) lower TICS.

Conclusions: Our findings suggest that the role of aneurysm location on cognition is multifactorial. This relationship is affected by sex, age, cognitive impairment severity, and the specific cognitive domain under examination. As such, future studies in this area should consider effects of demographic data to avoid obscuring the true nature of this relationship and limiting the reliability and generalizability of study conclusions. Correspondence: *Shelley Peery, PhD, Psychology, Rusk Institute of Rehabilitation Medicine, NY Medical Center, 400 East 34th St., New York, NY 10016. E-mail: shelleypeeryphd@gmail.com*

Autoimmune Disorders (e.g., CFS, Lupus, Fibromyalgia)

K. BEKKEN, L. LESUEUR & W.N. PACHAS. The Use of Namenda in the Treatment of Mental Compromise in Fibromyalgia.

Objective: FM is often accompanied by deficits in short term memory, organization, and other mental changes, independent of other symptoms, such as sleep disorder, pain, reduced ADLs, and fatigue. The incidence of FM in the USA is estimated to be 6-9 million, mainly affecting middle-aged women.

Because of the favorable effect of Namenda (memantine) on mental functioning in Alzheimer's patients, we investigated this drug's effect on functioning in FM.

Participants and Methods: Subjects included 15 patients with Fibromyalgia. Participation included two neuropsychological evaluations (one on and one off Namenda).

Standardized measures included WAIS-III subtests, WMS-III/WMS-R subtests, COWAT, CVLT-II, Hooper, Rey/Taylor, and the Wisconsin Card Sorting Test.

Results: Out of 16 measures on which we had measures of performance on and off Namenda, the majority of measures demonstrated significant improvement within all subjects. Improvement on the remaining measures demonstrated improvement, but not to a significant degree.

Conclusions: These results are limited by sample size, and must thus be considered exploratory. Nevertheless, these data are quite encouraging, both in terms of qualitative improvement and quantitative, measurable improvement. Across all subjects, Namenda improved cognitive functioning on at least some of the measures, with the majority of improvement on tests of frontal lobe/executive functioning. This work continues, with a larger sample size and adjustment of measures to better address memory in particular. In the future, double-blind, placebo-controlled studies will be necessary to confirm the encouraging favorable effects of memantine.

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N. DONINGER, T. UTSET & J. FINK. Cognitive Function and Health Related Quality Of Life in Neuropsychiatric SLE.

Objective: Neuropsychiatric syndromes, including mood disorders and cerebrovascular disease, have been strongly associated with Systemic Lupus Erythematosus (SLE). This study examined differences in neuropsychological functioning and health related variables between SLE patients (N = 19) with a history of neuropsychiatric syndromes (NPSLE) and SLE patients (N = 31) with no such prior history (non-NPSLE).

Participants and Methods: Participants completed neuropsychological tests assessing learning, memory, executive functioning, and motor speed as well as self-report instruments measuring pain, fatigue, depression, anxiety, and health-related quality of life. Groups were equivalent with respect to disease related variables, including time since diagnosis, serological markers, and prevalence of medical comorbidities (e.g., fibromyalgia).

Results: Controlling for differences in estimates of premorbid ability, NPSLE patients generally performed worse than non-NPSLE patients on measures of attention/processing speed. Group differences on measures of cognitive processing speed remained after controlling for observed differences in the severity of depression symptoms and limiting the NPSLE cohort to those patients without a history of stroke. On health related variables, NPSLE patients reported greater symptoms of depression and trait anxiety and endorsed greater impairment of work and other daily activities related to emotional problems than non-NPSLE patients. NPSLE and non-NPSLE patients did not differ with respect to symptoms of pain and fatigue.

Conclusions: These results support prior research indicating greater disease severity among NPSLE patients. In addition, group differences in neuropsychological functioning may not just be symptomatic of a comorbid mood disturbance or history of cerebrovascular disease but rather the influence of disease-related pathophysiological mechanisms on the central nervous system.

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A. SYED, J.L. SHUCARD & D.W. SHUCARD. The Contributions of Cognitive, Biological, and Psychosocial Factors to Depression in Systemic Lupus Erythematosus.

Objective: Systemic Lupus Erythematosus (SLE) is an autoimmune disease in which depression occurs at a higher rate than many other chronic illnesses. The etiology of depression in SLE, however, is not fully understood. This study examined the relative contributions of cognitive, biological, and psychosocial factors in the development of depression in SLE.

Participants and Methods: Fifty-four SLE participants were studied. Data from the following domains were analyzed: Neuropsychological (Paced Auditory Serial Addition Test); biological (SLE disease activity scale and anti-ribosomal P antibodies); psychosocial/functional disability (Sickness Impact Profile [SIP] and Coping Response Inventory); and psychological (a composite depression score created from the Beck Depression Inventory, Structured Clinical Interview, and Symptom Checklist-90).

Results: Working memory/processing speed impairment was related to each of the three SIP dimensions of functional disability (physical, psychosocial, independent), as well as to the total SIP functional disability score ($r = -.47, p < .01$). Disease activity was related to the SIP physical ($r = .511, p < .05$) and independent dimensions ($r = .39, p < .01$). A hierarchical regression analysis revealed that functional disability was the only predictor of depression in SLE, with the psychosocial and physical dimensions making the greatest contributions.

Conclusions: These results suggest that functional disability directly influences depression in SLE and that working memory/processing speed

impairment and disease activity may act as moderating variables through their effect on functional disability. Coping response did not play a role in predicting depression in SLE. On the basis of these findings, a multidisciplinary approach to the assessment and treatment of depression in SLE would be beneficial.

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J. WARD, E. VAN DER HULST, M. NAQIBUDDIN & M. PETRI. Impaired Implicit Learning in Systemic Lupus Erythematosus.

Objective: The current pilot study investigated implicit learning, processing speed, and problem solving in patients with systemic lupus erythematosus (SLE) and compared performance in these domains in SLE participants based on occupational status.

Participants and Methods: Participants were 21 individuals with SLE who underwent assessment of implicit learning (i.e., Serial Reaction Time Test; SRTT), processing speed (i.e., Symbol Digit Modalities Test; SDMT), and problem solving (i.e., D-KEFS Tower test), as well as the Beck Depression Inventory (i.e., BDI-II). Information was also obtained regarding disease severity, i.e., clinician ratings of disease severity and antinuclear and antiphospholipid antibody lab values.

Results: Overall group performance was intact on the SDMT and D-KEFS Tower but abnormal on the SRTT. When divided into subgroups based on occupational status (i.e., disabled versus working), SDMT and Tower test performance was intact in both groups. Participants with SLE who were still working exhibited intact implicit learning while disabled subjects failed to show an implicit learning effect. Although equivalent in age, education, and disease severity, subgroups significantly differed on BDI-II score. Group differences on SRTT performance remained after covarying for BDI-II score. Stepwise logistic regression analysis revealed that among the demographic, disease severity, depression, and cognitive variables, the only significant contribution to classification of occupational status (i.e., disabled versus working) was SRTT performance, with 88.2% overall accuracy, 100% specificity, and 80% sensitivity.

Conclusions: These preliminary findings suggest that deficits in implicit learning combined with significant symptoms of depression may serve to disrupt aspects of daily functioning in patients with SLE and warrant further investigation.

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Behavioral Neurology

C.S. CALLEY, G.D. TILLMAN, S. O'MEARA, P.S. MOORE, V. HENDERSON & J. HART. Reliability of Subjective Memory Rating in Predicting Neuropsychological Performance.

Objective: With the increasing number of aging individuals with cognitive impairments, effective screening measures would improve the likelihood of detecting impairments. Subjective reports of symptoms are typically obtained in clinical settings, yet the validity of those reports and the correlations with neuropsychological measures are relatively unknown.

Participants and Methods: In a study of 70 subjects enrolled in an Alzheimer's Disease Center, we analyzed the subjective reports of word-finding/language difficulties and memory difficulties, a behavioral neurologist's clinical impression of those abilities, and neuropsychological testing results. The subject pool consisted of 33 normal controls, 19 with MCI, and 18 with Alzheimer's Disease.

Results: Comparisons of subjective dichotomous ratings of intact or impaired for the subject's and neurologist's evaluation were compared with

13 neuropsychological measures of word finding/language and episodic memory. The patient's and neurologist's subjective ratings of memory problems both correlated well with standard neuropsychological measures of memory ($r=0.63$ to $r=0.7$ for Logical Memory). However, both the subject and physician ratings of word finding/language impairments had a notably weaker correlation with the relevant neuropsychological measures of word finding/language ($r=0.1$ to $r=0.5$ for COWAT and Boston Naming Test).

Conclusions: These findings suggest that while subjective memory assessments of memory abilities are reasonably useful, similar assessments by patients or physicians after an examination of word finding/language difficulties can be relatively inaccurate. Improving the subjective screening instruments for multiple cognitive domains would contribute to detection of impairments in the growing number of elderly individuals.

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J.B. HAMMOND, F.M. SKIDMORE, D. ANTONIELLO, T. BRYANT, L. GONZALEZ-ROTHI, K.M. HEILMAN & K.D. WHITE. Dopamine Modulates the Rate of Perceptual Switching in Parkinson's Disease.

Objective: Binocular rivalry is a phenomenon in which unchanging but conflicting visual input leads to perceptual switching. We studied binocular rivalry in Parkinson's disease (PD), to evaluate the influence of dopaminergic systems on perceptual switching.

Participants and Methods: Thirteen nondemented subjects with PD and 8 healthy controls were tested on a perceptual switching task, binocular rivalry. Ten subjects were in a self-reported "on medication" ("on") state, two were "off medication" ("off"), and one changed from "off" to "on" during testing. Stimuli consisted of white binocular fixation guides against a black background, centered within which was a one-degree disk filled with a moving grating. The disk could be presented binocularly (same grating orientation in both eyes) or dichoptically (orthogonal grating orientations in the two eyes) by a head-mounted display.

Results: Response accuracy was similar between groups. Although on average perceptual dominance durations did not differ between groups, PD dominance durations were concentrated near the median duration. A minority of PD dominance durations were unusually long (>30 sec). Long dominance durations (low switching rates) were associated with self-reported "off" status (presumably, relative dopamine depletion). Transition from "off" to "on" state was associated in one patient with development of shorter dominance durations.

Conclusions: PD subjects who were "on" had dominance durations that regressed to the median compared to controls. Subjects who were "off" had unusually long dominance durations. Switching from "off" to "on" in one patient resulted in shortening of the dominance duration. These data suggest that dopamine modulates switching in binocular rivalry.

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J.B. HAMMOND, K.D. WHITE, D. ANTONIELLO, T. BRYANT, L. GONZALEZ-ROTHI, K. HEILMAN & F.M. SKIDMORE. The Kinetic Depth Effect is Altered in Parkinson's Disease.

Objective: The kinetic depth effect is a phenomenon in which a two-dimensional moving image is perceived as a three-dimensional structure. We performed a study of the kinetic depth effect in Parkinson's disease (PD).

Participants and Methods: Participants included 16 individuals with PD and 12 healthy controls, who viewed a 90 sec "movie". Stimuli consisted of a series of dots moving right to left and left to right. When all dots travelled along one trajectory the appearance was of an opaque rotating ball. Throughout the movie, the proportions gradually decreased

from all dots moving in one direction (100%/0%) to half of dots moving in each direction (50%/50% - a “transparent” ball), then increased until it reached 0%/100% (in the opposite direction). Subjects responded by saying “flat” when perceiving a 2-D image or “ball” when perceiving a 3-D image.

Results: No controls saw a flat ball at any point in the experiment, however six PD subjects reported the illusion changed from a “ball” to a “flat” image ($p = 0.024$).

Conclusions: In order to see depth (3-D) in the 2-D display a person has to maintain attention on a subset of moving dots, has to perceive the changes in movement speed (dots slow up as they come to the end of the ball) and develop a 3-D (ball) percept rather than a 2-D circle percepts. The inability of the PD subgroup is unable to see the 3-D image at certain points may be related to deficits in attention or perception, and further study is needed.

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C.E. HOFFMAN & J.H. KRAMER. Straight Gyrus Correlates with Disinhibition in Dementia.

Objective: Current models of prefrontal function posit a dissociation between orbitofrontal areas that mediate social-emotional control, and dorsolateral structures that are more heavily involved in cognition. The current study tests this model in a mixed sample of elderly subjects by examining brain correlates of disinhibition and overall cognitive functioning in dementia patients and normal controls.

Participants and Methods: We studied 44 subjects (8 normal controls and 36 patients) with structural MRI. Mean age was 63.1 (SD = 7.6). Structural MRIs were processed using Brains2 software (Maggionta et al 2002) to yield volumes of the frontal lobes. The straight gyrus (SG) was then manually traced for each scan to serve as a marker of orbitofrontal volume. Disinhibition was measured by the Neuropsychiatric Inventory (Cummings et al., 1994). Overall cognitive functioning was measured by the Mini-Mental State Exam (MMSE; Folstein, Folstein, & McHugh, 1975).

Results: Correlations between brain volumes (SG and frontal lobes) and disinhibition and MMSE were computed after controlling for head size. SG volumes correlated negatively with disinhibition ($r = -.47, p < .01$), but did not correlate with MMSE score ($r = .06, p = .71$). Frontal lobe volumes correlated with MMSE score ($r = .31, p < .05$), but not with disinhibition ($r = -.22, p = .15$).

Conclusions: These results support a specific association between orbitofrontal cortex and behavioral control. There was an association between straight gyrus volume and disinhibitive behaviors, whereas frontal lobe atrophy is associated with overall cognitive dysfunction, but not specifically with disinhibition.

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K.T. KINGSLEY, S. PEERY & L.A. SCHAEFER. The Neuropsychological Impact of a Bilateral Cerebellar Hemorrhage: A Case Study.

Objective: Historically, the literature has limited the role of the cerebellum to the mediation of motor functioning and balance. However, scientists are increasingly recognizing the role of the cerebellum in cognitive functioning as well. There are still few studies that have documented the cognitive sequelae after cerebellar damage. We present the neuropsychological outcome of a patient status post cerebellar stroke followed by discussion of the characterization of the role of the cerebellum in modulation of cortical neuropsychological function.

Participants and Methods: Ms. M. is a 51 year old network engineer referred two months post bilateral cerebellar hemorrhage, emboliza-

tion of a left cerebellar AVM, followed by AVM resection. Past medical history is significant for hysterectomy, hypothyroidism, and papillary carcinoma. Ms. M. underwent a comprehensive neuropsychological evaluation followed by 8 months of cognitive remediation focusing on improving awareness, attention, and executive functioning.

Results: Ms. M. presented with significant expressive and receptive aphasia, stuttering, behavioral disinhibition of socially inappropriate speech and laughter, fatigue, and deficits in verbal abstract reasoning, visuospatial relationships, attention, memory, mental flexibility, and problem solving. She also showed difficulties in instrumental ADLs including cooking, phone use, shopping, and management of finances. Following remediation, improvements have been noted in stamina, attention span, awareness, aphasia, abstract reasoning, mental flexibility, and memory functioning.

Conclusions: This case revealed deficits in a much wider range of cognitive functions than have previously been documented due to cerebellar dysfunction. The qualitative characterization of these deficits provide support for the hypothesis that the cerebellum modulates and refines its cortical input.

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Dementia Subcortical (e.g., Huntington's, Parkinson's, PSP)

M. AMICK, K.L. CHOU & M. GAGNER. Verbal Fluency in Parkinson's Disease Patients with Subthalamic Nucleus Deep Brain Stimulation.

Objective: Declines in verbal fluency are consistently observed in patients with Parkinson's disease (PD) following subthalamic nucleus deep brain stimulation (STN-DBS). These deficits have been attributed to the surgical procedure, but no study has confirmed that stimulation itself, post-operative reduction of anti-parkinsonian medications, or the interaction of these factors do not account for verbal fluency deficits. We hypothesized that verbal fluency would not change across four different stimulation/medication conditions.

Participants and Methods: Participants included twelve individuals (8 males, 4 females) with PD treated with chronic STN-DBS for at least 12 months. All subjects were assessed by an unblinded rater in 4 conditions in the following order: 1) DBS-on/medication-off, 2) DBS-off/medication-off, 3) DBS-off/medication-on, 4) DBS-on/medication-on. Each participant performed one phonemic and one semantic fluency task for each condition. To minimize test-retest effects, parallel forms were used. To allow comparison between conditions each fluency score was converted to a z-score using the sample mean.

Results: A one-way within subjects repeated measures analysis of variance was conducted. There was no effect of condition for either phonemic or semantic fluency. ($F < 0.01, p > 0.99$, both conditions).

Conclusions: Neither phonemic nor semantic fluency significantly changed across the four conditions. This study is limited by small sample size, however our results strongly suggest that verbal fluency is not affected by post surgical stimulation or medication changes. Rather, these findings suggest that the declines in verbal fluency following STN-DBS surgery are related to the surgical procedure. Importantly, reduced verbal fluency should be expected following STN-DBS and patients with poor verbal fluency should be counseled accordingly prior to surgery.

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Y. BOGDANOVA, M.M. VALMAS, J. LERER & A.M. CRONIN-GOLOMB. Numerical Cognition in PD: The Spatial Representation of Numerical Distance.

Objective: Deficits in visuospatial function in Parkinson's disease (PD) arise from changes in the cortico-striato-thalamic circuit that includes

the basal ganglia and their cortical projection areas, the dorsolateral prefrontal cortex and the posterior parietal lobes. We hypothesized that PD would affect some aspects of number processing associated with visuospatial dysfunction. We also investigated the effects of side of PD onset upon the spatial representation of number.

Participants and Methods: Twenty non-demented PD patients and 28 normal control volunteers (NC) were administered number-processing and neuropsychological tests. PD patients included right-side onset (RPD) and left-side onset (LPD) subgroups ($n=10$ each), reflecting relatively great contralateral hemisphere dysfunction.

Results: PD patients were impaired on several number processing and visuospatial tasks. PD performance on the mental manipulation of numerical distance correlated with performance on visual manipulation of numerical distance and spatial attention/working memory. Their performance on the mental manipulation of the numerals correlated significantly with performance on visuospatial tasks. The pattern of PD performance was significantly different for RPD vs. LPD. LPD underestimated numerical distance on the horizontal number line and demonstrated a similar bias on the mental number transcoding task (having more missing digits). These findings suggest that right hemisphere-based visuospatial dysfunction also deleteriously affects numerical cognition. By contrast, RPD made more errors than NC on written number transcoding and serial counting, demonstrating left hemisphere-based effects on verbal aspects of number processing.

Conclusions: Side of PD onset is associated with specific types of deficits in number processing. Spatial deficits in number processing in PD suggest a close functional relation between numerical quantity representation and visuospatial processes mediated by the right hemisphere.

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D.A. CAHN-WEINER, J.L. OSTREM, L. VERHAGEN, P.A. STARR, P.S. LARSON, R.A. BAKAY, R.T. BARTUS & W.J. MARKS. Intra-putaminal Gene Transfer with AAV2-Neurturin (CERE-120) for Parkinson's Disease: Preliminary Neuropsychological Test Results.

Objective: We previously reported preliminary safety and efficacy results of an open-label phase I trial of bilateral stereotactic intraputamenal injection of adeno-associated viral (AAV2)-neurturin (CERE-120), a neurotrophic factor with possible regenerative and protective properties for dopamine neurons, in patients with Parkinson's disease (PD). Presented here are the results of cognitive testing performed prior to and following treatment.

Participants and Methods: Twelve PD patients were enrolled; all suffered from motor fluctuations, despite optimized PD medications. Mean age was 57.4 ± 7.9 years and mean duration of PD was 11.3 ± 3.2 years. Neuropsychological evaluations were performed at baseline and at three months and one year post-treatment on medications.

Results: There were no significant differences across time in overall cognition, verbal fluency, naming, attention, executive function, mood, or activities of daily living. There was a significant effect of time for delayed recall on the Hopkins Verbal Learning Test-Revised (8.5 ± 0.92 at baseline vs. 5.6 ± 0.85 at 1 year) and for recognition discriminability (9.3 ± 0.48 at 3 months vs. 10.8 ± 0.29 at 1 year); however, when a Bonferroni correction was applied to account for multiple, pair-wise comparisons, the effect was not statistically significant. Similarly, individual analyses revealed that changes on these two measures were less than one standard deviation in all subjects.

Conclusions: These findings represent preliminary cognitive test results from an open-label phase I clinical trial of trophic factor/gene therapy for Parkinson's disease. General cognitive ability showed no change between baseline and one-year follow-up. Similarly, no significant changes were observed between baseline and one-year post treatment in specific cognitive functions assessed after correcting for the number of comparisons performed. A controlled, phase II trial is currently underway and will provide additional data regarding the neurocognitive tolerability of CERE-120.

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L.B. FEFFER, A.A. MCEWAN & J.V. FILOTEO. An Analysis of Errors on the Wisconsin Card Sorting Test in Demented and Nondemented Patients with Parkinson's Disease or Huntington's Disease.

Objective: The Wisconsin Card Sorting Test (WCST) has been used extensively to detect executive functioning deficits in patients with Parkinson's disease (PD) or Huntington's disease (HD). Although most studies have identified deficits on this task in these patients, not all have found impairment. This discrepancy may be due to past studies not taking into account global level of cognitive functioning. The present study examined the performance of demented and nondemented PD and HD patients on the WCST and compared error types (perseverative errors, non-perseverative errors, and set losses) in these subgroups.

Participants and Methods: WCST data from 119 PD patients and 30 HD patients were included in this study. Patients were subgrouped as demented or nondemented based on cut-off scores on the Mattis Dementia Rating Scale. To account for total number of trials administered, percentage of error-types was calculated by dividing the total number of errors on the various indices by the total number of trials attempted.

Results: Demented PD patients committed a greater percentage of both perseverative and nonperseverative errors than did nondemented PD patients, although there was a greater difference in perseverative errors. In contrast, demented and nondemented HD patients did not differ in the percentage of nonperseverative errors, but the demented group committed a higher percentage of perseverative errors. Groups did not differ in the percentage of set loss errors.

Conclusions: Perseverative errors appear to be the best WCST index for differentiating demented and nondemented PD or HD patients. Non-perseverative errors can make this discrimination in PD but not HD. Set loss errors are not sensitive to dementia levels in PD or HD.

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D. FLODEN, A.R. REZAI, B.L. WALTER & C.S. KUBU. Patients with Pre-operative Cognitive Impairment Show Disproportionate Cognitive Slowing Following STN-DBS for Treatment of Parkinson's Disease.

Objective: Deep brain stimulation (DBS) of the subthalamic nucleus (STN) successfully treats the cardinal motor symptoms of Parkinson's disease in well-selected patients. Neuropsychological outcome studies suggest that nondemented patients experience minimal cognitive morbidity following STN-DBS and, at most centers, neuropsychological evaluation is standard procedure for evaluating surgical candidacy. However, there is little evidence concerning cognitive outcome in operated patients with evidence of cognitive impairment prior to surgery. The goal of the present study was to evaluate the impact of mild to moderate pre-operative cognitive dysfunction on neuropsychological outcome following bilateral STN-DBS.

Participants and Methods: We retrospectively identified 34 patients who had undergone bilateral STN-DBS to treat Parkinson's disease and who had completed pre- and post-operative neuropsychological testing. Eight patients showed mild to moderate pre-operative impairment on the Mattis Dementia Rating Scale (DRS) and 26 patients showed intact pre-operative DRS performance. We used a repeated measures General Linear Model analysis to compare pre- and post-operative neuropsychological test performance in these groups.

Results: Our results confirmed prior reports of general post-operative declines in verbal fluency and other select cognitive functions. However, the analysis also revealed that patients with pre-operative cognitive impairment showed disproportionate post-operative slowing on a measure of processing speed. This deficit was unrelated to time between testing sessions or post-operative change in DRS scores.

Conclusions: This finding suggests that mild to moderate cognitive impairment prior to surgery may increase the risk of cognitive morbidity following STN-DBS for treatment of Parkinson's disease. The findings are considered in the context of possible anatomical substrates of DBS activity.

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I. GALTIER, A. NIETO, J. BARROSO & J. LORENZO. Verbal and visuospatial memory profile in different stages of nondemented Parkinson disease patients.

Objective: Problems in declarative memory are frequently reported in Parkinson disease (PD) patients and have been traditionally related with deficits in learning capacity and free recall. However, recent findings suggest that deficits in cued recall are also present. We aimed to examine verbal and visuospatial learning, as well as free and cued recall in different stages of nondemented PD patients.

Participants and Methods: We studied thirty-seven PD patients (ages 40-75; MMSE: 26.46) and twenty matched controls (ages 36-78; MMSE: 28.70). Patients were divided into two groups based on the severity of illness assessed by UPDRS-Motor Examination (UPDRS-ME): Group-I: UPDRS-ME range 0-27 (n=15) and Group-II: UPDRS-ME range 28-54 (n=22). CVLT was used to examine verbal learning and 8/30 SRT (an adaptation of 10/36 SRT; Rao et al, 1991) was used to assess visuospatial learning. Both instruments include five learning trials as well as free and cued recall.

Results: Results revealed a group effect on last learning trials and total learning of the CVLT and 8/30 SRT, with worse performance for Group-II patients compared to controls. No differences were found between Group-I patients and controls on any measures. In addition, Group-II patients differ to controls in cued recall of CVLT. No differences were found in visuospatial free and cued recall.

Conclusions: Our results indicate that early-stage PD patients do not show deficits on declarative memory. However, intermediate-stage patients show learning impairments on verbal and visuospatial memory. In sum, deficit in declarative memory increases with disease severity. Moreover, cued recall deficit on verbal memory may appear in intermediate-stages.

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M. GLISKY, W. GERRISH, J. BENTLEY & K. OLSEN. The Typical Cognitive Profile in Parkinson's Disease: Who Remains Cognitively Intact?

Objective: This study examined the typical pattern of cognitive functioning in a community-based sample of Parkinson's disease (PD) patients, its relation to social and medical functioning, and its impact on quality of life.

Participants and Methods: A sample of 150 patients with idiopathic PD received a neuropsychological battery, including measures of attention, processing speed, memory, language, visual spatial, and executive functions. Demographic variables, medical information, and self-report measures of depression, anxiety, and quality of life (PDQ 39) were also collected.

Results: Results showed mean scores for all above-mentioned areas of cognitive functioning were within normal limits, except measures of processing speed and executive functioning, which showed mild impairments (Trails A $z = -1.6$; Trails B $z = -2.1$; and Rey Complex Copy $z = -2.1$). A small sub-group of patients ($N = 17$) remained cognitively intact, with no significant impairments in any cognitive domain. This group

differed from the other patients only in duration of disease ($M=3.3$ years vs $M=6.8$ years). On a measure of perceived quality of life, only the Mobility subscale differed between groups. Cognitively intact patients had fewer perceived mobility difficulties but did not perceive any differences in overall discomfort, cognition, social stigma, or social support.

Conclusions: This study adds additional information regarding the cognitive functioning of PD patients. In our large community based sample, a majority of patients in the mid-stage of PD exhibited mildly reduced performance on executive functions and speeded measures, with other cognitive functions relatively intact. Results suggest that there is a small subset of patients (about 15%) who remained cognitively intact. Shorter disease duration appeared to predict this maintenance of cognitive functioning. Those who remained cognitively intact did not perceive their overall quality of life differently than those with mild cognitive changes, except in relation to mobility.

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M. JEDRZKIEWICZ, J.S. MARTZKE, C.R. HONEY, R.G. LEY & M. SINDEN. Bilateral Subthalamic Deep Brain Stimulation in Parkinson's Disease: The Relationship Between Pre-operative Cognitive Functioning and Post-operative Quality of Life and Mood.

Objective: Bilateral subthalamic deep brain stimulation (BSTN DBS) improves motor functioning. The purpose of this study was to examine the relationship between pre-operative cognitive status and post-operative mood, quality of life, and cognitive change.

Participants and Methods: Study participants were a group of patients ($n=19$) with advanced Parkinson's Disease who underwent BSTN DBS surgery. Participants' global cognitive status was assessed pre-operatively using the Mattis Dementia Rating Scale (DRS). Both pre-operatively and post-operatively (two months following BSTN DBS surgery), participants completed the Medical Outcomes Study Short Form (SF-36), Profile of Mood States (POMS), and an extensive neuropsychological battery.

Results: Correlational analyses revealed significant positive correlations between participants' baseline DRS total scores and change on vitality and physical functioning subscales of the SF-36 and the POMS vigor/activity subscale. Correlations between baseline DRS scores and cognitive change scores were rare and inconsistent in direction of effect.

Conclusions: This study revealed that patients undergoing BSTN DBS surgery who had higher pre-operative levels of cognitive functioning tended to report a more positive outcome in vitality and physical functioning along with self-reported feelings of vigor and activity. There was no reliable relationship between baseline DRS score and cognitive change associated with surgery. The primary limitation of the current study relates to the low incidence of marked pre-operative "dementia" in the patient sample, consistent with expectations given current guidelines for DBS surgery patient selection.

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L. KIRSCH-DARROW, L. ZAHODNE, A. MIKOS, B. SKOBLAR, C. HASS, C. JACOBSON, H.H. FERNANDEZ, M.S. OKUN, R. RODRIQUEZ & D. BOWERS. Apathy Measurement in Parkinson's disease: Comparing the UPDRS Item 4 and the Apathy Evaluation Scale.

Objective: Current practice often assesses apathy with a single item from the Unified Parkinson's Disease Rating Scale (UPDRS, item 4). Yet, the Apathy Evaluation Scale (AES) has been found to be reliable and valid in assessing apathy in PD (Starkstein, 1992). The relationship between the UPDRS item 4 and the "gold standard" AES scale is not currently known. The purpose of this study was to evaluate UPDRS item 4 in relation to the AES.

Participants and Methods: Three hundred and one PD patients were administered the AES and the UPDRS. As a group, PD patients were 67.9 years old (SD=10.4), well educated, and in moderate stages of disease severity (UPDRS motor=29.5). We compared the UPDRS item 4 to the standard AES classification of ≥ 14 as apathetic. A "receiver operating characteristics" (ROC) curve was obtained and logistic regression was used to determine sensitivity, specificity, positive and negative predictive power for UPDRS item 4.

Results: PD patients had a mean AES of 13.68 (range 0-33) and item 4 of 1.14 (range 0-4). The ROC curve showed area under the curve as .75 (best = 1.0, worst = .5). Item 4 correctly classified only 69% of patients. Sensitivity was only 52.3%, while specificity was 87.2% with positive predictive power of 64.2% and negative predictive power of 73%. Over one fourth of the PD patients with a zero score on Item 4 of UPDRS scored in the clinically apathetic range on the AES.

Conclusions: These findings suggest item 4 is not an adequate screening tool for apathy in PD. It has poor sensitivity in relation to the Apathy Evaluation Scale.

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S. KURTZ, S. REICH, A. CERNICH, P. SHORT, L. SHULMAN, K. ANDERSON, L. GRATTAN, J. KENT, W. WEINER & R.L. KANE. Automated Neuropsychological Assessment Metrics (ANAM) Tower Test Demonstrates Increased Planning Difficulties in Parkinson's Disease Patients.

Objective: Measures of executive functioning, especially timed spatial measures, are some of the earliest markers of cognitive impairment in Parkinson's Disease (PD) patients. The aim of the current study is to examine potential differences between PD patients and healthy controls on a computerized executive measure, the ANAM Tower Test.

Participants and Methods: Patients and controls were recruited from the University of Maryland Parkinson's Disease Center and completed ANAM. Of those individuals, a total of 77 patients completed the Tower Test (Control, N=47; PD, N=30). The ANAM Tower Test (ATT) consists of 5 puzzles, of increasing difficulty. The scores of interest for this analysis included mean reaction time and mean planning time (time between moves). The performance of PD patients and controls were compared, using Bonferonni corrected ANCOVAs, due to small sample size with age as a covariate.

Results: No between-group differences were noted in mean reaction time when the analyses were controlled for age. However, the ANCOVA comparing the mean planning time between groups was significant ($F(3, 74) = 9.29, p = .003$). A post-hoc t-test comparing the planning time of impaired PD and non-impaired PD patients demonstrated that the impaired PD patients were slower ($t=3.571, p=.008$). Patients were defined as impaired using traditional neurocognitive measures.

Conclusions: Computerized measures of executive function may be more sensitive to the executive deficits exhibited by patients with cognitive symptoms secondary to PD over and above the effects of age. This finding was more pronounced for the patients with greater levels of cognitive impairment.

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S.K. LAGEMAN, G.E. SMITH, J.Y. MATSUMOTO & K.H. LEE. Prevalence of Pre-Clinical Risk Factors for Neurodegenerative Disease in Parkinson's Disease Patients Presenting for Deep Brain Stimulation.

Objective: The aims of this study are to report the prevalence of pre-clinical risk factors for neurodegenerative disease in patients with Parkinson's disease (PD) who present as candidates for Deep Brain Stimulation (DBS) and to evaluate motor and cognitive outcomes of these patients post-DBS.

Participants and Methods: This is a retrospective study of thirty-four PD patients who presented as DBS surgery candidates at Mayo Clinic Rochester in 2006-2007. Medical records were reviewed to assess current/past presence of extra-pyramidal signs (rigidity, bradykinesia, postural instability, and resting tremor), visual hallucinations, fluctuating cognition/alertness, and symptoms of rapid eye movement sleep behavior disorder (RBD).

Results: In this sample, 25/34 (73.53%) patients had rigidity, 32/34 (94.12%) had bradykinesia, 28/34 (82.35%) had postural instability, and 31/34 (91.18%) had resting tremor. All patients had 2+ parkinsonian signs, meeting criteria for presence of extrapyramidal signs. No patients had evidence of cognitive fluctuations, 1 had visual hallucinations, and 4 had RBD symptoms. PD-consistent cognitive inefficiencies were noted in three of the individuals with RBD symptoms, but did not contraindicate DBS. Chi-square analysis of surgery approval and presence of risk factors for neurodegenerative disease was non-significant ($\chi^2 = 1.256, p = 0.262$). Additional motor and cognitive outcome data will be reviewed.

Conclusions: While dementia is a known contraindication for DBS, DBS outcomes on patients with pre-clinical risk factors for neurodegenerative disease are unknown. Prevalence data and longitudinal outcome studies of PD patients with risk factors for neurodegenerative disease are needed to empirically inform DBS clinical practices. Issues regarding DBS surgery recommendations and outcomes will be discussed. Correspondence: *Sarah K. Lageman, Ph.D., Psychiatry and Psychology, Mayo Clinic, 200 First Street SW, West-11, Rochester, MN 55905. E-mail: lageman.sarah@mayo.edu*

K.M. LOMBARDI & E.J. MOES. Contrast Sensitivity as a Contributor to Motor Dysfunction in Parkinson's Disease.

Objective: The purpose of this study was to explore the relationship between contrast sensitivity (CS) and motor functioning in Parkinson's disease (PD), and the effect of wearing colored lenses on both. It was hypothesized that CS would be significantly correlated with stride length (SL) and walking speed (WS) due to improved perception of optic flow and other visual parameters. The relationship between yellow lenses, blue lenses, CS, SL, and WS was also explored.

Participants and Methods: Twenty-two individuals with PD were recruited for the study, of which three were excluded from analysis due to acuity less than 20/40, measured with a Snellen chart. Nineteen PD individuals, mean age = 67.73 years (range 43-90), participated in the study. Mean symptom duration was 9.68 years. Using a repeated measures, within-subjects design, CS was measured with the Pelli-Robson chart while wearing no lenses, clear, yellow, and blue Noir Medical Technology lenses (presented in counter-balanced order). Participants were asked to walk with no assistive devices for 10 meters, during two trials for each of four conditions (no lenses, clear, yellow, and blue lenses).

Results: CS was significantly related to walking speed ($r_s = .580, p < .01$) and SL ($r_s = .516, p < .05$). Yellow tinted lenses did not improve CS, compared to baseline, while blue lenses decreased CS. Mean SL was significantly shorter when wearing blue lenses compared to no lenses.

Conclusions: CS is significantly related to stride length and walking speed in PD. Yellow lenses may be effective only under specific viewing conditions.

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P. MATTIS, D. ZGALJARDIC, E. ANASTASIO, C. TANG, Y. MA, V. DHAWAN, J. PAULSEN, M. GUTTMAN, D. EIDELBERG & A. FEIGIN. Neuropsychological Functioning in Gene Positive but Presymptomatic Patients with Huntington's Disease.

Objective: Huntington's disease (HD) is an autosomal-dominant neurodegenerative disease. Progressive cognitive impairment is a

common symptom of HD, and more subtle cognitive deficits in gene positive but pre-symptomatic patients (pHD) have been observed. We examined the pattern of change over time in neuropsychological functioning known to differentiate patients with symptomatic HD from pHD.

Participants and Methods: As part of an ongoing longitudinal progression study, 11 pHD subjects (Age 48.1 ± 10.6 ; CAG Repeats = 41.6 ± 1.75), underwent neuropsychological testing at three time points over 44 months. At baseline and the first follow-up period (18 months) all subjects remained asymptomatic. At the final visit, 4 subjects were diagnosed with symptomatic HD based on the evaluation of an experienced movement disorder.

Results: At the final time point, statistical analyses revealed significant differences between the HD and pHD groups on eight neuropsychological variables, primarily within the domains of memory and executive functioning. Follow-up analyses revealed that the majority of differences were present over the entire course of the study. However, a clear interaction was found on the CVLT-2 (sum), resulting from pHD subjects declining performance between time points 2 and 3. Similar trends were found on other measures: Trail Making Test (B), the Rey Complex Figure (30-minute delay), and the Symbol Digit Modality Test (written).

Conclusions: These findings support the presence of cognitive deficits in pHD patients, especially as they approach disease onset. A meaningful decline in tests of executive function over 2 years may herald the onset of symptomatic HD.

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M.K. MURPHY, J. CHAPIN, A. REZAI & C. KUBU. Impulse Control Disorder Behaviors are Frequent in PD DBS Candidates and Unrelated to Medication Status.

Objective: Several groups have demonstrated that the prevalence of impulse control behaviors (ICBs), including hypersexuality, compulsive gambling and shopping, is inflated in patients with Parkinson Disease (PD) and that the behaviors are related to L-DOPA and/or dopamine agonists (DA) use. The current study examined the predictive relationship between Levodopa equivalent daily dose (LEDD) and ICBs, and the specific effect of DA therapy.

Participants and Methods: 137 consecutive patients with PD completed a neuropsychological assessment as part of their standard pre-operative investigation to determine candidacy for placement of deep brain stimulation (DBS) electrodes. A structured interview was completed with all participants that included questions addressing ICBs.

Results: Approximately 40% of patients reported a clear increase in ICBs following the diagnosis of PD. Participants were grouped by presence ($n=54$) or absence ($n=83$) of reported increase in ICBs.

A series of logistic regressions were computed to assess if LEDD predicted ICBs group status and if DA use specifically provided additional predictive utility. All of these analyses were nonsignificant. Further analyses examining medication status x age and medication status x gender interactions were also nonsignificant in predicting ICBs.

Conclusions: Results are inconsistent with existing literature suggesting L-DOPA and/or DA are related to ICBs. Almost 40% of our sample reported ICBs, which is much higher than previous reports. This may reflect differences in patient samples and/or ICBs criteria. Nonetheless, these data highlight the fact that ICBs symptoms are frequent in PD DBS candidates and may be very distressing to the patient and family even though they may not meet strict criteria for Impulse Control Disorder. Furthermore, these data suggest that ICBs may not simply reflect overall dopamine burden and raise the possibility of a multifactorial etiology for ICBs.

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C. NEHL, J. PAULSEN, K. DUFF, D. LANGBEHN, N. DOUCETTE, C. ROSS, M. GUTTMAN, A. AGARWAL, C. GIAMBATTISTA & .. PREDICT-HD INVESTIGATORS OF THE HSC. Functional outcomes and quality of life in pre-diagnosed Huntington's disease: Seeking outcome measures for clinical trials.

Objective: Selecting appropriate outcome measures is critical for successful clinical trials, and governmental regulatory agencies are increasingly asking for daily functioning or quality of life measures. These measures might be even more critical in trials aimed at very early disease phases (i.e., prior to full symptomatic onset). The current study sought to identify functional outcome measures for clinical trials in pre-diagnosed HD.

Participants and Methods: Seventy individuals with pre-diagnosed HD (i.e., have the HD gene expansion without a current diagnosis) from the PREDICT-HD study participated. They completed self-report measures of work productivity, social adjustment, quality of life, and depression. Participants' performance on a neuropsychological battery was also obtained.

Results: Compared to community norms, participants exhibited more difficulties in social adjustment (23% impaired) and subdomains of quality of life (22% health, 17.1% family). Poorer social adjustment and quality of life were associated with increased depressive symptoms. The relations between functional measures and other markers of HD onset (e.g., years to expected onset, neuropsychological measures) were nonsignificant. While few difficulties were reported on a measure of work productivity, total hours worked per week varied. Fewer hours employed was associated with slower cognitive processing speed and more motor symptoms.

Conclusions: Pre-diagnosed HD individuals exhibited more social and quality of life difficulties than controls, which was associated with increased depressive symptoms. Relations between functional measures and other markers of HD onset, however, were minimal. Decreased awareness in participants could contribute to poorer associations between self-reported functional measures and early HD markers. Regardless, the current study better informs researchers about functional outcome measures needed for clinical trials in pre-diagnosed HD. Results also highlight the need to assess depression in pre-diagnosed HD. Correspondence: *Carissa Nehl, Medical Psychology, The Mayo Clinic, 200 1st St SW, Rochester, MN 55905. E-mail: carissa-nehl@uiowa.edu*

E. PIROGOVSKY, J. GOLDSTEIN, G. PEAVY, M. JACOBSON, R. KIM, J. COREY-BLOOM & P. GILBERT. Memory for Temporal Order in Presymptomatic Gene Carriers for Huntington's Disease.

Objective: The identification of sensitive markers for preclinical changes in Huntington's disease (HD) may play a critical role in the development and implementation of future interventions to delay the onset of HD symptoms. Studies suggest that the frontal lobes may be important for accurate temporal order memory. Since the frontal-striatal loop is affected very early in the course of HD, temporal order memory may be particularly sensitive to neuropathological dysfunction in presymptomatic HD and may serve as a powerful tool for the early detection of cognitive changes in preclinical stages of this disorder.

Participants and Methods: Twelve presymptomatic gene carriers and 12 non-gene carriers were administered a visuospatial temporal order memory task on a computerized radial 8-arm maze. On the study phase, the participant was shown a random sequence of circles presented one at a time at the end of each of the eight arms. On the choice phase, the participant was presented with a circle at the end of two of the study phase arms and was asked to choose the circle that came earlier in the sequence. Parametric manipulations of the temporal metric were carried out by systematically changing the temporal separation lag between the two circles in the choice phase.

Results: Both groups showed superior performance on distal temporal separation lags compared to proximal temporal separation lags. However, presymptomatic gene carriers demonstrated significant impairments relative to non-gene carriers on more proximal temporal separation lags.

Conclusions: These results suggest that temporal order memory may be sensitive to preclinical cognitive changes in HD.

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T. SCHENKENBERG, P.A. HOUSE, J.D. STEFFENS & D.J. BALLARD. Verbal Fluency in Candidates for Deep Brain Stimulation (DBS) Surgery.

Objective: Our interdisciplinary team (neurology, neuropsychology, physical therapy and neurosurgery) screens Parkinson's disease (PD) patients for DBS surgery to exclude candidates who may have poor outcomes. Early, poor verbal fluency has been reported to predict subsequent dementia in PD patients, but no verbal fluency standards exist with regard to DBS surgery. The purpose of this project was to retrospectively analyze verbal fluency in candidates for DBS surgery.

Participants and Methods: Fifty-five patients, ages 44-85 have been evaluated since 2003. Cutoff scores for passing the neuropsychological screening process were based upon published reports. The FAS test of verbal fluency was included in the test protocol.

Results: Six candidates did not pass the standard neuropsychological cutoff scores. Their FAS scores were 24, 39, 19, 20, 25 (mean = 25.4), with one patient being unable to fully participate. The mean FAS score for the 49 patients who passed the screening process was 32.7, a score that is comparable to the published "metanorm" mean for normal subjects. However, 4 of 49 patients who passed the standard cutoff scores achieved FAS scores well below expected levels, i.e., 19, 12, 12, 18.

Conclusions: Poor verbal fluency test scores are uncommon in DBS candidates who pass standard neuropsychological cutoff scores, while they are common among patients who do not pass the standard cutoff scores. If low verbal frequency scores prove to independently predict hastened neuropsychological deterioration following DBS implantation, formal verbal fluency standards may augment DBS candidacy criteria. Correspondence: *Thomas Schenkenberg, Ph.D., Neurology, University of Utah, 30 N. 1900 E., Salt Lake City, UT 84132. E-mail: thomas.schenkenberg@hsc.utah.edu*

K. WEAVER, T.L. RICHARDS, O. LIANG & E.H. AYLWARD. Cognitive Decline and Corticostriatal Tract Integrity in Preclinical Huntington's Disease.

Objective: Huntington's disease is an inherited, neurodegenerative disease resulting in idiosyncratic choreatic motor abnormalities. Prior to the onset of motor complications individuals who test positive for the HD gene mutation often develop subtle yet significant declines of various cognitive abilities. In the current study, we used diffusion tensor imaging (DTI) and single voxel magnetic resonance spectroscopy (1H MRS) to examine whether declining cognitive abilities are associated with corticostriatal abnormalities in presymptomatic HD (pHD) individuals.

Participants and Methods: Whole brain diffusion measurements were collected and axial and radial diffusivity values, which reflect axonal and myelin integrity, respectively, were extracted. 1H MRS metabolite concentrations were collected from three voxels placed at points within the corticostriatal pathway, including lateral orbitofrontal cortex, caudate nucleus, and white matter connecting these two regions. Cognitive testing included the Stroop task (ST), Symbol Digit Modalities (SD) and Verbal Fluency (VF).

Results: pHD individuals performed significantly worse than matched controls on SD and VF, with similar performance on ST. A significant positive correlation was observed between SD performance and axial diffusivity measurements extracted from the volume of tissue from within the white matter spectroscopy voxel but only in the pHD group. At the level of the cortex, significantly decreased NAA levels were observed in the pHD group relative to controls.

Conclusions: Because NAA is considered to be a marker for neuronal stability, the combined data suggest that cognitive declines in pHD may be a function of decreased cortical projection neurons prior to the onset of motor symptoms.

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F.S. WINSTANLEY, J.A. BOBHOLZ, M. SHARLAND, D. LEE, S. GREMLEY, S. HUNG, B. HINER, K.A. BLINDAUER, C. SHERIDAN & B. KOPELL. Postoperative outcome of Deep Brain Stimulation (DBS) in an elderly population.

Objective: To examine cognitive outcome in elderly patients undergoing DBS. At the present time, little is known about this population; however, there is no consistent data to suggest age alone is a predictor for patients undergoing DBS.

Participants and Methods: Five patients ages 71-85 underwent DBS surgery at our center from 2000-2005. 4 patients had bilateral STN (2-PD, 2-ET); 1 patient was staged; 1 patient had a left VIM for treatment of PD. One of the bilateral STN patients also underwent replacement of the left STN with a left VIM 6 months following the original surgery. All patients had comprehensive pre- and postoperative neuropsychological testing.

Results: All patients showed a significant postoperative decline on at least one neuropsychological measure. Most patients declined on verbal memory tests, the WCST, and SDMT. One patient showed a significant generalized decline; however, his particular profile suggested a possible progressive dementia rather than surgery induced decline. Only one patient showed significant decline on verbal fluency tests.

Conclusions: These results are preliminary, but showed that all patients declined on at least one measure and most decline was noted on tests other than verbal fluency. The strengths of this study are that outcome data in DBS surgery patients of such an old age are rarely reported. However, these results do not imply that age itself is a significant predictor of outcome and examination of other predictor variables in this population (e.g. MCI, small vessel disease) is ongoing at our center.

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Hydrocephalus

E. AUSTRIA, M. LACY, S. HUNTER, D. FRIM, K. KASZA & C. LEE. Executive Functioning in Children with Shunted Hydrocephalus.

Objective: In the present study we directly examine the executive functioning of children with shunted hydrocephalus compared to peers on measures of executive functioning.

Participants and Methods: Comparison of demographic and measures between shunted patients and controls was performed using two-sample t tests for continuous measures and chi-square tests for categorical measures. Nonparametric tests were also performed (not shown), and conclusions were similar. Since there were multiple outcomes of interest, the nonparametric test for multiple endpoints due to O'Brien (1984) was applied to the cognitive measures: CAS_EA, CAS_RA, CAS_PC, FDI, GDS and Digit Span. O'Brien's procedure maintains the type I error rate, and it is best used when differences are expected for all of the endpoints. A p-value ≤ 0.05 was considered statistically significant. All analyses were performed using Stata, Version 9.

Results: 41 shunted patients and 18 controls were included in the analyses. Controls performed significantly better on selective tasks of attention (CAS, $p=.05$) and working memory (WISC-III FDI, $p=.01$). Children with hydrocephalus were more likely to miss information and to

respond impulsively (Commission errors, $p=.03$; Distractibility-Commission errors, $p<.01$; Distractibility-Total Errors, $p<.01$). The p -value from O'Brien's overall test was 0.03 indicating that there was a statistically significant difference in executive functioning (as assessed using the outcomes measured) between the two groups.

Conclusions: Children with early shunted hydrocephalus showed significantly impaired processing speed, resistance to distractibility and attentional focus compared to their peers. Further studies examining early intervention of attentional deficits on later academic skills may prove especially beneficial.

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A.L. HESTER, L.H. LACRITZ, K.C. SAINÉ, J.A. WHITE, E. ALLEN, E. PETERSEN, M. MINO & C.M. CULLUM. Neuropsychological Performance Following Lumbar Drain in Patients Undergoing Evaluation for Treatment of Normal Pressure Hydrocephalus.

Objective: Cognitive dysfunction associated with normal pressure hydrocephalus (NPH) can improve with ventriculoperitoneal (VP) shunt placement, and clinical improvement subsequent to lumbar drainage of CSF has been used to identify patients likely to benefit from shunting. To examine the utility of neuropsychological assessment in NPH, baseline and post-drain results from subjects who were later shunted (S) were compared with results from those who were not shunted (NS).

Participants and Methods: Fifty-two consecutive patients with presumed NPH (S = 22, NS = 30) were administered the MMSE, Trail Making Test (TMT), Verbal fluency (FAS, Animals), Digit Span, and Hopkins Verbal Learning Test-Revised. Baseline results were analyzed using independent samples t -tests, and pre-post drain results were assessed with repeated measures ANOVA.

Results: The groups were similar in terms of age and education, and at baseline, S and NS groups did not differ neuropsychologically. However, pre-post drain ANOVAs revealed significant differences on Animal fluency ($F_{1,45} = 5.50, p = .023$), Digits Backward ($F_{1,23} = 78.05, p = .001$), and MMSE ($F_{1,50} = 4.08, p = .049$), with shunted patients showing improvements post-drain. The S group also improved on FAS and TMT Part B post-drain, though these differences were nonsignificant.

Conclusions: NPH patients who were subsequently shunted showed neuropsychological improvement post-lumbar drain, while the non-shunted group remained stable. Results suggest that serial cognitive assessment pre-post lumbar drain may assist in the selection of appropriate surgical candidates.

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L. MEDALIE, J. REESMAN, C. VONTHOMSEN, S. DEMETRIDES, E. LEVEY & A. ZABEL. Initiation deficits and adaptive dysfunction in youth with myelomeningocele and shunted hydrocephalus.

Objective: Adolescents with myelomeningocele and shunted hydrocephalus (MMH) frequently present with symptoms of executive dysfunction and struggle to achieve self care independence as they transition into adulthood. We sought to examine the potential relationship between executive and adaptive dysfunction that might contribute to this transitional difficulty.

Participants and Methods: During routine medical appointments, indices of adaptive and executive functioning in 27 youth (10 females) with MMH (mean age = 10.6 +/- 3.7 years, range = 5-18 years) were collected using the ABAS-II (Harrison & Oakland, 2003) and BRIEF (Gioia et al., 2000) parent report rating scales.

Results: Mean standard scores were low for each ABAS-II composite scale when compared to published norms (test value = 100), and a significant within MMH-group discrepancy ($p \leq .001$) was noted between

the mean Practical Composite (SS= 75.1) and the mean Conceptual (SS= 85.4) and Social Composites (SS=88.6). Specific practical skill concerns were noted in Self Care (mean ScS= 4.7 +/-3.6) and Home Living (mean ScS= 5.4 +/-4.1). The BRIEF Metacognition Index (MI; mean T= 64.7) was significantly higher (i.e., more problematic) than the Behavioral Regulation Index (mean T= 59.1) ($p < .05$). No significant relationship was observed between the ABAS-II and BRIEF Composite scales. However, significant negative correlations were noted between the Initiate subscale of the BRIEF MI and 6 of the 9 subscales of the ABAS-II (Functional Academics, Home Living, Health and Safety, Leisure, Self-Direction, and Social).

Conclusions: These data suggest a strong link between initiation and the general adaptive abilities of children and adolescents with MMH.

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M.D. SWARTWOUT, P.T. CIRINO, J.M. FLETCHER & M. DENNIS. Cognitive Posterior Attention Deficits in Spina Bifida Meningomyelocele Are Unrelated to Parent ADHD Ratings.

Objective: Children with spina bifida meningocele (SBMM) and hydrocephalus have attention impairments, especially for posterior attention functions such as disengaging and shifting. To evaluate the effects of hydrocephalus on attention, we compared anterior and posterior attention in two clinical groups, both with hydrocephalus but one (SBMM) with dysmorphologies of the posterior cortex and midbrain. We also related test function to parent ratings of inattention and hyperactivity and to cortical volumes.

Participants and Methods: One hundred one children with SBMM, 17 with Aqueductal Stenosis (AS), and 40 typically developing control children (ages 8-18) were given the Gordon Vigilance Task, and their parents rated their inattention and hyperactivity on the SNAP-IV behavioral questionnaire. Cortical brain volumes were obtained from structural magnetic resonance imaging scans.

Results: Compared either to children with AS or to controls, children with SBMM were impaired on posterior but not anterior behavioral measures. Oculomotor abnormalities were associated with slower reaction time. While the presence of ADHD symptomatology in SBMM was relatively high (35%), this classification was not associated with attention task performance. White and gray matter volumes were uncorrelated with task performance.

Conclusions: Children with SBMM display a distinct pattern of attentional strengths and weaknesses that, because they are not apparent in children with AS, are likely due, not to hydrocephalus, but to the unique posterior cortex and midbrain dysmorphologies of SBMM.

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M.D. SWARTWOUT, S.L. GARNAAT, K.A. O'BRIEN, J.M. FLETCHER & M. DENNIS. Interactions of SES, IQ, and Achievement in Spina Bifida Meningomyelocele.

Objective: Spina bifida meningocele (SBMM) is associated with a phenotypic pattern of higher verbal than nonverbal IQ scores. However, this pattern has been evaluated primarily in children who are Caucasian and middle class with lower spinal lesions. We explored the relation of IQ and academic outcomes with ethnicity, lesion level, and SES in SBMM.

Participants and Methods: Caucasian (n=156) and Hispanic (n=81) children with SBMM and shunted hydrocephalus received the Stanford Binet Test of Intelligence-IV (SB) and achievement subtests of the Woodcock-Johnson-Revised (WJR). SES was determined from parent questionnaires.

Results: Multivariate analysis revealed a significant Score-Ethnicity-SES interaction. Hispanic children with lower SES had lower verbal than nonverbal scores. In contrast, the expected pattern of higher verbal than nonverbal IQ was found in Hispanic children with higher SES and Caucasian children at all levels of SES. Follow-up analyses indicated that lower lesion level predicted higher nonverbal IQ, while low lesion level, Caucasian ethnicity, and higher SES predicted higher verbal IQ. An interaction of verbal and nonverbal IQ predicted both reading and math performance; the positive relationship between nonverbal IQ and academic achievement attenuated as verbal IQ increased.

Conclusions: Lower SES is associated with lower verbal IQ primarily in economically-disadvantaged Hispanic children with SBMM. Furthermore, academic achievement appears to be largely correlated with verbal IQ, which may compensate lower nonverbal IQ.

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Medical Disorders

S.P. CERCY & B. BRONSON. Cognitive Dysfunction In A Case Of Pre-Treatment Diffuse Large B-Cell Lymphoma.

Objective: Cognitive impairment is well-known with primary CNS lymphoma, intravascular lymphoma, and iatrogenic effects of chemotherapy and whole-brain radiation for treatment of cancer. We describe cognitive deficits in a case of treatment-naïve diffuse large B-cell lymphoma (DLBCL).

Participants and Methods: A 48 year-old, right-handed, African-American man presented with community-acquired pneumonia and associated delirium; sensorium cleared quickly on antibiotics, but low-grade fever persisted. Pulmonary TB was ruled out. CD4 count was 40 and pancytopenia was present, but repeat HIV ELISA screens were negative. Axillary lymphadenopathy was identified; pan-body CT revealed diffuse nodules suggesting metastatic disease. Lymph node biopsy confirmed advanced DLBCL. Prior medical and psychiatric history were unremarkable. He had a history of cocaine dependence in remission. MRI with contrast showed mild microvascular disease. He underwent neuropsychological evaluation; 2 weeks later, he started chemotherapy.

Results: Impairments were found in visual recall memory, processing speed, confrontation naming, visuospatial organization, and cognitive flexibility. Attention, verbal fluency, and abstraction were deficient. Verbal memory and logical reasoning were within expected limits.

Conclusions: This patient showed no gross evidence of lymphoma-related CNS involvement, delirium had resolved, and chemotherapy began following neuropsychological evaluation. We propose that cognitive dysfunction may occur in a subset of treatment-naïve individuals with DLBCL even in the absence of gross CNS involvement. A putative mechanism centers on deleterious effects of B-cell-mediated cytokine secretion on central neurons. Moreover, we speculate that individual-difference factors such as apolipoprotein E genotype may operate as mediating variables and account in part for cognitive variability.

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A. DOREMAN, R.D. NASS, C.M. ZAROFF, L. BURTON & W. BARR. Autistic Symptomology and Cognitive Functioning in Tuberous Sclerosis Complex.

Objective: The neuropathological correlates linking Tuberous Sclerosis Complex (TSC) and autism, and the relationship between behavioral features of autism and intellectual functioning of patients with the disorder remains equivocal. Furthermore, the relation between tuber count

and cognitive impairment and autism has been inconclusive. The objectives of this study were to examine the association between infantile spasms and autistic symptoms in patients with TSC and whether the presence of autistic symptomology was associated with cognitive impairment. Furthermore, this research addressed whether increased tuber count is associated with autistic symptoms and cognitive impairment in TSC.

Participants and Methods: Neuropsychological data and scores on the Gilliam Autism Rating Scale (GARS) and Social Communication Questionnaire (SCQ) were collected from 34 patients with TSC. Information was also collected on the presence/absence of infantile spasms, and magnetic resonance imaging data from a subset of patients, (N=24) were reviewed to determine total tuber count of each participant.

Results: Results revealed a significant relationship between autistic symptomology and lower cognitive functioning in patients with TSC as determined by the GARS Autism Quotient ($p < .001$) and SCQ score ($p < .001$). Patient history of infantile spasms was not associated with autistic symptomology. No association was found between tuber count and intelligence or autistic symptomology.

Conclusions: This investigation provides evidence that higher autistic symptomology is associated with reduced intellectual functioning in TSC patients. Early behavioral interventions for patients with TSC-autism might thus be useful in enhancing cognitive functioning.

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J. ELDER, S. THRASHER & L. KIRKLAND-CULP. Neuropsychological profiles of patients with cardiovascular disease: Increasing levels of risk factors and memory impairment.

Objective: Multiple risk factors contribute to the development of cardiovascular disease (CVD). Hypertension, hyperlipidemia, and diabetes are among the most common risk factors for CVD. The effects of CVD on the heart and circulatory systems have been well documented; however, the effects of acute and chronic risk factors as they relate to cognitive functioning are unclear. Studies suggest mixed results regarding memory functioning in patients with CVD risk factors. In some cases there were reports of decline in cognitive performance among persons at risk for cardiovascular disease, whereas, other studies found no relationship between cognitive performance and risk factors for CVD. The present study examined memory functioning using the California Verbal Learning Test-Second Edition (CVLT-II). It was hypothesized that an increase in the number of CVD risk factors would be positively correlated with decreased memory performance.

Participants and Methods: The participants for this study included 40 individuals previously diagnosed with hypertension, diabetes, hyperlipidemia, or some combination thereof. Diagnoses were made by health care providers at the Atlanta Veterans Affairs Medical Center.

Results: Diabetes appeared to be the most significant risk factor irrespective of concomitant risk factors such as hyperlipidemia and hypertension. Diabetes accounted for the most significant decline in short-delayed free recall ($p < .05$), long-delayed free ($p < .05$), and cued ($p < .05$) recall, and recognition hits ($p < .01$), in comparison to persons with hypertension or hyperlipidemia. Surprisingly, having hypertension or hyperlipidemia with diabetes did not result in further memory decline.

Conclusions: Results suggest that cardiac patients with diabetes are at the greatest risk for developing memory problems. The current standard of practice promotes an aggressive attempt to control hypertension in cardiac patients. This study suggests that equal or greater attention should be given to cardiac patients with diabetes.

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K.F. HOTH, A. POPPAS, D.J. MOSER, R.H. PAUL & R.A. COHEN. Cardiac Dysfunction is Associated with Cognition in Older Adults with Heart Failure.

Objective: Previous studies have implicated decreased systemic perfusion as an etiological factor in the development of cognitive deficits in cardiovascular disease. The aim of this study was to characterize cognition in patients with moderate to severe heart failure and examine the association between two measures of systemic perfusion (i.e., ejection fraction, cardiac index) and cognition.

Participants and Methods: Thirty-one patients with moderate to severe heart failure and 31 patients with cardiovascular disease and no heart failure completed a medical history interview and neuropsychological assessment. Participants with heart failure additionally underwent an echocardiogram to assess cardiac function.

Results: Patients with heart failure performed significantly worse than the cardiovascular disease- no heart failure group on several measures of executive functioning and psychomotor speed. Among the heart failure group, lower ejection fraction was associated with weaker global cognition, performance on several, but not all, measures of executive functioning, and was marginally associated with delayed memory. Decreased cardiac index was associated with poorer immediate memory and weakly associated with global cognition.

Conclusions: The results suggest that depressed systemic perfusion is associated with cognitive deficits among patients with heart failure. Research including measures of cardiac function, cerebral perfusion, and cognition will be necessary to clarify the causal nature of the suggested mechanism.

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S. HUIJBREGTS, I. ROWBOTHAM, S. DE BREIJ, I. PIT-TEN CATE & L. DE SONNEVILLE. Diffuse Cognitive Impairment in Adolescents with Neurofibromatosis Type 1.

Objective: To assess whether patients with Neurofibromatosis Type 1 (NF1), where mutations of the gene that codes for the protein neurofibromin have been associated with impaired tumor suppression, synaptogenesis and neuronal differentiation, present with specific or diffuse cognitive impairment using task paradigms tapping into different cognitive domains at lower and higher information processing levels.

Participants and Methods: 16 NF1 patients and 16 age- and sex-matched controls (mean age: 14.5 years, SD: 1.3) performed computerized tasks measuring perception (Feature Integration (FI)), executive functioning (inhibitory control and cognitive flexibility: Response Organization-Arrows (ROA); working memory (Memory Search 2 Dimensions (MS2D)), and motor control (Tracking (TR) and Pursuit (PU)). Data were analyzed with repeated measures ANOVAs.

Results: NF1 patients performed poorer and traded speed for accuracy more than controls on all tasks. Accuracy deteriorated more for NF1 patients than for controls when working memory load increased in MS2D [$F(1,30) = 19.1, p < .001$], when inhibitory control [$F(1,30) = 6.3, p = .018$] and flexibility [$F(1,30) = 3.5, p = .071$] were required in ROA, and when unexpected movements (PU) were required rather than pre-defined movements (TR) [$F(1,30) = 6.2, p = .019$]. The group x information processing level interaction for FI was not significant initially, but a trend was observed after control for processing speed [$F(1,29) = 3.3, p = .082$].

Conclusions: NF1 is associated with diffuse cognitive impairment. The results may be interpreted as indirect support for the reduced connectivity hypothesis for NF1 which suggests that information processing will be particularly impaired when it involves (functional connectivity between) multiple brain areas.

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C. NABER, A.L. BERNSTEIN, B. MORGAN & L. HAMMOND. Migraine Prodromes: A Complex Neurophysiologic Process of Cognitive, Emotional and Physical Symptoms.

Objective: Migraine is a complex neurophysiologic phenomenon where pain occurs in the later half of the event. Neurochemical changes may trigger symptoms that precede the onset of pain, nausea, and photophobia. The earlier migraine treatment can be initiated, the greater likelihood of successful amelioration of pain and disabling symptoms. This study attempted to identify prodromes to migraine in order to optimize treatment windows.

Participants and Methods: One hundred and two patients participated in open-ended interviews with a neurologist, specializing in headache care. Patients were previously diagnosed with migraine by International Headache Society criteria as part of their participation in the headache clinic of a large non-profit HMO. Patients were asked to describe symptoms that predicted the onset of migraine. Frequency counts were conducted to determine the most common reproducible descriptive terms of prodromes and the timeframes at which they occur.

Results: Patients symptoms grouped into physical, emotional and cognitive prodromes. Patients reported mostly physical prodromes (71.56%), followed by emotional (50.00%) and cognitive (12.74%) ones. The most commonly reported predictor of migraine was irritability (40.20%) and fatigue (29.41%). 79% of patients were able to estimate the timing of prodrome symptoms. The greatest number of prodromes was reported to occur 13 to 24 hours prior to the onset of migraine (51.7%), with most symptoms occurring in the 1st 24 hours before migraine (93.2%).

Conclusions: Physical and emotional symptoms appear to commonly precede migraine in the 24 hour period before the onset of pain. Tracking of symptoms prior to the onset of pain could lead to earlier intervention and prevention of the pain and disability associated with migraine.

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C. NABER, O. WATER-SCHMEDER, P. BOHRER, K. MATONAK, A.L. BERNSTEIN & L. HAMMOND. Mindfulness, Dialectical Behavior Therapy, and Vestibular Rehabilitation: A Transdisciplinary Approach to Coping with Vestibular Problems.

Objective: The aim of this study was to determine the effectiveness of a group treatment that utilized Dialectical Behavior Therapy (DBT), mindfulness, and vestibular rehabilitation techniques.

Participants and Methods: Thirty eight patients with vestibular problems participated in a group program designed to improve vestibular symptoms. Patients had participated in an interdisciplinary evaluation panel and were invited to participate in further group treatment. Treatment groups had 3 to 8 patients and met every other week for 5 sessions. Groups were co-led by a neuropsychologist and physical therapist. Patients were taught vestibular rehabilitation techniques, as well as core skills of mindfulness and DBT. Pre and post measures of physical and emotional functioning, as well as dizziness were given. Measures included the BDI2 and BAI, SF 12v2 Health Survey, Dizziness Handicap Inventory, and Functional Level Scale. Additional rating scale measures of impairment, coping with symptoms, and patient satisfaction were given.

Results: There were no significant differences between patients' scores before and after treatment on specific measures of depression, anxiety, or mental health. After group treatment, patients reported better physical coping (SF12 PCS: $p=0.004$) and functionality (FLS: $p<0.0001$), as well as fewer limitations from dizziness (DHI: $p<0.0001$). Rating scale measures of impairment ($p<0.0001$) and coping ($p<0.0001$) were significant as well. Patients felt that the group was informative, influential, and effective and reported greater use of skills after treatment ($p<0.0001$). 97.3% of participants felt that the group was more effective than previous treatment.

Conclusions: The results suggest that the group treatment was highly effective at improving functionality, increasing coping, and decreasing symptoms of dizziness among patients with vestibular problems. Patients were highly satisfied with the group and reported it to be more effective than previous treatment.

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T. PATERSON, S. GELB, R.J. SHAPIRO & W.J. THORNTON. Self-Reported Depressive Symptoms and Age Predict Medication Adherence in Successful Renal Transplant Patients.

Objective: We have recently reported diminished cognitive functioning following kidney transplant, which may have vast implications for real-world illness management issues, such as medication adherence. This said, the impact of potentially important modifiers of cognitive performance following transplant remains unknown. The present study assessed the ability of self-reported distress to predict medication adherence in persons following successful renal transplant. Specifically, we examined the utility of the four factors of the CES-D (Depressed Affect, Positive Affect, Somatic Symptoms, and Interpersonal Symptoms) toward predicting adherence.

Participants and Methods: Forty-four renal transplant patients completed the CES-D and Transplant Effects Questionnaire (TxEQ), a measure designed to assess organ recipient's behavioral and emotional response following transplantation. Through linear regression, we examined the relationship between the CES-D factor scores and medication adherence (reported on the TxEQ).

Results: After controlling for age, gender, and education, CES-D score was highly predictive of medication adherence; increased depressive symptoms predicted decreased adherence. After controlling for age, only the Positive Affect factor of the CES-D predicted adherence; participants reporting decreased positive affect reported lower adherence. Age was also a significant predictor of adherence, such that increased age predicted decreased adherence; this remained significant after controlling for degree of Positive Affect.

Conclusions: It appears that older age and positive affect may be important modifiers of medication adherence in renal transplant patients. These results show that the CES-D Positive Affect factor, which contains four questions, is a good predictor of medication adherence in this population, indicating the potential usefulness of this brief screening measure in assessing renal transplant patients.

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B. POTTER, P. BROUWER, M.F. OCKU, Z.E. DREYER & K.R. KRULL. The Reliability and Predictive Validity of a Neurocognitive Screening Battery to Identify Learning Problems in Children with Cancer.

Objective: To evaluate the reliability and validity of a screening battery in children with cancer and to demonstrate better sensitivity and specificity for academic problems of this screen compared to parent report.

Participants and Methods: Of the 248 total children, 48 (age 6-20 yrs) were retested within a two year period, and 52 (age 6-20 yrs) had a follow-up comprehensive neuropsychological assessment. Children were recruited consecutively from a clinic for long-term survivors of childhood cancer. The screen's performance measures included the Trail Making Test, Grooved Pegboard, Verbal Fluency, and Digit Span. Parents completed academic and behavior ratings using the Child Symptom Inventory. A global index of mean performance was used to summarize screen performance. This index was compared to cut-off scores of SS=85 for IQ and SS=80 for academics.

Results: Reliability of the index was good, $r(48)=.715$, $p<.001$. For validity, the performance measures from the screen significantly pre-

dicted FSIQ, PIQ, VIQ (all $r's>.5$, $p's<.001$) and academic achievement ($r's>.35$, $p's<.025$) from the comprehensive evaluation, while parent ratings did not ($p's>.05$). Significantly higher sensitivity, specificity, and positive and negative predictive value, determined using Chi-Square, were demonstrated using the screen's performance measures for IQ's and academic performances. Parent ratings were non-significant and unreliable predictors of specific academic performance.

Conclusions: In a sample of long-term survivors of childhood cancer, screening of sensitive neurocognitive abilities is a reliable method of identifying children at greatest risk for cognitive deficits. Such screening may be helpful as they predict true cognitive and learning problems more accurately than parent report of children's academic performance. Correspondence: *Brian Potter, Psy.D., Texas Children's Hospital/Baylor College of Medicine, 6621 Fannin St CC 1630, Houston, TX 77030. E-mail: bspotter@bcm.edu*

M. PRIMEAU, C. BLODGETT DYCUS, G. SIVARAJAN, K. BARTON, H. BROWN, E. MELIAN & V. PRABHU. Does Preoperative Cognition Discriminate among Primary CNS Tumor Types?

Objective: While the utility of neuropsychological findings for operative planning and outcome prediction is well established in epilepsy surgery, scant work in this vein has been published for primary CNS tumors. Since the neuro-oncologist's treatment goal is to preserve function while optimizing survival, predictive information from preoperative assessment may be quite valuable.

Participants and Methods: Preoperative results from 14 consecutively referred adults were categorized by normative comparison as normal, marginal, or impaired for the domains of attention, perception, construction, naming, verbal fluency, verbal memory, executive function, and motor function. Sample characteristics were: mean age: 47.4 years (range 25-67), mean years of formal education: 14.7 (range 8-18), 9/14 patients were male, 11/14 were right-handed, and 8/14 had a left-hemisphere tumor site. Tumor type (postoperative pathology) was either glioblastoma multiforme, low-grade glioma (oligodendroglioma, oligoastrocytoma), or meningioma.

Results: Inspection of distributions did not suggest a main effect of tumor type on overall impairment. Nonparametric analyses indicated that phonemic verbal fluency was significantly more likely to be worse among GBM patients (Chi-square=22.8, $df=6$, $p<.01$), an unexpected selective contrast. Fluency was also more often impaired with left-sided lesions (4/8 left, 1/5 right). Asymmetry of motor function was rarely concordant with lesion side.

Conclusions: Results suggest that GBM, perhaps by virtue of its invasiveness and rapid change, interferes more with on-line verbal processing speed than the other tumor types. Further accrual of cases is needed for replication. If preoperative profiles help predict tumor type, decisions about the risk/benefit of aggressive resection may be more objective.

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C. STEPNOWSKY, J. PALAU, T. ZAMORA & J. HAMILTON. Effect of Adherence with Sleep Apnea Treatment on a Psychomotor Vigilance Task.

Objective: Obstructive sleep apnea (OSA) results in impaired daytime alertness that impacts daily functioning. The gold standard treatment for OSA is continuous positive airway pressure (CPAP) therapy, but it is unknown whether extended use of CPAP will provide greater symptom alleviation. The goal of this study was to evaluate the effect of adherence to CPAP treatment on vigilance in OSA patients.

Participants and Methods: Eighty-five predominately male (96%) OSA patients from a larger study of CPAP adherence were included. Patients had a mean age of 57 ± 12 (range: 28-83), mean body mass index of 33 ± 6.7 (range: 22-63), and severe OSA (mean number of apneas and hypopneas per hour of sleep = 35 ± 21 ; range: 15-104). All were given

identical CPAP instruction and followed for one month. Measures were taken at baseline and at one month. The computerized Psychomotor Vigilance Test (PVT), a sustained vigilance/attention reaction time test, assessed behavioral alertness. Participants responded as quickly as possible to the random appearance of a white dot presented on a black screen for 50 ms.

Results: Data indicated that OSA patients with higher CPAP adherence levels had improved scores on the Psychomotor Vigilance Test, including faster reaction time ($r = -.241$; $p = .031$) and fewer minor lapses ($r = .210$; $p = .050$).

Conclusions: This study suggests that higher levels of CPAP adherence are associated with greater improvements in vigilance. The data supports the hypothesis that extended use of CPAP provides greater symptom alleviation. Future research needs to examine the nature of this relationship to better inform the length of CPAP use that best impacts key clinical outcomes. Correspondence: *Carl Stepnowsky, PhD, VA San Diego Healthcare System, 3350 La Jolla Village Drive, San Diego, CA 92161. E-mail: cstepnowsky@ucsd.edu*

J. SUHR, E. MARK, J. KINKELA, C. FRANCE & J. FRANCE. Neuropsychological Impairment associated with Hypertension.

Objective: Studies have demonstrated neuropsychological impairment in both treated and untreated hypertensives, with deficits observed in verbal and visual memory, visuospatial/ constructional skills, psychomotor speed, attention/working memory skills, and abstract reasoning/executive functioning. We examined the relationship of hypertension diagnosis to neuropsychological test performance in patients referred for dementia screening.

Participants and Methods: Participants were consecutive referrals for dementia screening in an outpatient geriatric medicine department, excluding those with medical chart-documented CVA ($n = 41$, 10 male, ages 60-95, mean age 78). Individuals were divided into groups based on presence or absence of a physician diagnosis of hypertension; all hypertensives were taking medication for their condition. The neuropsychological screen included subtests of the WAIS, the RBANS, VRT, COWA, and TMT.

Results: Groups were not different in gender distribution, but the hypertensive group was older and less educated. Age and education corrected scores were used in all analyses. Groups were not different in diagnosis with diabetes, hyperlipidemia, CAD, or possible dementia. Groups were not different in general intellect (Information, Arithmetic), language (RBANS), processing speed (RBANS, COWA, TMTA), or delayed memory (RBANS). The hypertensive group performed significantly worse on immediate memory (RBANS, VRT), visuoconstructional ability (RBANS, Block Design), and aspects of executive functioning (Similarities, TMTB).

Conclusions: Consistent with prior research, we found evidence for neuropsychological dysfunction in treated hypertensives, even after controlling for other cardiovascular explanations for cognitive impairment. Presence of hypertension (as well as duration, severity, and current treatment) should be considered when interpreting neuropsychological test results in dementia screening.

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Neglect

S.H. KIM, S.W. SEO, S.M. GO, B.H. LEE & D.L. NA. Anatomical correlates of severe hemispatial neglect.

Objective: Hemispatial neglect is one of the most common cognitive deficits after right hemisphere injury. However, little is known about neural correlates of 'severe' hemispatial neglect. Our study aims to explore which combinations of lesions are associated with severe hemispatial neglect and to investigate the relationship between severity of neglect and extent of the lesion.

Participants and Methods: We performed neglect tests in 423 patients with right hemisphere stroke. Of these, 208 patients were considered to

have contralesional neglect (CN). The severity of CN was measured by the total score of the two tasks (0-10 for line bisection and 0-10 for line cancellation). Patients were classified into three groups: mild (< 5), moderate (≥ 5 and < 15) and severe (≥ 15). Lesions on CT or MRI were manually depicted on the templates provided by MRIcro.

Results: Of 15 patients with severe CN, 12 patients had infarctions and 3 had hemorrhages. Grossly, of 12 patients with severe CN due to infarction, MCA+PCA involvement were noted in 3 patients, MCA+ACA in 1 patient, and only MCA in 8 patients. Mildly affected patients tended to have lesions restricted to subcortical structures. Severely affected patients had greater extent of lesions involving the frontal, parietal, temporal and subcortical regions than moderately affected patients. Among these areas, middle and inferior frontal gyri, superior and middle temporal gyri and insula were most frequently affected.

Conclusions: Lesions associated with severe neglect were much more extensive than those causing mild or moderate neglect. Lesions critical for producing severe left hemispatial neglect involved the middle and inferior frontal gyri, superior and middle temporal gyri, and insula cortex.

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G. PAGLIUCA & P. MONAGHAN. Neglect Dyslexia and the Reading System: Combining Classic Connectionist Models with Neuropsychological Disorders.

Objective: Connectionist models of reading have been used to describe the reading process in detail (Plaut et al., 1996), but no attempt has been made so far to exploit these models in order to account for visual and attentional disorders of reading. Neglect dyslexia is a reading disorder usually associated with unilateral visuospatial neglect. This syndrome has been at the center of attention as it provides unique insights into the reading system. When asked to read words aloud, neglect dyslexia patients omit or substitute the letters at the beginning of the word. However, patients' performance on reading nonwords is strikingly poorer than performance on known words. This "lexicality effect" is one of the benchmarks of this reading impairment.

Previous models of neglect dyslexia have been developed specifically to address impaired reading, and have not inherited the benefits of models of intact reading (e.g., Mozer and Behrmann, 1990).

Participants and Methods: We used a large-scale model of reading (Harm & Seidenberg, 1999) and lesioned in order to simulate neglect dyslexia by implementing an attentional gradient across the visual input (Kinsbourne, 1993).

Results: The lesioned model simulated the typical neglect dyslexia error pattern and its benchmark effects: the lexicality effect (words read better than nonwords); the length effect (long words more prone to error than short words), chi-square tests used.

Conclusions: We propose that lesioning established connectionist models of reading can offer a more parsimonious explanation of the reading pattern shown by neglect dyslexia patients and give insights into the nature of the lexical system.

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Other

H. BOULTON & C. LIOSSI. Attentional bias for pain-related information in individuals developing chronic pain after Spinal Cord Injury.

Objective: The present study investigated attentional bias towards pain related words in individuals with Spinal Cord Injury (SCI). It was hypothesised that individuals with chronic pain and SCI would demonstrate an attentional bias for pain related information.

Participants and Methods: A total of 44 participants were recruited for this study. There were three groups: chronic pain and SCI ($n = 14$), SCI ($n = 15$), and healthy controls ($n = 15$). All participants completed a dot probe computer task that presented pain-related words, pertaining to sensory and affective characteristics of chronic pain, and neutral words. Words were presented at two exposure durations, 500ms and 1250 ms. A mixed factorial design was employed to examine effects on attentional bias scores of group status, the type of pain word, and the exposure duration of the pain words.

Results: A 3x2x2 mixed design ANOVA was employed to analyse the attentional bias scores. Results showed that individuals with chronic pain and SCI did possess an overall attentional bias towards pain related information, in comparison with the other two groups. This difference in attentional bias between the groups was not significantly affected by exposure duration (500ms vs. 1250 ms) or type of pain words (affective vs. sensory pain words).

Conclusions: Attentional bias towards pain is a factor that contributes to the maintenance of chronic pain in individuals with SCI who subsequently develop chronic pain. Therapeutic interventions addressing attentional bias are probably useful in the management of SCI related chronic pain. Correspondence: *Christina Lioffi, Psychology, University of Southampton, Highfield, Southampton SO17 1BJ, United Kingdom. E-mail: cliossi@soton.ac.uk*

R. BOURKE, V.A. ANDERSON, J. TRINDER, M. DAVEY, A.M. WALKER & R.S. HORNE. Neurobehavioural Function in Children with Sleep Disordered Breathing.

Objective: Sleep disordered breathing (SDB) is a very common but currently under-diagnosed condition in children. Severity ranges from Primary Snoring (PS) with no associated disruptions to sleep or ventilation to obstructive sleep apnoea syndrome (OSAS). The impact of this broad spectrum of SDB on behaviour in childhood remains unknown. This study investigated neurobehavioral function in children with varying degrees of SDB and control children with no history of SDB.

Participants and Methods: Ninety-six children (53M) aged 7-12 were studied. Routine polysomnography classified children into 4 groups: PS ($n = 48$), mild OSAS ($n = 16$), moderate/severe OSAS ($n = 11$), and controls ($n = 21$). In addition, neurobehavioural assessments (CBCL & BRIEF) were completed.

Results: Difficulties were noted in all SDB groups on the CBCL and BRIEF compared to controls. Children with SDB had significantly higher rates of total, internalising and externalising behavioural problems demonstrated across the SDB spectrum. Increased rates of behavioural executive dysfunction were also found in children with SDB.

Conclusions: Neurobehavioural deficits are common in children with SDB regardless of severity. These findings highlight behaviour difficulties that may be present in children who only snore but are otherwise healthy. Results have implications for the treatment of milder forms of SDB, particularly PS which is traditionally viewed as benign. Potential mechanisms for behavioural problems in PS and across the SDB spectrum need further investigation.

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D. BOWERS, L. KIRSCH-DARROW, A. MIKOS, U.S. SPRINGER, H.H. FERNANDEZ & M.S. OKUN. Apathy in Non-Demented Parkinson Disease: Relationship to Psychophysiological Blunting.

Objective: Apathy is a prominent neuropsychiatric feature of Parkinson disease (PD). It is distinct from depression, occurs in both demented and non-demented PD patients, and is correlated with disease severity. The mechanisms that underly apathy in PD remain unclear. In this study, we tested the hypothesis that apathy in non-demented PD patients is related to reduced psychophysiological reactivity.

Participants and Methods: We measured skin conductance (SCR) and emotion modulation of startle eyeblink responses in 24 idiopathic PD patients and 17 controls who viewed standardized sets of pleasant, unpleasant, and neutral pictures. Startle eyeblinks were elicited by white noise bursts (95db, 50 ms) and measured from sensors over the orbicularis oculi. PD patients were tested on medication, not demented or depressed, and completed the Apathy Evaluation Scale (AES).

Results: Relative to controls, PD patients had dramatically reduced SCR's ($p < .001$) and failed to show normal emotional modulation of startle eyeblink responses. This physiologic blunting occurred in the context of normal picture ratings. Correlational analyses revealed significant relationships between apathy scores (AES) and SCR ($r = -.638$, $p < .001$), valence ratings of negative pictures ($r = .652$, $p < .002$) and startle eyeblink ($r = -.313$, $p < .05$).

Conclusions: Increased apathy scores among non-demented PD patients were associated with decreased autonomic arousal (SCR) and reduced startle modulation. Of import, the nature of the relationship between apathy and these physiologic parameters varied (i.e., linear for startle, cubic for SCR) and may involve different underlying mechanisms. The basis for the apathy-hypoarousal relationship could reflect central mismodulation of limbic regions and/or peripheral autonomic dysfunction and neurotransmitter alterations associated with Lewy body changes. These findings will be discussed in terms of methodologic and conceptual issues involving apathy and implications for treatment.

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L.N. BROWN, N. MADDEN, Z. KISS & O. SUCHOWERSKY. Sensory Temporal Processing in Parkinson's Disease.

Objective: Dopamine has been implicated as a major neurotransmitter influencing timing abilities. Recent studies have indicated that patients with Parkinson's disease (PD) are impaired in their ability to time information. However, it is unclear whether patients with PD demonstrate impairment in their ability to time sensory information. Impairment in the ability to time sensory information may have major implications for motor output responses. The objective of this study was to determine whether PD patients demonstrate impaired sensory temporal processing when compared to controls.

Participants and Methods: Two types of tactile temporal thresholds were examined in patients with PD and controls. The measurement of simultaneity judgment (SJ) thresholds required participants to respond (YES/NO) whether pairs of tactile stimulations to their fingertips (index and middle of either hand or both index fingers) occurred simultaneously. To measure temporal order judgment (TOJ) thresholds, participants were required to respond (LEFT/RIGHT) whether their left or right index finger was stimulated first.

Results: The PD group demonstrated significantly higher SJ thresholds than the control group ($p < .01$), regardless of hand stimulation. Results of the TOJ threshold analyses indicated that the PD group were significantly less accurate in their ability to identify which index finger was stimulated first (p values ranged from .01 to .04 across 5 different intervals of stimuli separation).

Conclusions: This study revealed that PD patients are impaired in sensory temporal processing, which may possibly be related to decreased levels of dopamine. Further studies are needed to determine the relationship between dopamine levels, clinical disability, and sensory temporal thresholds.

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T. DO, M. LACY & A. DALVI. Neuropsychological Indices of Cognitive Functioning in Early Parkinson's Disease.

Objective: Early cognitive impairment in Parkinson's disease is thought to be due to impaired dopaminergic functioning in the basal ganglia rather than to dysfunction in the prefrontal cortex. Thus early in the disease course PD patients should demonstrate greater impairment on cognitive tests of procedural memory relative to tests of executive functioning.

Participants and Methods: Participants:

- 1) 15 non-medicated PD patients in Hoehn & Yahr stages 1 or 2, diagnosed within the past 3 months
- 2) 15 normal controls
- 3) Between 45-85 (mean age of 67 for PD patients, 60 for controls)
- 4) At least 12 years of education (mean of 15 years for PD patient, 17 years for controls).
- 5) MMSE > 27
- 6) GDS < 20

Neuropsychological/Cognitive Measures:

- 1) Delis-Kaplan Executive Function System-Tower Test
 - a) DV = scaled score Total Achievement
- 2) Serial Reaction Test
 - a) DV = average of the median reaction times (RT) from blocks 1-2, average of blocks 3-4, average of blocks 5-6, and average of blocks 7-8).
 - b) DV = Correct response out of 120 in a Generate phase
- 3) Mini Mental Status Examination
- 4) WRAT-3 Reading Subtest
- 5) US Parkinson's Disease Questionnaire (PDQ-39)-Emotional Well-Being Subscale (PD patients only)
- 6) Geriatric Depression Scale

Results: 1) No significant group differences were found between PD patients and controls on the D-KEFS Tower Task or rate of learning on the SRT.

- 2) Trend in learning on the SRT.
- 3) PD patients endorsed more depressive symptomatology compared to controls.
- 4) Subjective level of depression did not appear to affect group performance.

Conclusions: Our study looked to explore how cognitive functioning may be affected by early dopamine depletion in the striatum. Our findings suggests that early striatal degeneration may impact explicit awareness on an incidental task in PD patients. However, it may not necessarily be important in regulating executive functioning.

Limitations:

- 1) Small group sizes
- 2) Limited number of cognitive measures

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J. FITZGERALD SMITH, J. WERTHEIMER, R. KRAMER, J. WHERRY, M. TUCHMAN, C. WALTON & V. TREPATSCHKO. The Relationship between Sleep and Emotional Well-being in Individuals with Parkinson's disease with and without Deep Brain Stimulation.

Objective: Parkinson's disease is known for its motoric disturbances, but recent research has brought greater emphasis on the non-motor symptoms of the PD patient. The goal of our research was to assess the relationship between sleep, anxiety, and depression in individuals with Parkinson's disease who have and have not undergone DBS.

Participants and Methods: The participants included 87 individuals with DBS and 76 individuals without DBS. A self-report, survey-based methodology was used. Each participant was administered the Brief Symptom Inventory-18, Parkinson's disease sleep scale and a supplemental questionnaire assessing demographics/clinical characteristics of the sample.

Results: The non-DBS group reported more somatization, anxiety, and global distress than the DBS group. Both groups reported sleep disturbances, but it was notable that the DBS group had fewer sleep disturbances than the Non-DBS group, which could potentially be accounted for by the surgical procedure minimizing, if not eliminating, fragmented sleep that previously resulted from motor disturbances. There was not a significant difference between the groups in the context of depression.

Conclusions: The beneficial effects of DBS on sleep are encouraging for substantial reasons. Improving sleep is likely intimately linked to improving quality of life and decreasing emotional distress. The typical reduction of antiparkinsonian medication following DBS may beneficially affect sleep hygiene by decreasing daytime sleepiness. The current findings of this study implicate that anxiety and somatization may have a greater impact on sleep disturbance than depression, as there was not a significant difference between the groups in the context of depression. Correspondence: *Julie Fitzgerald Smith, Ph.D., Neuropsychology, VA Illiana Health Care System, 1900 E. Main, Bldg 103, Danville, IL 61832. E-mail: Julia.FitzgeraldSmith@va.gov*

J. HASSENSTAB, A. ARENTOFT, V. SWEAT & A. CONVIT. Pre-diabetes: Brain Volumes, Inflammation, and Verbal Memory in Metabolic Syndrome.

Objective: Concurrent with the rise in obesity and type 2 diabetes, the prevalence of metabolic syndrome, often considered a "pre-disease" state, is increasing rapidly. Very few studies have comprehensively examined cognition or brain volumes among individuals with metabolic syndrome. This study, unlike any published study to date, assessed cognitive performance and brain volumes in non-diabetic, non-demented individuals who met ATP-III criteria for metabolic syndrome.

Participants and Methods: 34 participants with metabolic syndrome (Aged 62.6 ± 6.1 years) were compared with a group of 37 healthy controls (Aged 59.6 ± 6.2 years) on various tests of neurocognitive functioning. In addition, 68% of participants completed structural MRI.

Results: There were no group differences in education, IQ, and MMSE score (all p 's > .10). After controlling for differences in age and gender, participants with metabolic syndrome exhibited decreased performance on several memory tasks, including immediate and delayed recall on paired associates tasks from the WMS-R (all p 's < .05), and decreased learning ($p = .04$), immediate free recall ($p = .04$) and delayed recall ($p = .03$) on the CVLT. There were no significant differences on other tests of cognitive performance, although some measures of attention and executive functioning indicated trends. No differences in brain volumes (whole brain, and ROIs in frontal and temporal areas) were observed. Inflammation exhibited no associations with cognitive performance or brain volumes in post-hoc analyses.

Conclusions: Our results suggest a pattern of predominantly verbal memory deficits characteristic of medial temporal lobe dysfunction, however, volumetric analyses of the medial temporal region exhibited no differences between groups. Contrary to recent studies, inflammation appeared to have no relationship to cognitive performance in our relatively small sample. Future studies should examine more closely the relationship between inflammation and cognitive performance in metabolic syndrome.

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G.R. JOHNSTONE. The Neuropsychology of Spiritual Experience.

Objective: To test a neuropsychological model of spiritual experience which suggests deafferentation of right parietal lobe functioning is related to transcendence (i.e., diminished perception of the self) and increased left temporal lobe functioning is related to increased experience of culturally based religious archetypes.

Participants and Methods: 26 individuals with TBI, at least 6 months post-injury, were recruited as outpatients. Participants completed neuropsychological tests of frontal, temporal, and parietal lobe functions, as well as a measure of spiritual experience (i.e., INSPIRIT).

Results: As hypothesized, a measure of right parietal function (i.e., JOLO) was negatively and significantly correlated with spirituality ($r = -.56, p < .01$). Measures of left temporal function (WMS-3 Logical Memory LM I&II) were the only measures positively correlated with spirituality ($r = +.13, +.04$); right temporal lobe functions were negatively correlated with spirituality (WMS-3 VR I $r = -.34$; VR II $r = -.11$). Frontal lobe measures were negatively but non-significantly correlated with spirituality (i.e., COWAT $r = .00$; Trails B $r = -.09$).

Conclusions: The results support a neuropsychological model of spiritual experience which suggests: a) diminished right parietal function is associated with transcendence (i.e., diminished experience of the self) consistent with right hemisphere/parietal disorders of the self (e.g., anosagnosia, left sided neglect); and b) increased left temporal lobe functioning is associated with enhanced experience of culturally based religious archetypes. These findings are generally consistent with neuro-radiological studies which indicate spirituality is neurologically hardwired (Newberg et al., 1997; 2003), specifically that Buddhist meditation and Christian prayer are associated with decreased right parietal functioning; and clinical research which indicates that increased left temporal lobe activity (i.e., temporal lobe epilepsy) is associated with increased experience of religious archetypes.

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K.R. MOHN, R. MURROW, D. ENGLERT, E. HADAR & A. TROSTER. Cognitive Safety of Pallidal Deep Brain Stimulation in Unusual Cases of Dystonia.

Objective: Deep brain stimulation (DBS) of the globus pallidus internus (GPi) is an often effective intervention for medically refractory primary (and to lesser extent, secondary) dystonia. Findings among the few published neuropsychological studies are inconsistent, but both positive and negative, subtle, circumscribed changes in attention/working memory, executive functions and verbal fluency have been reported. Cognitive outcomes have not been published, however, for persons with more unusual clinical presentations of dystonia. Pre-and post-surgical neuropsychological findings are described to explore the cognitive safety of bilateral GPi DBS for two cases.

Participants and Methods: Case 1 is a patient with previous, unsuccessful surgical interventions (thalamotomy and cerebellar stimulation). Case 2 is a patient with myoclonic dystonia and tremor. Pallidal electrode placement was confirmed by post-operative MRI.

Results: Neither patient demonstrated significant change in overall level of cognitive functioning four months post-surgery. Possibly clinically meaningful declines (> 1 standard deviation) were apparent for both patients in tasks demanding of selective attention and response inhibition, cognitive set switching, and semantic verbal fluency. One patient performed worse on a measure of prose memory. Although objective cognitive outcomes were similar in the two patients, subjective appraisal of overall post-surgical functioning was not.

Conclusions: These results suggest that the nature of the changes observed in patients with complex dystonias or prior ablative neurosurgical treatment may not differ substantially from those in primary dystonia patients. The possibility of circumscribed but clinically meaningful changes in cognitive functions should be discussed with patients in the context of pre-surgical counseling.

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R. NAKASE-RICHARDSON, S.A. YABLON, C.C. EVANS, M. SHERER & T. NICK. Serial Yes/No Reliability After TBI: Implications for Emergence from the Minimally-Conscious State.

Objective: Guidelines for defining the "minimally conscious state" (MCS) include behaviors that characterize emergence, specifically functional interactive communication (accurate yes/no responding) and functional use of objects. Guidelines were developed by consensus due to lack of empirical data to guide definitions. Criticism emerged that individuals with severely impaired cognition would have difficulty achieving the requisite threshold of accuracy and consistency proposed to demonstrate emergence from MCS. Objective: Determine the utility of the operational threshold for emergence from posttraumatic MCS, by evaluating a measure of yes/no accuracy (Cognitive Test for Delirium, CTD_AP).

Participants and Methods: Prospective, consecutive cohort of responsive patients recovering from traumatic brain injury (TBI), including a subset meeting criteria for MCS at neurorehabilitation admission who improved and were able to undergo study protocol. Participants were evaluated at least weekly, and given the CTD_AP as a component test for rating cognitive status.

Results: Of the 1434 observations from 336 participants, 767 observations yielded inaccurate yes/no responses. 75 participants (22%) never attained consistently accurate yes/no responses at any time during their hospitalization. Generalized Estimating Equations analysis revealed that confused participants were more likely to respond inaccurately to yes/no questions. Further, the subset of individuals who were in MCS upon rehabilitation admission and improved were also more likely to respond inaccurately to yes/no questions.

Conclusions: Consistent yes/no accuracy is uncommon among responsive patients in early recovery from TBI. These results suggest that the operational threshold for yes/no response accuracy as a diagnostic criterion for emergence from MCS should be revisited.

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E. POUTIAINEN & M. TIAINEN. The Profile of Cognitive Impairment in Patients Resuscitated from Cardiac Arrest May Vary According to the Overall Severity of Cognitive Deficits.

Objective: Cardiac arrest (CA) results in global cerebral ischemia and hypoxic-ischemic injury with wide-ranged cognitive deficits. Previous studies have mainly concentrated on subjects with clinical symptoms after CA, while this study included also asymptomatic CA sufferers. The aim of the study was to evaluate a profile of cognitive impairment after successful resuscitation from CA.

Participants and Methods: 41 CA patients participated in the prospective cohort study. At seven months after CA the neurological and neuropsychological examinations, functional and mood scales were performed. Neuropsychological examination included memory (WMS/logical memory and list learning), executive function (TMB-TMA, Stroop), visuospatial speed (WAIS-R/DSY, TMA), spatial skills (WAIS-R/BD, Vosp6, 7) and language skills (naming, category fluency). A patient's performance was categorised as normal if none of the tests scored below the cut point of 1.5 sd from the demographic controls, mildly impaired if less than 30% (1-2/10) of the tests fell below the cut point, and moderately to severely impaired if at least 30% of the tests (3-10/10) scored below the cut point.

Results: Eleven patients (27%) had intact cognitive performance, 16 (39%) had mild cognitive problems, and 14 (34%) patients had moderate to severe cognitive impairment with additional problems in everyday functioning. Two thirds of the patients with mild overall cognitive abnormalities had executive problems, while only 4 of them had memory deficits. Twelve of the 14 patients with moderate to severe impairment had memory and executive dysfunctions.

Conclusions: In this cohort study of CA sufferers memory and executive deficits were found in most of the subjects with moderate to severe cognitive impairment, while executive deficits predominated in those with mild overall cognitive problems. Thus, the profile of cognitive deficits seem to vary according to severity of overall cognitive impairment in CA patients seven months after resuscitation.

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D.M. SCHIEHSER, D.D. SONG, S. LESSIG & J.V. FILOTEO. Behavioral Changes Associated with Apathy, Disinhibition, and Executive Dysfunction in Parkinson's Disease.

Objective: Cognitive and behavioral disturbances associated with fronto-striatal dysfunction commonly occur in Parkinson's disease (PD). Nevertheless, the relationships among cognition, behavioral changes, mood symptoms and motor functioning have yet to be determined. The purpose of this study was to examine the relationship among these variables.

Participants and Methods: Twenty nondemented PD patients and their family members were administered the Frontal Systems Behavior Scale (FrSBe) Self- and Family Rating Forms to assess changes in behavior. PD patients were also administered measures of global cognition, executive functioning, memory, spatial judgment, mood, and motor symptoms.

Results: Based on the FrSBe, when comparing current levels to pre-diagnosis levels, significant increases in apathy, disinhibition and executive dysfunction were reported by both patients and family members. Family members, however, rated patients' increases in executive dysfunction as significantly greater than the patients' self-ratings. Patients' ratings of their overall changes in behavior and apathy levels were predicted by their current levels of mood and tremor, whereas family members' ratings of patients' overall changes in behavior and apathy levels were predicted by current levels of bradykinesia, mood, and memory functioning. Family members' ratings of increased executive dysfunction were associated with patients' current memory performances and increases in disinhibition were predicted by the patients' current mood.

Conclusions: PD patients' levels of mood, tremor, and bradykinesia are important factors in determining changes in overall behavior and increases in apathy. These results have implications for assessing behavioral changes in PD using different reporting sources and specific motor and cognitive factors.

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M.E. ZIMMERMAN, A.M. BRICKMAN & M.S. ALOIA. Neuropsychological Function and Cognitive Reserve in Obstructive Sleep Apnea.

Objective: Individuals with Obstructive Sleep Apnea (OSA) exhibit impairment in multiple cognitive domains. The theory of cognitive reserve posits that there are individual differences in the ability to behaviorally compensate for the negative effects of neuropathological processes. The goal of this study was to examine whether cognitive reserve has an impact on neuropsychological test performance in untreated individuals with OSA.

Participants and Methods: One-hundred-ninety-three participants (65% women) were grouped by Average IQ (AIQ; n=96) and High IQ (HIQ; n=97). Participants were medically healthy and diagnosed with OSA by overnight polysomnography. All participants received neuropsychological assessment of vigilance, memory, executive function, and psychomotor speed.

Results: The HIQ group performed better on tests of vigilance, memory, executive function, and psychomotor speed ($t=5.49$ to 2.23 , $p=0.00$ to 0.03). There were no IQ group differences on measures of OSA sever-

ity. Pearson correlations stratified by IQ group revealed statistically significant relationships in the AIQ group between OSA severity and delayed recall for visual information ($r=-0.21$, $p=0.02$) and OSA severity and psychomotor speed ($r=-0.18$, $p=0.04$) that were not present in the HIQ group ($r=-0.08$, $p=0.20$; $r=-0.07$, $p=0.24$ respectively).

Conclusions: These results indicate that despite similar levels of OSA severity, individuals with high IQ performed better than individuals with normal IQ on multiple neuropsychological measures. The presence of the relationship between OSA severity and memory and psychomotor speed in the normal IQ group but not in the high IQ group suggests that high cognitive reserve "protects" individuals from the full expression of OSA-related cognitive dysfunction.

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Stroke

H.A. BENDER & K.G. LANGER. Unawareness in a Interdisciplinary Rehabilitation Setting: A Case Study.

Objective: Anosagnosia and/or incomplete awareness of disability can be a significant limiting factor to functional progress and goal-setting in an acute care rehabilitation setting. A case study illustrates.

Participants and Methods: An 88-year-old, Caucasian, high school educated woman with an initial presentation consistent with right middle communicating artery infarct, underwent comprehensive interdisciplinary assessments, including physiatric, neurologic, psychologic, physical and occupational therapy, psychiatric, and speech-language pathology. Psychological evaluation included both clinical interview and neuropsychological screening. Subsequent neuroimaging and a neuro-radiologic consultation revealed cortical and subcortical involvement consistent with diffuse metastatic disease presumed secondary to ovarian cancer. Additional neuroradiographic findings were remarkable for a remote right cerebellar cerebrovascular accident (CVA). Prior to hospitalization, the patient was recently widowed and resided independently in the community.

Results: Patient was oriented to person and mildly disoriented to place and time. Visual fields were grossly intact. Awareness of disability and ability to relate an accurate medical history were initially moderately to severely impaired. Upon direct questioning, the patient displayed a marked contrast between her subjective report and her objective physical limitations. Highly structured querying revealed an interaction between both emotional and neurogenic factors.

Conclusions: Thorough assessment of a patient's level of awareness is critical to maximizing the response and overall effectiveness of intervention and treatment. Detailed clinical interviewing with successive, hierarchically structured query may yield the information necessary to differentiate between cognitively based unawareness and emotional denial. Such understanding can facilitate clinically-sensitive, carefully titrated psychoeducation in an interdisciplinary rehabilitation setting.

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J.A. GRIFFEN, L.J. RAPPORT, R. COLEMAN BRYER, C.A. SCOTT, C. MCKAY, R.D. WHITMAN & T. SHERMAN. The Effect of Driving Status on Community Integration in Stroke Survivors.

Objective: Driving a motor vehicle is an essential activity of daily living for adults, and driving cessation has been associated with psychological and physical morbidity. Fifty to 70% of stroke survivors cease driving; however, few studies have examined the effects of driving cessation on community integration among stroke survivors.

Participants and Methods: Eight-seven pairs of stroke survivors and significant other informants (N = 174) recruited from the community and hospital clinics participated. Objective community integration (mobility, occupation, social integration) was assessed via informant ratings, whereas subjective community integration and perceived social support were assessed via survivor self-report.

Results: MANCOVA indicated a main effect of driving status after accounting for stroke severity and use of alternative transportation. Specifically, drivers were more mobile and made more productive use of their time. A driving status x social support interaction showed that drivers with high social support had better social participation outcomes than did non-drivers and drivers with low social support. A driving status x gender interaction showed that men drivers had significantly better outcomes in mobility and occupation than did men non-drivers, whereas women drivers and non-drivers did not differ significantly.

Conclusions: Driving status had unique and substantial influence on community integration following stroke. Social support facilitated community integration but did not buffer the effects of driving cessation. Rather, high social support, in addition to driving, resulted in the most optimal outcome. Although men and women resumed driving at equal rates, driving cessation showed differential effects for men and women in regards to their community integration.

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J. IRBY & C. VICKERY. Cognitive profiles of subcortical stroke on the RBANS.

Objective: Objective: Cognitive profiles associated with cortical vs. subcortical lesions are well documented in neuropsychology. However, there is less research on the cognitive profiles associated with lesions to various subcortical structures. The present study examined the cognitive profiles associated with isolated lesions in four subcortical structures: white matter, basal ganglia, thalamus, and brainstem.

Participants and Methods: Participants and Method: One-hundred and nine patients in an acute stroke rehabilitation setting with neuroimaging-confirmed subcortical strokes (white matter n = 24; basal ganglia n = 32; thalamus n = 20; brainstem n = 33) were administered the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS). MANOVA analysis, controlled for age and race, was performed with the 12 RBANS subtests.

Results: Results: Results indicated a marginally significant omnibus effect for subcortical location (p = .056). Post-hoc analysis indicated significant effects for the immediate memory subtests, semantic fluency, and list recognition. Patients with basal ganglia lesions consistently performed worse on these subtests while patients with brain stem lesions consistently performed the best. RBANS indices and subtest scores are presented graphically.

Conclusions: Conclusions: The results suggest that there are distinct cognitive profiles associated with isolated lesions to distinct subcortical regions.

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R.S. MARSHALL & R. PANICO. A Pilot Study on the Effect of Unilateral Nostril Breathing Following Stroke.

Objective: Unilateral nostril breathing (UNB) is one of the specific yoga breathing practice called pranayama. Previous research has demonstrated increased verbal abilities individuals who complete right nostril breathing and enhanced spatial abilities with left nostril breath-

ing (Jella & Shannahoff-Khalsa, 1993). Wertz et al., (1987) also suggested that unilateral nostril breathing could influence cognitive function in the contralateral hemisphere in non-brain damaged individuals. A study for individuals after stroke was conducted to determine if prolonged use of unilateral nostril breathing (10 weeks) would impact cognition. It was expected that unilateral nostril breathing may increase language abilities in individuals post stroke. The implication is that if increased performance was observed, it could be studied as a potential rehabilitation for individuals who have suffered a stroke.

Participants and Methods: Four post-stroke individuals participated in a ten-week study with an initial, middle, and final assessment. Individuals participated in a four-week program practicing the breathing techniques, and six weeks of at-home practice.

Results: Improvement on the COWA was observed and was significantly higher at the final testing than at the initial assessment. Also of note were lower scores on the BDI and BAI similar to previous studies (Marshall & Panico, 2007), although these were not statistically significant.

Conclusions: Based on the findings of this study, a program in yogic breathing technique may useful for increasing word production. Future research should replicate these results with more participants and expand to include individuals with aphasia.

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C. MCKAY, L.J. RAPPORT, R. COLEMAN BRYER, J.E. CASEY, C.A. SCOTT, J.P. PELLERITO, C. BURT, J.A. GRIFFEN & T. SHERMAN. Self-Evaluation of Driving Simulator Performance Following Stroke.

Objective: Impaired self-awareness (ISA) of deficit has far-reaching and potentially catastrophic consequences to stroke survivors. One of the most potentially dangerous consequences of ISA manifests when stroke survivors attempt to resume driving prematurely. Despite these potential dangers, very little research has examined the relationship between ISA and driving. The present study examined the self-awareness of driving simulator and neuropsychological performance among stroke patients, comparing them to healthy control participants.

Participants and Methods: Thirty stroke survivors and 30 controls were each asked for prediction and postdiction ratings of their performance on various driving simulator and neuropsychological tasks. Self-estimates versus actual performance discrepancy scores were calculated for various simulator and neuropsychological measures.

Results: The results indicate that across all measures, the stroke survivors greatly overestimated their performance in comparison to the accuracy of self-evaluations among the controls, thus suggesting impaired self-awareness. This pattern of overestimating was observed on both novel (neuropsychological) and familiar (driving) tasks. However, there was some evidence to suggest that stroke survivors can benefit from feedback, as seen by increased accuracy in postdiction versus prediction self-evaluation scores. Additionally, both stroke survivors and controls showed greater shift toward accurate self-estimation on postdiction of driving performance than on postdiction of neuropsychological test performance.

Conclusions: Although the temporal stability of the shift in awareness is not known, these results support the further investigation of driving simulators as a useful and safe method of assessing and potentially improving stroke survivors' ISA. This study also supports the use of metacognitive discrepancy scores as valid indices of ISA.

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R.C. MULLIGAN, A.P. HALEY, B.A. JERSKEY, F. IRANI, A. POPPAS, L.H. SWEET & R.A. COHEN. Endothelial Function Predicts fMRI Activity in the Medial Prefrontal Cortex.

Objective: Studies of cardiovascular disease (CVD) have reported that markers of systemic arterial disease predict cognition even in the absence of stroke. The neural correlates of vascular disease have only recently been investigated. The present study evaluated the relationship between endothelial function and fMRI activity.

Participants and Methods: Nine right-handed CVD patients (age 67+8 years) without history of stroke or evidence of lacunar infarct on MRI scan were enrolled. Using B-mode ultrasound, endothelial function was assessed by measuring brachial artery diameter at rest and during reactive hyperemia. A verbal working memory (VWM) 2-back task was presented within an fMRI scanner. Empirical regions of interest (ROI) were determined by contrasting 2-back activity with baseline. Average response to the 2-back condition within each ROI was correlated with absolute dilation in vessel diameter.

Results: Mean accuracy was 79+11%; reaction time averaged 1062+203 ms. Task-related activation was observed in middle frontal gyrus bilaterally, medial frontal gyrus, left insula, left inferior parietal lobe, and left precuneus. Vessel dilation was positively correlated with magnitude of activation in medial frontal gyrus even when age was covaried ($r = 0.86, p < .05$). No relationship was observed between ROI activation and task performance.

Conclusions: Patterns of VWM activation and behavioral performance were consistent with previous literature. Poor endothelial function was related to lower brain activation in response to a VWM task in the medial frontal gyrus, an area previously implicated in executive function. Vascular disease therefore may contribute to grey matter dysfunction, a finding requiring further investigation.

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K. PARK, S. YOON & J. KWON. plenium or parahippocampus involvement and its relationship to cognitive decline in posterior cerebral artery infarction.

Objective: The cognitive impairment after posterior cerebral artery (PCA) infarcts is frequently observed and diverse neuropsychological deficits have been described such as aphasia, amnesia, dyscalculia, visuospatial dysfunction and so forth. However, within PCA territory, functionally important areas associated with multiple cognitive declines except thalamus have not been determined. We investigate the locus or loci that might induce multiple cognitive declines in PCA territory infarction.

Participants and Methods: The subjects were 41 patients with unilateral PCA infarctions that involved only the occipital lobe or the occipital lobe plus other areas served by the PCA. All subjects received Mini-Mental Status Examination (MMSE) within 2 months after onset.

Results: 18 patients (43.9%) had cognitive impairment that was considered to be present if the patient has a score below 24 points. The severity of cognitive impairment was not associated with lesion location on left hemisphere, sex, age, the level of education, or the interval between stroke onset and MMSE assessment. Only lesion volume showed negative correlation with the MMSE score. Lesion location analysis revealed that the occipital plus the splenial or the parahippocampal lesion contributed to the decline of MMSE score. Furthermore, lower performance score in recall and drawing than others among MMSE subscales was observed in the PCA infarctions.

Conclusions: This study suggests that the parahippocampal or the splenial involvement with the occipital lesion is significantly important for inducing the cognitive decline following the PCA infarction.

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L.J. RAPPORT, C.V. PARADEE & S.A. LANGENECKER. Circadian preference and cognitive performance among rehabilitation inpatients.

Objective: Circadian preference—individual preference for morning or evening activities—is the most powerful of the circadian rhythms. The present study examined the influence of testing time on cognitive performance among rehabilitation inpatients.

Participants and Methods: Participants were morning-oriented inpatients in three groups ($N = 72$): right- and left- hemisphere stroke, and noncognitively-impaired orthopedic controls. Each participant was assessed at the preferred and non-preferred times; sessions and tests were counterbalanced to control for practice. The repeated battery included the Trailmaking tests, Rey-Osterreith Complex Figure (ROCF), and a continuous performance test (CPT). Brain function in response to cognitive challenge was obtained via tympanic temperature changes during the CPT.

Results: Mixed-model ANOVAs indicated significant circadian preference effects for all three groups on the ROCF and CPT accuracy; however, a group \times time interaction indicated disproportionate decrements in performance among the cognitively-impaired groups at the nonpreferred time as compared to controls. A significant group \times session \times temperature change interaction on tympanic temperature during the CPT paralleled performance accuracy on the task: Cognitively-impaired patients showed less temperature drop (cognitive engagement) at the nonpreferred time, whereas patients without cognitive impairment showed similar patterns at the two testing times. These results could not be explained by differences in visual perception, mood, or sleepiness.

Conclusions: These results replicate our prior findings regarding the disproportionate adverse effects of circadian preference on persons with brain impairment. Circadian preference may interfere with the active utilization of cognitive reserves when persons are required to perform cognitively challenging tasks at nonoptimal times of day. These findings may have implications for scheduling rehabilitation therapies and discharge planning.

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M.A. TURKEN, C.A. RACINE, C.L. CAREY, J.H. KRAMER & S.A. JOSEPHSON. Neuropsychological Profiles in Right Posterior Cerebral Artery Strokes: A Case Series.

Objective: Infarctions of the right Posterior Cerebral Artery (R-PCA) territory are frequently associated with visual deficits; however, the neuropsychological profile of R-PCA strokes is not well defined. The current study was designed to examine the cognitive correlates of R-PCA stroke in greater detail.

Participants and Methods: We tested 7 individuals with R-PCA stroke, 3 with occipital lesions and 4 with occipital/temporal lesions [Age: 56.9 \pm 11.4; Education: 17.4 \pm 2.0; Time since stroke: 7.7 mo. \pm 5.8]. All patients had significant cognitive complaints per self-reported questionnaire. The neuropsychological test battery included tasks of verbal & visual memory, verbal fluency, object naming, executive function, visual-spatial skills, and processing speed.

Results: All patients had MMSE scores between 28-30; however, on more detailed testing patients exhibited overall deficits ranging from subtle to moderately impaired. Memory decline was the most pervasive symptom, with 6/7 showing decreased visual recall and 5/7 showing verbal recall difficulties. Otherwise, patients showed variable deficits in executive function (trails, verbal fluency, working memory), object naming, processing speed, and visual-spatial skills.

Conclusions: In a case series, there was significant variability in the severity and pattern of neuropsychological deficits following R-PCA infarction. Memory impairment was the most frequently observed symptom (visual > verbal); however, there were also variable effects on ex-

ecutive function, processing speed, naming, and visual-spatial skills. Contrary to some literature suggesting that PCA infarction results mainly in visual deficits that largely resolve with time, we found evidence for a wide range of neuropsychological profiles and levels of impairment following R-PCA stroke.

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C. VAN HEUGTEN, K. VERHOEVEN, M. POST, S. SCHIEMANCK, P. VRANCKEN & M. VAN ZANDVOORT. Cognitive impairments predict quality of life in stroke patients one year post stroke.

Objective: To investigate the relationship between cognitive impairments and quality of life one year after stroke.

Participants and Methods: Cross-sectional study in which 92 stroke patients were examined one year post stroke. Cognitive functioning was measured with the MMSE and an extensive neuropsychological test battery (language, memory, neglect, mental speed, mental flexibility, visual perception). Four key quality of life domains were measured: functional independence (Barthel Index), social participation (Frenchay Activities Index), depressive mood (CES-D) and life satisfaction (LiSat-9). Regression analyses were performed to analyse cognitive predictors of quality of life controlling for demographic variables and motor impairment.

Results: The presence of cognitive problems varied between 19% (neglect) up to 56% (verbal recognition). Neglect and language impairment were determinants for functional independence (11% additional explained variance). Visual and verbal memory and visual perception were determinants for participation (15% additional explained variance). Depression and life satisfaction were not determined by cognitive impairments.

MMSE scores were also related to functional independence and social participation (6% and 15% additional explained variance respectively), but not to depressive mood and life satisfaction.

Conclusions: Both cognitive functioning and specific cognitive impairments were related to functional independence and social participation, but not to depression and life satisfaction. The MMSE as a measure of global cognitive functioning was useful to study the impact of cognitive impairment on quality of life.

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S. VARUGHESE, E. MURRAY, M. DAVIS, M. UDDARAJU & A.M. BARRETT. The Florida Mental Status Examination for Cognitive Evaluation after Stroke.

Objective: To compare a brief instrument for cognitive screening, the Florida Mental Status Exam (FMSE), with the Mini Mental Status Examination (MMSE) for assessment of post-stroke cognitive disorders.

Participants and Methods: In subjects at risk for stroke who present with sudden onset of memory and cognitive problems, the Mini Mental State (MMSE) may be the most commonly used tool to assess for abnormal mentation. The FMSE, a brief measure of cognitive status, includes assessment of 5 basic cognitive domains (attention, intention, verbal memory, language and related functions, and visual spatial ability). It was previously standardized as a screen for early memory and cognitive disorder in the elderly (Doty et al., 1990). This instrument incorporates assessment of verbal memory and frontal lobe function not included in the MMSE and thus may be superior to detect stroke-related cognitive problems. We administered the FMSE to 87 participants (53

with stroke, 33 men, mean age=56.8 years; 34 controls, 13 men; mean age=55.2 years). Participants also completed the MMSE and medical screening. We separated FMSE score into three parts: semi-quantitative bedside tasks, verbal fluency, and the Hopkins Verbal Learning Test (HVL; Brandt, 1991).

Results: Subjects with stroke scored significantly lower on each part of the FMSE and on the MMSE compared with controls. Discriminant function analysis revealed that the HVL and word fluency sections of the FMSE correctly classified 77/87 subjects. One function was generated with these two best predictors and was significant $\Lambda=.495$, $\chi^2(3, N=87) = 58.71$, $p < .001$.

Conclusions: These results support verbal fluency and verbal memory as potentially sensitive measures of cognitive dysfunction after stroke. The FMSE, which incorporates both types of tasks as well as other standard cognitive assessment, may be superior to the MMSE for post-stroke cognitive screening.

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Paper Session 4

10:45 a.m.–12:15 p.m.

Mild Cognitive Impairment

T. GIOVANNETTI, B. MAGUIRK BETTCHER, L. BRENNAN, D.J. LIBON, M. BURKE, K. DUEY, C. NIEVES & D. WAMBACH. Characterization of Everyday Functioning in Mild Cognitive Impairment: A Direct Assessment Approach.

Objective: The diagnostic criteria for mild cognitive impairment (MCI) have been somewhat controversial, particularly surrounding everyday functional deficits. This study evaluated the degree and pattern of everyday functional difficulties in MCI using standardized, direct observation of everyday task performance.

Participants and Methods: Participants with MCI ($n = 25$), mild Alzheimer's disease (AD; $n = 25$), and healthy Controls ($n = 18$) performed the Naturalistic Action Test, a performance-based measure that includes 3 everyday tasks of increasing complexity. Comprehensive scoring procedures entailed measures of overall level of impairment as well as an array of error types, including omissions and various commission subtypes (i.e., sequence, substitution, perseveration, etc.).

Results: MCI participants performed worse than controls, but better than AD participants, on measures of overall impairment and total errors [$F(2, 65) > 37$, $p < .01$ for both]. MCI participants performed a pattern of errors that was similar to Controls, but markedly different from AD participants [$F(2, 65) > 6.4$, $p < .01$ for all comparisons]. That is, MCI and Control participants demonstrated a higher proportion of commission errors, whereas the AD group demonstrated a higher proportion of omission errors. Finally, relative to Controls, MCI participants showed performance difficulties on all everyday tasks, even relatively simple and familiar activities.

Conclusions: MCI is associated with mild everyday action difficulties on even simple everyday tasks. These mild difficulties are qualitatively similar to the intermittent errors made by healthy controls, but quite different from the functional deficits observed in patients with mild AD. These findings have implications for the diagnosis of MCI and the treatment of functional difficulties in this population.

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A. NORDLUND, P. QUINLAN, S. HANSEN & A. WALLIN. Two Year Outcome of Mild Cognitive Impairment Subtypes.

Objective: To study the two year outcome of subjects diagnosed with Mild Cognitive Impairment (MCI).

Participants and Methods: One hundred and ninety-two subjects diagnosed with MCI were examined with 24 tests comprising the cognitive domains speed/attention, memory, visuospatial function, language and executive function and followed up after two years.

Results: At baseline 7 subjects (4%) belonged to the purely amnesic group, 61 (32%) to the multiple domains impaired amnesic, 46 (24%) to the multiple domains non-amnesic and 48 (25%) to the single domain non-amnesic group. Thirty subjects did not show any significant impairment as compared to their age norm. After two years 32 subjects (16%) were lost for follow-up. Of the 160 subjects followed up, 6 (4%) had improved to normal, one from the amnesic, one from the multiple domains, 3 from the single domains group and one without any significant impairment at baseline. Forty-one subjects (26%) had progressed to dementia. Out of these 30 were from the multidomain amnesic group and 11 from the multidomain non-amnesic group. The combination of memory and language impairment was the strongest predictor of progression to dementia.

Conclusions: The results suggest that memory impairment alone, or impairment in any one cognitive domain, are rather benign conditions. Impairment in several cognitive domains is associated with a more severe outcome over two years. Also, 27% of the subjects who progressed to dementia, including Alzheimer's disease, did not show memory impairment at baseline, which suggests that memory impairment is not always the first symptom of even the most common dementia disorders. Correspondence: *Arto Nordlund, MSc, Institute of Neuroscience and Physiology, Sahlgrenska Academy, SU/Molndal, Wallingsgatan 6, Molndal 431 41, Sweden. E-mail: arto.nordlund@neuro.gu.se*

K. MURPHY, A.K. TROYER, B. LEVINE & M. MOSCOVITCH. Episodic but not Semantic Autobiographical Memory is Reduced in Amnesic Mild Cognitive Impairment.

Objective: Converging evidence indicates the earliest brain changes in amnesic mild cognitive impairment (aMCI) involve the hippocampus and related structures. This is consistent with the fact that aMCI is characterized by decline in anterograde memory as measured by the ability to learn and remember new information. We investigated whether retrograde memory for autobiographical information was affected in aMCI.

Participants and Methods: Eighteen control (age 66-84 years) and 17 aMCI (age 66-84 years) participants described a personal event from each of five periods across the lifespan. These events were transcribed and scored according to procedures that separate episodic (specific happenings) from semantic (general knowledge) elements of autobiographical memory.

Results: Although both groups generated descriptions of similar length, they differed in the composition of their autobiographical recall. The aMCI group generated fewer episodic ($M=12.98$, $SD=4.67$) and more semantic details ($M=20.06$, $SD=11.94$) per recalled event relative to the control group (episodic $M=17.97$, $SD=7.84$; semantic $M=12.48$, $SD=5.48$), resulting in a significant group-by-detail-type interaction $F(1,33)=15.99$, $p<.001$, partial eta squared=0.33. Both groups showed a similar temporal gradient of recall, with more details recalled for recent than for remote life periods.

Conclusions: These results indicate that episodic and semantic autobiographical memories are differentially affected by the early brain changes associated with aMCI. Interpretation of these findings within the context of multiple trace theory (Nadel & Moscovitch, 1997) implicates medial-temporal-lobe dysfunction in aMCI as predominantly affecting episodic autobiographical memories, with possibly preserved

neural integrity in systems uniquely supporting semantic autobiographical memory.

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L. DELANO-WOOD, K.I. KIMBRELL, A.J. JAK, Y. CHANG, B. SCHWEINSBURG, N.R. HORNE, C.E. WIERENGA, D.P. SALMON, L.R. FRANK & M.W. BONDI. Disruption of Posterior Cingulate Integrity and Associations with Cognition in Mild Cognitive Impairment.

Objective: Although volumetric changes typically are not seen in the posterior cingulate (PC) until Alzheimer's disease (AD) is evident, metabolic abnormalities in the PC are implicated by PET and SPECT studies. Given that the PC may be one of the most sensitive regions undergoing preclinical AD alterations, we employed diffusion tensor imaging (DTI) to examine the microstructural integrity of the PC in participants with mild cognitive impairment (MCI).

Participants and Methods: Forty nondemented participants were divided into groups based on cognitive status (MCI: $n=11$; Normal Control [NC]: $n=29$). Groups were comparable on age, education, gender, stroke risk, and APOE genotype. DTI estimates of fractional anisotropy (FA) of the PC were obtained from axial slices using color-coded maps as a guide for ROI placement.

Results: Relative to NCs, MCI patients demonstrated significantly lower PC FA. MCI status was predictive of PC FA after adjusting for age, stroke risk, and whole brain volume. PC FA was significantly positively correlated with hippocampal volume as well as performance on tests of memory and executive functions.

Conclusions: Consistent with changes seen in AD, findings demonstrate impaired integrity of the PC in MCI. Alterations were associated with reduced hippocampal volumes but not age or stroke risk, suggesting that microstructural posterior white matter degeneration may be linked to underlying pathologic processes specific to an incipient dementia. Findings implicate involvement of white matter pathology in the development of MCI-related cognitive changes and suggest that reduced FA of the PC may be a candidate marker of conversion to AD.

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K. PATEL, S. CORREIA, S. EPSTEIN, E. SCHLICHTING, S. ZHANG, D. LAIDLAW, P. MALLOY & S. SALLOWAY. Grey and White Matter Changes on MRI and Diffusion-Tensor Imaging and Cognitive Function in Mild Cognitive Impairment.

Objective: To assess changes in cerebral grey matter and white matter and their associations with cognitive functioning (i.e., processing speed and memory) in patients with mild cognitive impairment (MCI).

Participants and Methods: Eleven MCI patients (age=72.6±6.0) and 14 controls (age=74.0±7.5) underwent MRI with diffusion-tensor imaging (DTI) and cognitive testing. Grey matter, white matter, hippocampal, and subcortical hyperintensity volumes (HCV, GMV, WMV, and SHV, respectively) were measured and corrected for intracranial volume (ICV). DTI measurements were the number and length of transcallosal and bilateral cingulum bundle fibers weighted for linear anisotropy and corrected for ICV. Alpha was set at ($\alpha=.025$) to achieve a balance between Type I and Type II error.

Results: The groups did not differ significantly by age, education, sex. The MCI group had smaller left HCV ($p=.012$) but did not differ from the controls by ICV, right HCV, GMV, WMV, or SHV. Transcallosal fibers were fewer and shorter in total length in the MCI group ($p<.001$); no other significant DTI differences were found. The MCI group had significantly poorer processing speed and verbal recall ($p<.01$); the groups did not differ on measures of executive functioning or confrontational

naming. Processing speed and verbal recall correlated significantly with left HCV and transcallosal fiber integrity in the entire sample ($p \leq .005$).
Conclusions: The results extend previous literature showing loss of white matter integrity in MCI and are consistent with prior reports of decreased HCV in MCI. They also demonstrate that decreased white matter integrity and HCV play a role in processing speed and memory.
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Symposium 3

10:45 a.m.–12:15 p.m.

Methods of Assessing Cognitive Trajectories in Outcomes Research and Clinical Practice

Chair: Gordon Chelune

Discussant: Kevin Duff

G.J. CHELUNE. Methods of Assessing Cognitive Trajectories in Outcomes Research and Clinical Practice.

Symposium Description: This symposium examines emerging new methods for assessing reliable change over multiple time points and their application in outcomes research and clinical practice. In contrast to traditional single-point assessments designed to identify impairments in current cognitive status, these approaches focus on cognitive trajectories and meaningful change. Rather than treating practice effects as a statistical artifact in serial assessments, these approaches focus on change as the variable of interest and treat it as a potential biomarker of neurologic integrity. Scott Millis presents an overview of the Linear Mixed Model (LMM), and demonstrates its use in assessing change in new learning and memory in patients recovering from traumatic brain injuries, noting the advantages LMM has in handling missing data, modeling time effects, and accounting for the correlations between repeated measures. Deborah Attix describes an extension of Standardized Regression-Based (SRB) methods to characterize normative cognitive trajectories across three time-points for a co-normed battery and how these can be applied to identify meaningful individual deviations from expected retest performance. Gordon Chelune delineates an application of SRB methods to the data of individual subjects to create ipsative prediction equations and deviation scores, and compares these to group predictions using data from a population-based study of older adults tested 4-times over a 10-year period. Paul Maruff concludes with studies of change over time in samples of athletes recovering from concussions and patients with Alzheimer's disease, highlighting the statistical, methodological, and practical differences between assessments designed to assess impairment versus change in cognitive status.

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S.R. MILLIS. Linear Mixed Models: Measuring Change.

Objective: In the past, investigators have often favored repeated measures analysis of variance (rANOVA) or multivariate analysis of variance (rMANOVA) in assessing change in cognition, particularly when persons were measured at more than two time points. However, both methods have significant limitations. Neither method can handle missing data. rANOVA also has the restrictive statistical assumption of sphericity or circularity. In relaxing that assumption, rMANOVA pays the price by reduced statistical power to detect change over time. When used to assess treatment efficacy over time, both methods answer an uninteresting question having little practical importance, 'do the treatments differ in any way over time?' The linear mixed model (LMM) has several advantages to the traditional method in analyzing change. LMM can handle missing data, can account for the correlation between repeated measurements on the same participant, has the flexibility to model time effects, and uses all available data. In addition, LMM can determine whether there is substantial variability in cognition across participants at the beginning of the observational or interventional period and whether there is significant variability in the change trajectory over time across participants. Covariates can also be entered in the LMM to explain this variability. Along with providing an overview of the LMM, the presentation will demonstrate the use of the LMM to examine change in new learning and memory in persons with traumatic brain injury. Data are from the multicenter Traumatic Brain Injury Model System.

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D.K. ATTIX, T.J. STORY, G.J. CHELUNE, J.D. BALL, M.L. STUTTS, R.P. HART & J.T. BARTH. Trajectories of Normal Neuropsychological Change.

Objective: Clinical neuropsychology is driven by the systematic application of measurement tools and principles, and typically boasts strong normative resources. Yet the amount of data regarding normative change remains scarce given the frequency with which the clinician or researcher employs serial assessment to monitor disease progression, intervention response, or recovery of function. Standardized regression based (SRB) models offer a method of augmenting clinical judgment by offering norms that account for variables that modify change, including practice effects, measurement error, regression to the mean, demographic factors, and baseline ability. The current study draws from a sample of 332 normal individuals to provide SRB data for eight commonly used neuropsychological measures. Linear regressions were utilized to provide co-normed baseline data with demographic adjustments and to construct normative test-retest change scores. The SRB models provide norms that delineate expected, normal change across three time points, and offer the important advantage of yielding standardized z-scores that are comparable across measures. Applying a relatively new approach, we used both baseline (T1) and initial retest scores (T2) to predict (T3) scores. Because performance on any previous trial was accounted for in the subsequent model of change, the serial normative formulas model change trajectories rather than simple point to point change. These equations provide indices of deviation from expected baseline and change performance for use in clinical and research settings.

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G.J. CHELUNE, J.T. TSCHANZ, C. CORCORAN, N. FOSTER, M. NORTON & K. WELSH-BOHMER. Deriving Ipsative Trajectories of Cognitive Change.

Objective: Recent studies have applied reliable change methods to characterize cognitive performance trajectories across multiple time points using standardized regression-based (SRB) methods derived from group data. This presentation demonstrates the feasibility of applying similar SRB methods to create ipsative prediction equations from data in individual subjects. The equations here are derived from the population-based Cache County Study of Memory, Health and Aging in which 317 clinically-confirmed normal older adults (baseline age 65-92) were administered the revised Modified Mini-Mental State Exam (3MS) four times at 3-4 year intervals over 10.5 years. Analysis of the standardized 3MS scores revealed a significant linear practice effect for the group, with considerable individual variation in the deviation of observed Time-4 scores from their SRB group-predicted scores. Using similar SRB methods, an ipsative "trajectory" of change was also derived for each subject by fitting a regression line through his/her first 3 data-points to predict Time-4 performance, and the individual's standard error of estimate was used to calculate a standardized ipsative deviation-score. The group-predicted Time-4 scores correlated .84 with the ipsatively predicted scores, and the ipsative deviation-scores correlated .59 with the group-derived deviation scores. Thus, it appears possible to independently characterize an individual's trajectory of performance without a reference group and to use this to identify meaningful deviations in the person's cognitive trajectory over time. Further study of individual cognitive change may eventually reveal that practice effects are not merely statistical artifacts but potential biomarkers of neurologic integrity.

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P. MARUFF. Assessing Cognitive Change Versus Assessing Cognitive Impairment.

Objective: In neuropsychology there is a growing interest in statistical techniques and methods for assessing cognitive change over time. However, the selection of the appropriate statistical technique is dependent on the question being asked by the neuropsychologist and also the context within which it is asked. Furthermore, there are important differences between clinical decisions about the presence of change and the presence of impairment. Using data from ongoing studies of concussion in elite athletes (n=312) and Alzheimer's disease in older adults (n=37), this presentation will consider how the detection of change over time in cognitive function can reliably inform clinical decisions about the presence and progression of neurodegenerative illness or recovery from injury. This presentation will also highlight the limitations associated with clinical decisions based on the identification of cognitive change. We will then consider how issues associated with neuropsychological assessment can limit the ability to detect cognitive change; issues such as the time allowed for assessment, the appropriateness of tests for repeated use and test data characteristics. Finally we will consider how decisions about cognitive change and decisions about cognitive impairment can be combined in the neuropsychological management of patients. The main argument in this presentation is that the statistical, methodological and practical issues associated with the measurement of cognitive change are different to those associated with the identification of cognitive impairment. It is therefore important for the neuropsychologist to understand these limitations and to be clear as to why they are conducting an assessment.

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Poster Session 3: Assessment and Cross-Cultural Issues

11:00 a.m.–12:30 p.m.

Assessment/Psychometrics

R. ADDEO, J. WERTHEIMER, M.L. WOODBURY, C.A. VELOZO & K. GARRETSON. Brooks Functional Assessment Scale: Rasch Analysis of a new Brain Injury Functional Outcomes Measure.

Objective: To assess construct and item level psychometric characteristics of a new outcome measure for brain injury patients, the Brooks Functional Assessment Scale (B-FAS).

Participants and Methods: 230 patients with brain injuries that have undergone treatment in a neurorehabilitation day treatment program. Admission and discharge scores from the 9-item B-FAS were subjected to factor and Rasch analyses.

Results: The results suggest that the B-FAS is unidimensional and fits the Rasch model. The scale has moderate to high point-measure correlations, and the internal consistency is strong at both admission and at discharge. The instrument measures distinct levels of ability at both admission and at discharge, without significant ceiling effects. The item hierarchies at admission and at discharge were similar though differential item functioning analysis suggests that three of the items in the scale have different difficulty measures at admission versus discharge. However, this finding did not have a significant negative impact on person measurement and these three items were retained.

Conclusions: The B-FAS is a clinician-rated instrument that has good psychometric characteristics and has the potential to be an extension of the FIM+FAM because it does not appear to have a significant ceiling effect. This instrument shows potential in effectively measuring higher level functional skills over time in the post-acute/outpatient rehabilitation setting for those with brain injuries.

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B.J. ALLEN, J.D. GFELLER, A.N. CAPPS, P.D. RUPPERT & M.J. ROSS. Construct Validity Of The Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT) With Traditional Neuropsychological Measures.

Objective: Computerized test batteries (e.g. ImPACT) have several advantages, relative to traditional "paper-pencil" tests for assessing the neuropsychological effects of sport-related concussion. Research indicates that some ImPACT scores correlate moderately with traditional measures (e.g. BVMT-R, SDMT). The present study further contributed to this literature by examining the construct validity of ImPACT.

Participants and Methods: A sample of undergraduate participants completed ImPACT and the "NFL" battery of tests (i.e., HVLIT-R, BVMT-R, Trail Making Test, COWA, and WAIS-III Symbol Search, Digit Symbol - Coding, and Digit Span) in a counter-balanced order of administration. The sample (N=100) was 56% female, 76% Caucasian, and 93% right-handed, with an average age of 19.69 (SD=1.19), and 13.21 (SD=1.09) years of education.

Results: Analyses revealed a wide range of correlations that demonstrated ImPACT indicators frequently correlated, as expected, with traditional tasks measuring similar constructs. However, the specific ImPACT subtests that comprise the various composite scores did not correlate highly with each other. In light of this finding, factor analyses were conducted to examine the factor structure of ImPACT. A five-factor

tor solution accounted for a total of 69% of the variance. The factors were determined to measure the following constructs: forced choice efficiency, primarily memory, inhibitory cognitive abilities, visual processing abilities with an element of memory, and errors on a Stroop-like task.

Conclusions: Notably, the subtest composition of these factors differs considerably from the standard ImPACT composites and suggests the test's composite measures merit further examination. Clinicians should exercise caution in interpreting ImPACT composites as they currently stand.

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J. ALLEN & B.H. SOKAL. The Reliability and Validity of Self-Reported Footedness.

Objective: This study's aim is to investigate the reliability and validity of an 11-item self-report measure of foot preference. Behavioral measures of footedness might be preferred as least susceptible to bias, but a self-report measure may be advantageous if it provides similar scores with similar reliability. Considering footedness in addition to handedness might enhance the strength of their relationship to other aspects of cerebral lateralization.

Participants and Methods: A 24-item (13 hand and 11 foot) self-report inventory was administered to 4939 undergraduates. Fifty-five participants also completed both a performance and self-report footedness inventory. The self-report inventory was readministered to a group of 50 participants 10-12 weeks later. Items were scored "1" for right, "2" for either, and "3" for left.

Results: The coefficient alpha internal consistency estimate of reliability of the 11-item subjective foot preference inventory was .84. The correlation between the different methods for assessing footedness was .79 (.90 corrected for attenuation), but the correlation between self-reports for handedness and footedness was .69 (.77 corrected for attenuation). The test-retest correlation of the footedness scale was .89 (1.00 corrected for attenuation).

Conclusions: The 11-item self-report inventory of foot preference has sufficient validity and reliability to be recommended to other investigators. Since hand preference and foot preference are only partially related, they should probably be treated as separate variables in studies of cerebral lateralization.

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J.P. BAERWALD & G.P. RYAN. Are Cognitive Measures of Achievement Influenced by Personality Facets of Achievement Striving?

Objective: The objective of this study was to explore the relationship between cognitive indicators of achievement with personality characteristics related to academic performance.

Participants and Methods: College-aged students ($n = 66$) volunteered for the study. These participants completed a history questionnaire, selected subtests of the Woodcock-Johnson Test of Achievement II (WJ-II), and the NEO-PI-R. WJ-II subtests included calculation, math fluency, reading fluency, spelling, word attack, and passage comprehension. Participant's scores on the WJ were compared with the NEO's conscientiousness facets (i.e., competence, order, dutifulness, achievement striving, self-discipline, and deliberation).

Results: Results indicated no significant relationship between participant's achievement scores on the WJ and personality characteristics on the NEO. Specifically, performance across all achievement subtests showed no significant relationship to any of the NEO's conscientiousness facets.

Conclusions: Our concept of achievement from a personality standpoint does not seem to be related to our cognitive concept of academic performance in the variables measured. While pathological characteristics have previously been shown to influence areas of achievement striving, this study's results indicate a lesser role of personality characteristics measured by the NEO. Additional analyses of participants reporting "significant difficulties" in academic performance ($n = 23$) found similar non-significant findings.

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L. BAKER. Assessing Treatment Effects on Selective Attention in Clinical Trials for Memory-Impaired and Normal Older Adults Using a Computerized Version of the Stroop.

Objective: The Stroop Interference test is used to assess selective attention for older adults in diagnostic and research settings. However, the sensitivity of this test to treatment effects is limited given that performance is quantified by a single response variable (number correct). Moreover, when the targeted population includes memory-impaired older adults, what appears to be inefficient attentional filtering may instead reflect a reduced ability to remember task instructions. In several clinical trials with normal older and memory-impaired adults, we utilized a computer-administered version of the Stroop to assess treatment-related effects on selective attention. Data will be presented demonstrating the sensitivity of this computerized version of the Stroop to evaluate attentional processing in treatment trials for healthy older adults and memory-impaired patients.

Participants and Methods: This version was created using a user-friendly programming platform (E-Prime, PST) developed for the design and implementation of computer-administered tests. Stimuli requiring voice-activated timed responses are presented in series, over several trial blocks. The "control" stimuli (color words in concordant font colors) are embedded within each block, and the trial blocks differ only by the instruction provided before each stimulus presentation ("read word" or "name color").

: This computer-administered design affords several advantages over the original version of the task. First, efficiency of selective attention is indexed by a more reliable and sensitive measure, response time averaged over a number of trials. Second, the inclusion of a task "reminder" prior to stimulus presentation minimizes memory load on task performance so that processes associated with selective attention might more effectively be evaluated.

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R. CLARK. Standardised and automated, touchscreen assessment of neuropsychological function.

Objective: There are polarised views on the use of automated, computerised testing to assess neuropsychological function. For example, it is argued that the psychologist should always be present to observe performance subtleties not evident from quantitative scoring; or that rigidly automated test instructions can invalidate test performance measures. Alternatively, conventional paper and pencil testing can suffer from uncontrolled variance due to interaction bias and/or non-compliant test delivery. We will present data from an automated, standardised touchscreen test battery ("IntegNeuro") recently developed as part of an international collaboration of scientists and clinicians.

Participants and Methods: Normative data from over 10,000 males and females across the full age range (6-80+) have been collected from

multiple sites in Australia, Europe and the USA. The battery has been validated and both test-retest and cross-site reliability established. The size of the database permits effective smoothing across age and years of education using a non-linear regression model to restrict the influence of individual differences on normative comparisons.

Results: Results will demonstrate (a) potent effects of age on measures of attention, language, memory, processing speed, motor and executive function, and (b) present relationships between the cognitive factors derived from database scores and measures of brain structure and function obtained from the same database participants.

Conclusions: It will be argued that standardised, automated testing that is well thought through can provide significant advantages in terms of time, cost, convenience and sensitivity and provide an effective screening tool, but that it will often need supplement from other tests as determined by the expert judgement of the neuropsychologist.

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E. SIMON & G. DONIGER. Controversy in Neuropsychology: Is NeuroTrax Computerized Cognitive Assessment Friend or Foe?

Objective: Our objective is to discuss new technology for cognitive assessment and how neuropsychologists can get involved.

There is a need for standardized cognitive assessment in early dementia detection and wide variety of neurological and psychiatric diseases. However, most patients do not undergo testing due, in part, to a lack of access to and high cost of neuropsychological testing. A clinical assessment system must be scientifically valid, sufficiently broad, practical for use, and have excellent support. The Mindstreams® (NeuroTrax Corp., NJ) system is valid for multiple domains, good test-retest reliability, and sensitive to treatment effects (20 published studies). The current paper presents data on the practicality of testing in the elderly.

Participants and Methods: Usability data were collected following each of 2888 consecutive testing sessions at 12 clinical centers. The chi-square test determined whether patients and technicians more often rated tests easy versus hard to use. Non-computer users, patients over 75 years, and poor performers ($\leq 1SD$ on overall battery performance) were analyzed separate.

Results: For the entire study database ($n=2888$; age: 64.7 ± 18.2 years), of patients who rated the tests either easy or hard to use, 83% rated them easy to use ($p < 0.001$). 73% of non-computer users, 70% of patients over 75 years old, and 69% of poor performers rated the tests easy to use ($p < 0.001$). Supervisor ratings were similar. For the entire study database, 76% of ratings indicated no patient frustration ($p < 0.001$).

Conclusions: Mindstreams computerized cognitive assessment is easily employed by the elderly including those with cognitive impairment, making it a practical tool for in-office assessment. Neuropsychologists may use this to test a large number of patients and then apply selected traditional tests where needed. Guidelines for physician use recommend focused referral to neuropsychologists for difficult cases. In addition, psychologists serve as the experts in NeuroTrax Centers of Excellence. Correspondence: *E. Simon, E-mail: ehy@neurotrax.com*

S. BOUWENS, C. VAN HEUGTEN & F. VERHEY. Psychometric Properties of Goal Attainment Scaling Used for People with Cognitive Disorders: A Systematic Review.

Objective: To establish a systematic review of studies evaluating psychometric properties of GAS applied in people with cognitive disorders following brain injury and dementia.

Participants and Methods: Eight databases were searched and reference lists from relevant articles were evaluated. Inclusion criteria were adult patients with cognitive disorders due to any brain injury or dementia in which GAS was used as outcome measure. Two authors independently reviewed all data.

Results: Twelve out of 823 studies met the inclusion criteria. The patients' mean age in the brain-injured group was 28.1 years ($N=60$, 32 female); the mean age in the demented group was 78.2 years ($N=846$, 550 female). The amount of time required for setting goals was appropriate and other aspects of feasibility were good. GAS was the most responsive measure compared to other outcome measures (effect sizes 0.61-5.11). Inter-rater reliability was high ($r = 0.92$ to 0.94 , $ICC = 0.87$ to 0.95), concurrent validity (GAS compared with the Barthel Index and clinical impression) was moderate to high ($r = 0.52$ to 0.85), convergent validity (GAS compared to clinical impression) and construct validity (GAS compared to functional capacity and quality of life) varied across the studies ($r = 0.00$ to 0.80 , $r = 0.00$ to 0.87 respectively).

Conclusions: GAS should be considered as a practical and responsive approach for measuring attainment of individualized goals in patients with cognitive disorders.

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N. CARLOZZI, J.C. STOUT, K. WHITLOCK, S. QUELLER, E. AYLWARD, D.R. LANGBEHN, K. DUFF, L.J. BEGLINGER & J.S. PAULSEN. Estimating Premorbid IQ in the Prodromal Phase of a Neurodegenerative Disease in the Predict-HD Cohort.

Objective: Cross-sectional findings in pre-diagnostic HD (pre-HD) indicate that the American National Adult Reading Test (ANART) is less associated with proximity to estimated disease onset than the Wechsler Abbreviated Scale of Intelligence (WASI), and therefore more suitable as a pre-morbid IQ estimate for pre-HD. We now examine these IQ estimates longitudinally over a two-year interval, along with striatal volumes to determine their susceptibility to change with disease progression.

Participants and Methods: We examined 230 CAG-expanded pre-HD and 26 CAG-normal participants using the ANART (baseline and year 3) and the WASI two subtest version (years 2 and 4) and MRI-based striatal volumes. Analyses were controlled for age, education and gender.

Results: Test-retest reliability was higher for the ANART ($r \approx .93$) than for either WASI subtest (all $r < .90$). Neither proximity to diagnosis, nor change in striatal volumes were associated with changes in ANART or either subtest of the WASI. Only declines on Matrix Reasoning were associated with baseline striatal volume.

Conclusions: Although 2-year striatal change was not related to decline in any estimate of IQ, the finding that larger baseline volumes were associated with less change over time on Matrix Reasoning suggests that the WASI may be relatively more sensitive to disease progression. Findings indicate that the ANART is a slightly better measure than the 2-subtest version of the WASI for pre-morbid IQ estimation in studies of early neurodegenerative disease.

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C. COLEMAN & N. GREGG. Factor Structure of Phonological and Orthographic Awareness Tests.

Objective: The vast majority of adults with learning disabilities are those with deficits impacting reading decoding, reading/writing fluency, and spelling. Clinically, these deficits are typically documented using phonological (or phonemic) and orthographic awareness tasks. Understanding the relationship between phonological/orthographic awareness and literacy skills among the adult population is critical from both an assessment perspective (e.g., differential neuropsychological diagnosis) and an educational perspective (e.g., effective remediation and academic

modifications). SEM is a useful tool to approach this type of analysis. The purposes of this study were two-fold: (a) to extend our understanding of the nature of phonological and orthographic awareness by investigating the factor structure of a battery of five phonological and five orthographic awareness tasks; and (b) to explore the relationship between the latent constructs of phonological and orthographic awareness and tasks used to measure these constructs.

Participants and Methods: University students with dyslexia, ADHD, dyslexia + ADHD (co-morbid), and no disabilities (total N = 630). Our methodology included Confirmatory Factor Analysis under a SEM framework

Results: Results provided evidence that research tasks used frequently to measure phonological and orthographic awareness do factor into two constructs for adults with dyslexia and adults with no disabilities. However, for those adults with ADHD (with or without accompanying dyslexia), both one- and two-factor models fit poorly.

Conclusions: Clinicians performing differential diagnosis with potentially-ADHD adults are urged to exercise caution when interpreting scores from phonological and orthographic awareness tasks. Additional implications of the results (e.g., an interaction between ceiling effects and the tendency of individuals with ADHD to make low-level errors due to attentional deficits) will be discussed.

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M.A. GARCIA-BARRERA. Derivation and Construct Validity Analysis of a Screener for Executive Functions.

Objective: The problem of valid measurement of psychological constructs remains an impediment to scientific progress (Strayhorn, 1993), including the measurement of executive function in child psychology. This multidimensional ability has been controversial since its first descriptions and multiple models have been developed in an attempt to understand the different components of such regulatory systems. The ecological validity of executive functions measurements have been improved with the introduction of rating scales. The purpose of this study was to analyze the construct validity of a screener for the estimation of executive functions in children.

Participants and Methods: For this study, a CFA model with 25 items loading into four latent factors representing four executive functions was developed (behavioral control, emotional control, attentional control, and problem solving), and its statistical properties were examined using Structural Equation Modeling. The sample for this study was obtained from the original standardization sample of the BASC Teachers for children aged 6-11 (N=2165).

Results: The items were derived from the original Behavior Assessment System for Children ages 6-11 (BASC-C). Reliability analysis demonstrated moderate to high factor internal consistency. Analysis of content validity (panel of experts) eliminated construct irrelevant indicators. Construct validity demonstrated the multidimensionality of the model (four-factors) and adequate fit (i.e., CFI= 0.948). Measurement Invariance analysis across sex and age demonstrated that the model was invariant.

Conclusions: Results supported the hypothesis that a reliable and valid executive functions measure could be obtained from a behavioral rating scale, and that its properties can be reliably testing using CFA and SEM methods. Furthermore, screeners are useful clinical tools in assessment settings. If implemented, this screener will provide clinicians and researchers with an instrument for the estimation of executive functions in children.

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D.A. PINEDA, M.A. GARCIA-BARRERA & D.C. AGUIRRE. Cross Cultural Validity Analysis Using SEM, of the Behavior Assessment System for Children in a Colombian Sample.

Objective: The utility of Structural Equation Modeling (SEM) in cross-cultural validity analysis is presented with an example study. The goal of this study was to analyze the dimensional structure of the Behavior Assessment System for Children (BASC-C) parents and teachers Spanish version questionnaires using SEM.

Participants and Methods: For this purpose, a randomized sample of 1176 children aged 6 to 11 years old was selected from the schools of Manizales City (Colombia, South America). Confirmatory factor analyses (CFA) under a SEM framework were developed and tested for both questionnaires. The theoretical models supporting these questionnaires were replicated and tested for this Colombian sample.

Results: Results showed that BASC parents had two dimensions: clinical and adaptive, KMO = 0.87, which explained 64% of the variance. CFA found that this 2 factor structure has an acceptable fit (GFI=0.783 y AGFI=0.681), but the theoretical 3 factor structure (internalizing problems, externalizing problems, and adaptive skills) fit better our data (NFI= 0.895; GFI= 0.895, AGFI=0.818). BASC teachers generated two clinical dimensions: externalizing (factor 1) and internalizing (factor 3), and one adaptive dimension, which was the factor 2 (75.2% of the variance). KMO was 0.90. CFA found that this 3 factor structure fit well (GFI=0.823 y AGFI=0.73); however, the theoretical structure of 4 factors (internalizing, externalizing, and school problems, plus adaptive abilities) fit better (GFI=0.897 y AGFI=0.831).

Conclusions: Structural Equation Modeling is a useful tool for the unveiling of the latent factor structure of ratings scales, and its validity examination across cultures. Clinical implications will be discussed.

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M.D. DICKINSON, S. RANE, M. HISCOCK, I. GRAUR, N. LACHNER, M. PAPAIOANNOU & J. CARSELLI. Further Validation of a Non-Manual Trail Making Test.

Objective: A computerized non-manual Trail Making Test (NMTMT) is being developed for use with manually impaired patients. In the validation process, we examined associations (1) between the NMTMT and the standard paper-and-pencil TMT, (2) between both tests and conceptually similar tests (convergent validity), and (3) between both tests and conceptually dissimilar tests (discriminant validity).

Participants and Methods: Eighty university students (50 females, 30 males) participated in each of two studies. All participants completed the NMTMT and the TMT. In Study 1, participants were also administered the Symbol Digit Modalities Test (SDMT), Stroop interference test (STROOP), Jumbled Numbers Task (JNT) and WAIS-III Letter-Number Sequencing Test (LNST). In Study 2, participants completed the Rey Auditory-Verbal Learning Test (AVLT), Raven's Progressive Matrices (RPM) and Finger Tapping (FT).

Results: Correlations between NMTMT and TMT scores were about .30 for Part A and .50 for Part B. Regression analyses for Study 1 indicated that SDMT scores contributed to the prediction of performance on Part A of the NMTMT ($p < .01$), and LNST scores contributed to the prediction of performance on Part B ($p < .01$). SDMT scores also contributed to the prediction of performance on Part A of the TMT ($p < .01$), but JNT scores contributed to the prediction of performance on Part B ($p < .01$). In Study 2, FT speed contributed to the prediction of TMT scores ($p < .01$) but none of the tests (AVLT, RPM, or FT) contributed to the prediction of NMTMT scores.

Conclusions: The TMT and NMTMT are moderately related to each other and have similar patterns of association and non-association with other neuropsychological measures. When the tests diverge, the differences are interpretable. Specifically, the NMTMT is not influenced by motor speed, and Part B of the NMTMT seems to require working memory to a greater degree than does Part B of the TMT.

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E. ELOFSON, G. HOLMAN, M. JOHNSON, C. MCGRATH & M. CHERRIER. Pilot Study of a Novel Virtual Reality Spatial Memory Test in Older Adults.

Objective: This study assessed feasibility and validity of a novel Virtual Reality Spatial Memory test (VRSM) for older adults. VRSM involves learning and navigating a virtual town. Validity was evaluated by comparison with spatial memory, spatial reasoning, and verbal memory tests. Spatial memory tests were hypothesized to have a strong correlation and verbal memory tests a weak correlation with VRSM performance. Practice effects between alternate versions of the VRSM were also estimated.

Participants and Methods: 60 older adults (50-82 years old, mean age: 62.5, mean education: 16+ years) completed the test battery, including the VRSM, a test of spatial memory (VSLT), two tests of spatial reasoning (WASI Block Design and mental rotation), a test of verbal memory (HVLT, Revised), and WTAR Estimated Full Scale IQ (Est. FSIQ).

Results: Age and Est. FSIQ, but not gender, predicted VRSM performance. VRSM performance correlated moderately with spatial memory ($r = .40, p = .004$) and with spatial reasoning ($r = .43, p = .001$). VRSM performance also correlated moderately with verbal memory ($r = .37, p = .009$). The practice effect between versions was substantial ($t(46) = 4.2, p < .001, d = 1.32$).

Conclusions: Our results provide preliminary support for the VRSM as a feasible and valid measure of spatial memory and reasoning in older adults. The VRSM is promising due to its portability, potential for use in brain scan studies, and potential greater external validity as an assessment of spatial functioning. Future studies should evaluate VRSM in clinical samples and samples with moderate education levels.

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C.J. FERGUSON, S.M. RUEDA, A.M. CRUZ & D.E. FERGUSON. Executive Functioning, Impulsive Aggression and the Validity of a Laboratory Based Aggression Paradigm.

Objective: A common laboratory paradigm for studying aggression, the "Taylor Competitive Reaction Time Test" (TCRTT) continues to be used despite the absence of proper validation studies. Using sound blasts administered by the participant against a fictional human opponent as a measure of aggression, the TCRTT allows for multiple methods of measuring aggression, related to both the intensity and duration of the sound blasts. Poor correlations between the noise intensity and duration measures have led to speculation that these two indices may be measuring separate forms of aggression, instrumental and impulsive aggression. The current study examined the validity of the TCRTT in 101 college student participants.

Participants and Methods: Participants were administered a test of verbal intelligence, a self-report measure of aggressiveness as well as neuropsychological measures of executive functioning associated with impulsive aggression. Participants also were administered the TCRTT.

Results: Results indicated concerns regarding the validity of the TCRTT as a measure of aggression. Specifically sound blast duration did not correlate either with self-reported aggression or low executive functioning. Sound blast intensity did correlate with self-reported aggression but not executive functioning.

Conclusions: These results suggest that laboratory studies of aggression using the TCRTT are of questionable validity, particularly if only sound blast duration is a significant finding. Sound blast intensity may be a more valid indicator of aggression than sound blast duration, but more research needs to be done before results using the TCRTT can be considered a valid measure of aggression.

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B. FREILICH, T. HERLANDS, C. GASS & A. MEDALIA. Normative Data on a Multiple Choice Logical Memory Recognition Test for the Wechsler Memory Scale, 3rd Edition (WMS-III).

Objective: Objective: Memory is typically divided into three stages: 1) encoding, 2) storage, and 3) retrieval. A comprehensive memory assessment ideally includes an approach that allows the examiner to make inferences regarding the integrity of each of these processes. This information cannot be solely ascertained from measures of free recall because poor performance may be due to either an encoding/storage defect or failed retrieval operations. For this reason, most new memory measures including the Logical Memory (LM) subtest of the Wechsler Memory Scale, 3rd Edition (WMS-III) include recognition testing to assist in differentiating between encoding/storage vs. retrieval deficits. However, the LM Recognition subtest of the WMS-III utilizes a true-false format, which is problematic for assessing memory because it lacks measurement precision. As an alternative, Gass et al. developed a 5-option multiple choice recognition test for WMS-III LM to reduce error variance associated with guessing. The objective of this study is to provide additional normative data for Gass et al.'s LM recognition test.

Participants and Methods: 50 cognitively normal adults, ages 20-60, completed WMS-III LM as well as Gass et al.'s LM recognition test as part of a larger normative project.

Results: Results: Neither age nor education were related to LM recognition scores, therefore, normative data are presented for the sample as a whole.

Conclusions: Conclusions: The norms that are presented can be used in combination with LM recall scores to differentiate between storage and retrieval deficits on the LM subtest of the WMS-III.

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G. GOLDSTEIN, D.N. ALLEN & N.J. MINSHEW. Confirmatory Factor Analytic Studies of the Wechsler Scales in Autism.

Objective: Objective: Determining whether the structure of intelligence is similar in children and adults with high functioning autism (HFA) to that found in normative samples and whether a separate "social context" factor would emerge that is unique to HFA.

Participants and Methods: Participants and Methods: 137 children and 118 adults with HFA were compared with data for comparable age groups contained in the standardization samples in the Wechsler manuals. Confirmatory factor analyses of the traditional 11 subtests of the Wechsler child and adult intelligence scales were accomplished. Varying solutions involving three and four factor models were attempted. Goodness-of-fit and related indices were computed.

Results: Results: Four-factor models incorporating a Social Context factor provided the best fit in both the autism and normative samples, but the subtest intercorrelations were generally lower in the autism samples.

Conclusions: Conclusion: Findings suggest similar organization of cognitive abilities in HFA to what was obtained from normative sample data. This result appeared to confirm the theory of underconnectivity or reduced communication among brain regions in autism reported in the recent literature.

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G. GUILERA, O. PINO, J. CÓMEZ-BENITO, J. ROJO, S. PURDON, J. REJAS, B. CRESPO-FACORRO, R. TABARÉS-SEISDEDOS, N. SEGARRA, A. MARTINEZ-ARAN, M. CUESTA, M. FRANCO, M. BERNARDO & E. VIETA. Decision validity and cut-off scores of the Spanish version of SCIP in a sample with Bipolar Disorder I.

Objective: The Screen for Cognitive Impairment in Psychiatry (SCIP; Purdon, 2005) is a brief assessment tool designed for evaluation of cognitive impairment in psychiatric disorders. The SCIP requires less than 15 minutes and it has three alternate forms; each consisting of five subscales for the assessment of immediate verbal list learning, working memory, verbal fluency, delayed list learning and visuomotor tracking. Prior investigations have confirmed the adequacy of the psychometric properties of the SCIP in relation to internal consistency, test-retest reliability, dimensional structure and convergent validity, but they have not yet explored the decision validity of the scale. Therefore, the aim of the present study is to describe the decision validity of the Spanish version of the scale (SCIP-S) in a sample with Bipolar Disorder I.

Participants and Methods: The SCIP-S was administered to a control sample (n=35) and to patients with Bipolar Disorder I (n=76). Different criteria were used to define the control group (non-affected cognitive functions) in each subtest, as well as in total score, taking into account 7 neuropsychological diagnosis.

Results: The study proposes preliminary cut-off points for each subtest and also for an overall cognitive factor based on the control group; they show as well a sensitivity and specificity analysis for each point.

Conclusions: The present study shows the first results on the sensitivity and specificity of the Spanish version of the SCIP in Bipolar I disorder, and encourage further investigation of the SCIP-S decision validity in other clinical populations.

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D.J. HARVEY, T. FRAZIER, R.I. NAUGLE & C.S. KUBU. Examination of Group Response Consistency on the Frontal Systems Behavior Scale.

Objective: The Frontal Systems Behavior Scale (FrSBe) is used to assess the integrity of frontally-mediated behaviors before (premorbid) and after (postmorbid) neurological illness or injury. The scale consists of 32 items addressing negative/maladaptive behaviors and 14 items addressing positive/adaptive behaviors. Both self and family report forms exist. Although the respondent is warned to read carefully before switching from positive to negative items, no formal consistency measure is included. This study examined whether the FrSBe was vulnerable to inconsistent responding between the positive and negative items.

Participants and Methods: The FrSBe was administered to 217 patients diagnosed with Parkinson's Disease (PD), or other movement disorder, and their family members as part of a comprehensive neuropsychological assessment.

Results: Positive-item grand means (the mean of all participant mean scores on positive items) were calculated for the 4 possible FrSBe conditions, i.e. premorbid self-report (PreSelf), postmorbid self-report (PostSelf), premorbid family report (PreFam), and postmorbid family report (PostFam). These 4 positive-item grand means were then compared with the individual negative-item mean scores for each of the 4 conditions. A cutoff value of 1.96 Standard Errors of Measurement (SEM) derived from the FrSBe manual reliability indices was used in each case. Negative-item mean scores deviated from positive-item cutoffs on 10/14 items (PreSelf), 8/14 items (PostSelf), 11/14 items (PreFam), and 11/14 items (PostFam) using this standard.

Conclusions: Findings suggest that, as a group, both patient and family respondents may be prone to inconsistent responding between the positive and negative items on the FrSBe.

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D.J. HARVEY, T. FRAZIER, R.I. NAUGLE & C.S. KUBU. Examination of Individual Response Consistency on the Frontal Systems Behavior Scale.

Objective: The inclusion of consistency measures in behavioral assessment instruments is important to establish response reliability. The Frontal Systems Behavior Scale (FrSBe) examines frontally-mediated behaviors before (premorbid) and after (postmorbid) neurological illness/injury. The scale consists of 32 items addressing negative/maladaptive behaviors and 14 addressing positive/adaptive behaviors, each scored on a 5-point Likert Scale. Both self and family report forms exist. No formal consistency measures are included, although the respondent is warned before switching from positive to negative items. This study sought to examine the degree of individual response consistency on the FrSBe.

Participants and Methods: The FrSBe was administered to 217 patients diagnosed with Parkinson's Disease (PD), or other movement disorder, and their family members as part of a comprehensive neuropsychological assessment.

Results: 14 item-pairs composed of similar negative and positive items from within each of the 3 FrSBe subscales (Apathy, Disinhibition, and Executive Dysfunction) were created on the basis of face validity. Grand means (i.e. mean of the mean percentages of respondents with a difference of 0, 1, 2, 3 or 4 points between item pairs) were calculated for each of the 4 possible FrSBe conditions, i.e. premorbid self-report (PreSelf), postmorbid self-report (PostSelf), premorbid family report (PreFam), and postmorbid family report (PostFam). The overall percentage of respondents with ≥ 2 points discrepancy between item-pairs was 26% (PreSelf), 28% (PostSelf), 20% (PreFam), and 25% (PostFam) respectively.

Conclusions: Findings suggest that a moderate number of patient and family respondents may be prone to inconsistent responding between the positive and negative items on the FrSBe.

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B.D. HILL, R.D. PELLA, G. JONES, H. GARCIE-MERRITT, J.R. O'JILE & D. GOUVIER. Confirmatory Factor Analysis of Working Memory, Processing Speed, and Mathematic Ability.

Objective: This study sought to determine the factor structure and relationship between tests of working memory (WM), processing speed (PS), and mathematical ability (MA).

Participants and Methods: Confirmatory factor analyses were performed on data from 581 participants (mean age = 22.3 years, SD 6.2; 51.3% male; 85% Caucasian, 11% African-American).

Three correlated factors were anticipated: a WM factor (the Wechsler subtests Arithmetic, Letter-Number Sequencing (LNS), Digit Span, and Spatial Span), a MA factor (the Woodcock-Johnson-III Broad Math Domain subtests Calculation, Math Fluency, and Applied Problems), and a PS factor (Trails Making Test part A and the WAIS-III subtests Digit Symbol Coding and Symbol Search).

Results: The first model was a poor fit (chi-square $p < .001$ and unacceptable fit indices). The possibility that indicators might 'load' on more than one factor was evaluated by allowing Arithmetic to load on both the WM and MA, and Math Fluency to load on MA and PS. Although this second model also had a significant chi-square, the fit indexes were dramatically improved (NFI=.961, CFI=.974, SRMR=.038).

Conclusions: These results raise questions concerning subtests often assumed to be proxies of the WM, PS, and MA constructs. For example, the Arithmetic subtest loaded higher on MA than it did on WM, raising the issue of whether its inclusion in the WM index of the WAIS should be re-evaluated. Additionally, Math Fluency, sometimes considered a measure of PS, loaded equally on factors for both PS and Math ability.

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J. HOLDNACK, M. KORKMAN, S. KEMP & L. DROZDICK. Application of NEPSY-II Parent-Education Adjusted Norms in a Clinical Sample.

Objective: The goal of the current study is to apply recently developed parent-education adjusted norms for selected subtests from the NEPSY-II in a sample of children with traumatic brain injury and developmental disorders.

Participants and Methods: Multiple pediatric clinical samples were collected as part of the NEPSY-II standardization for test validation purposes. The clinical/educational groups included in the current study include: Moderate to severe TBI (n=10); Language Disorder (n=29); Autism (n=23); and Emotionally Disturbed (n=30). The clinical groups have significantly different percentages of children with parents of low levels of educational achievement. Parent-education corrected T-scores were generated for 23 NEPSY-II subtests.

Results: In the TBI sample, effects sizes using the parent-education adjustments did not change or were slightly larger than age-adjusted only scores. The significant positive correlations between parent education level and test performance was very similar in size and direction when using either parent-education or age-only adjusted scores. Similar results were obtained for the Language Disorder and the Autistic Disorder groups (except correlations in negative direction in Autism). In the Emotionally Disturbed group, the effect sizes became smaller and the correlation reversed direction from positive to negative when using parent-education adjusted scores.

Conclusions: In the TBI, Autism and Language Disorder groups, the parent-education adjustments strengthen observed effects. In the Emotionally Disturbed group, two cognitively distinct groups emerged when correcting for parent education level which was not apparent using age-only adjusted scores. The relationship between parent-education and cognitive functioning is not the same across groups and these differences have diagnostic implications.

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G.I. HOLMAN, M. JOHNSON, K. SCHENK, C. HIGANO & M. CHERRIER. Alternate Forms Reliability of Paper-and-Pencil and Computerized Mental Rotation Tasks.

Objective: We constructed alternate versions of paper-and-pencil (p) (n = 5) and computerized (c) (n = 4) mental rotation (MR) tasks and evaluated alternate form reliability and practice effects to assess the hypotheses that (1) construction of alternate forms by rational methods (e.g. arbitrary division of existing items) is adequate, and (2) alternate forms are preferable to a single form for repeated evaluation.

Participants and Methods: 36 older males completed versions of pMR on five occasions. A subset (n = 18) also completed versions of cMR. Order of versions was randomized.

Results: Repeated measures ANOVA showed no practice effect across administrations on either the pMR ($F(4, 60) = .76, p = .56$) or the cMR ($F(3, 51) = .13, p = .94$). Repeated measures ANOVA did show an effect for version on both pMR ($F(4, 132) = 4.4, p = .002$) and cMR ($F(3, 51) = 3.1, p = .035$). The intraclass correlation coefficient (ICC) was .53 for the pMR and .52 for the cMR. Repeated measures ANOVA on optimal subsets (n = 4) of versions produced null findings for version, but only two subsets produced ICCs typically considered adequate (> .7).

Conclusions: Optimal subsets of paper-and-pencil and computerized MR tasks demonstrate adequate alternate form reliability. Construction of alternate forms of MR tasks by rational methods alone may be inadequate. While reduction in practice effect probably outweighs limitations in alternate forms reliability, study design may be optimized by selection of more reliable alternate MR forms.

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L. HUGHES, L. FORNNARINO, H.S. FRIEDMAN, R.H. RAYNOR & B.D. BRIGIDI. Comparison of Test Effort in Subgroups of Individuals with Primary Malignant Brain Tumors.

Objective: Individuals diagnosed with WHO grade IV tumors de facto qualify for disability and, therefore, unlike other neurologic populations (including individuals with lower grade tumors) applying for disability, have minimal incentive for secondary gain. Comparison of subgroups of individuals with primary malignant brain tumors based on tumor grade may provide a better understanding of the influence of effort on neuropsychological test performance. The current study seeks to fill a gap in the neuropsychological literature in that no previous studies have systematically explored test effort in individuals with primary malignant brain tumors.

Participants and Methods: Clinical and neurocognitive data for 1064 adults with primary malignant cancer was reviewed. All patients completed the Rey 15 and subsets completed the TOMM and WMT as part of a comprehensive neuropsychological battery. Groups were WHO grade IV (n = 470) and WHO grades I, II, and III (n = 594). Sample: 60% male, mean age of 55, 45% glioblastoma multiforme (WHO grade IV), and 38% frontal tumor location.

Results: Bivariate correlations showed modest inter-correlations among effort measures. Using published norms, 145 subjects (14%) were determined to have sub-optimal effort on the Rey 15. Subjects with WHO grade IV tumors had lower effort scores on the Rey 15 and this result remained significant after accounting for level of memory dysfunction.

Conclusions: Results suggest that low scores on certain effort tests may not necessarily reflect low effort for all neurooncology populations. Future studies should examine other test factors in neurooncology populations such as fatigue in relation to effort.

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E. JOHNS, N.A. PHILLIPS, H. CHERTKOW, L. BERGMAN, S. SOLOMON, J. DESORMEAU & Z.S. NASREDDINE. The Montreal Cognitive Assessment: Normative Data in the Community.

Objective: The Montreal Cognitive Assessment (MoCA; [Nasreddine et al. (2006), JAGS]) is a brief screening tool designed to detect mild cognitive impairment (MCI). This test was originally published with a normative sample with 13.3 years of education and a recommended cutoff score of 26. However, individuals with 12 years or less of education tended to perform worse on the MoCA, and a cutoff score of 25 was suggested for this group. Since many patients have lower levels of education, it is important to obtain education-appropriate norms for this test. The aim of the present study was to obtain normative data for the MoCA in a sample of participants with 12 years or less of education.

Participants and Methods: 35 healthy older adults between the ages of 60 and 90 were recruited from community settings. Participants were screened for health problems and medications affecting cognition, as well as subjective memory complaints and depression. The MoCA was administered along with the Mini-Mental State Examination (MMSE), which is a commonly used screening tool for dementia.

Results: The average MoCA score for the first 35 participants (mean age = 76.2 years; mean education = 9.7 years) was 23.7 (SD = 3.8), and was highly correlated with education ($r = .72, p < .001$). 48.6% of participants scored below 25 (the suggested cutoff for this sample), and a cutoff score of ≥ 22 correctly classified 77.1% of this sample.

Conclusions: An adjusted cutoff score should be considered when assessing individuals with 12 years or less of education.

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L.A. KEARNS & B.L. ROPER. The MMPI-2 Response Bias Scale: Validation in a Sample of U.S. Veterans.

Objective: Initial validation of the Response Bias Scale (*RBS*; Gervais) suggests that *RBS* may be superior to existing MMPI-2 validity scales in assessing neurocognitive response bias among compensation-seeking individuals. The current study examines the validity of *RBS* in a sample of veterans consisting of only 8% compensation evaluations but in which neurocognitive response bias was common.

Participants and Methods: Data from the Word Memory Test (WMT) and MMPI-2 were retrospectively gathered from the neuropsychology files at a large VA medical center. Cases were excluded based on MMPI-2 item omissions and inconsistency scales, and criterion groups were formed based on WMT performance, resulting in 77 participants who passed the WMT and 68 who failed it. The ability of the *RBS* and previously developed MMPI-2 validity scales to predict WMT outcome was assessed using correlational and regression analyses.

Results: Scales *RBS*, *F*, and *Fp* were associated with WMT pass/fail group membership, but the Fake Bad Scale (*FBS*) was not. Predictive validity of the *RBS* was essentially the same as that for *F* and *Fp*, with small-magnitude correlations ($r = .23$ to $.24$, $p < .005$). Regression analysis indicated that *RBS* did not add unique variance to the contribution of *F* in the prediction of group membership.

Conclusions: In a largely non-compensation-seeking referral context, *RBS* was associated with WMT failure but did not predict failure as robustly as in prior studies involving compensation-seeking individuals. Furthermore, it failed to add incremental validity beyond *F*-family scales. Possible reasons for these findings are discussed.

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S.F. LONG, J.A. FIELDS, C.M. CULLUM & L.H. LACRITZ. Feasibility and Utility of Prorating Trail Making Test Part B.

Objective: Extend the range of Trail Making Test Part B (TMTB) scores by prorating scores for individuals in whom the test was discontinued at 300 seconds, and assess association with other executive functioning (EF) and global measures in Alzheimer's disease (AD) subjects.

Participants and Methods: Participants included 149 subjects with probable AD [Mean age = 74 (7.7); Mean education = 13 (3.1)] who were administered the TMT as part of their clinical evaluations. Relationships between TMT variables, including prorated, difference, and ratio scores, and other cognitive variables were examined using Spearman rank correlation coefficients. Prorated scores were determined based on circles completed (CC), $[(300/CC) * 25]$. Difference scores were obtained by subtracting TMTA from TMTB. Ratio scores were calculated as the proportion of Part B to Part A. Additional difference and ratio scores were calculated using the TMTB prorated score.

Results: Of all the derived scores, comparison measures correlated most highly with the TMTB prorated score; WCST perseverations ($r = .27$), FAS ($r = -.36$), and ROCF copy ($r = -.55$), all p 's < 0.005 , as did global measures MMSE ($r = -.27$) and DRS ($r = -.41$), $p < 0.005$.

Conclusions: Among the TMT variables, the TMTB prorated score correlated highest with other cognitive variables, demonstrating the feasibility of this score in extending the range of TMTB for this population; although the incremental benefit compared with standard TMT variables was modest. Similar or better correlations with global versus EF measures supports TMTB as partially a measure of global cognitive functioning. Further exploration into the utility of this prorated score in other populations is recommended.

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R.K. MAHURIN. The Object Memory Test: Validity and Utility in Diverse Clinical Populations.

Objective: Standard memory tests often are not suitable for patients with severe cognitive impairment, low education or limited English skills. This report introduces the Object Memory Test (OMT), which was developed to provide a simple memory assessment in clinical populations for whom traditional memory tests may be difficult to administer or interpret.

Participants and Methods: Participants ($n = 223$) included Hispanic and non-Hispanic white elderly patients with dementia and healthy volunteers from the community. During OMT administration the patient is sequentially handed 16 everyday household objects and asked to name and remember each item, which is then hidden from view. Immediate free recall, delayed recall and recognition memory are assessed. Comparable versions of the test are available in English and Spanish.

Results: All participants understood and completed the test regardless of level of cognitive impairment. Discriminant functional analysis revealed correct classification of 87% of dementia patients and 81% of control participants. The OMT correlated highly with Wechsler Memory Scale Logical Memory, CERAD Word List, and the Rey Figure Recall ($r = .63$ to $r = .87$). Lower correlations were obtained with non-memory tests, including Finger Tapping and Rey Figure Copy ($r = .27$ to $r = .50$). Hispanic and non-Hispanic participants did not differ in performance. Test scores were not significantly correlated with educational level in either ethnic group.

Conclusions: These initial findings support the validity and clinical utility of the OMT as a memory test for patients who otherwise may be difficult to assess with traditional measures.

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A.E. MIKOS, B. PARKER, L. KIRSCH-DARROW, C. JACOBSON, M.S. OKUN, H. FERNANDEZ & D. BOWERS. Concurrent validity between a computerized battery and the DRS-2 in the Cognitive Screening of Movement Disorders Patients.

Objective: Recent popularity of deep brain stimulation (DBS) for treating patients with movement disorders has led to an increasing demand for efficient pre-surgery screening of cognitive status. We examined the concurrent validity between a computerized battery and a traditional neuropsychological screening measure in a sample of Parkinson disease (PD), Essential Tremor (ET) and Dystonia patients who were candidates for DBS.

Participants and Methods: Patients with PD ($N = 56$), ET ($N = 24$) and dystonia ($N = 12$) underwent cognitive assessment with a computerized battery (Mindstreams Cognitive Health Assessment) and a neuropsychological screening measure (Dementia Rating Scale-2; DRS-2) on 2 consecutive days. A global cognitive score (GCS) from the Mindstreams battery was derived from several domains (attention, memory, executive function, visual-spatial, verbal, processing speed, motor). Operating characteristics were calculated to determine the ability of the Mindstreams battery to detect abnormal performance (defined by the Mindstreams manual as $GCS < -1$ SD from the mean) compared to a "gold standard" designation of abnormal performance (DRS-2 score < -1 SD from the mean).

Results: The Mindstreams GCS was significantly correlated with the DRS-2 total raw score ($r = 0.451$, $p < 0.001$). Operating characteristics were: sensitivity of 33%, specificity of 82%, positive predictive value of 32%, and negative predictive value of 84%. Thus, almost 2/3 of people who were impaired according to the DRS were misclassified as normal by Mindstreams. Changing cutpoints for abnormality did not substantially improve sensitivity.

Conclusions: Although Mindstreams global cognitive scores significantly correlated with DRS total raw scores, detection of abnormality using different cut-points did not demonstrate adequate sensitivity or positive predictive value in this patient sample. Reasons accounting for the poor operating characteristics in movement disorder patients will be discussed.

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C. MORRISON, W. BARR & C. ZAROFF. Using Demographically-Corrected Norms to Lateralize Seizure Foci in African Americans.

Objective: Neuropsychological (NP) assessment is often included in the neurological work-up to determine seizure localization. However, the accuracy of NP data can be influenced by cultural/ethnic background which may affect the clinician's ability to judge "impairment." We investigated which norms would allow neuropsychologists to make more accurate judgments about seizure lateralization from NP data in a sample of African Americans with epilepsy.

Participants and Methods: Data from 31 subjects with unilateral focal epilepsy and IQ > 70 were standardized using age-based norms. Each data set was then re-normed using demographically-corrected (i.e., age, education, gender, and ethnicity) values on separate forms. All forms also included a brief case summary but no EEG/MRI information. Three neuropsychologists experienced with the epilepsy population and blinded to the type of data being reviewed (i.e., age or demographic norms) independently made determinations regarding seizure focus lateralization (left, right, or bilateral) for the 62 NP profiles. Where disparities occurred, the case was discussed and a consensus decision was reached.

Results: Using the age-based norms, 17/31 NP profiles were judged to be lateralizing with the remaining 14 felt to show bilateral cerebral dysfunction. Nine of the 17 decisions were consistent with the video/EEG results (52.9% concurrence). Using the fully-demographically corrected norms, 24/31 NP profiles were considered lateralizing with 15 of these decisions consistent with the video/EEG identified focus (62.5% concurrence).

Conclusions: The improvement in the ability to make lateralization judgments from NP data, as well as the accuracy of those decisions, demonstrates the concrete utilization of demographically-corrected normative data in an epilepsy setting.

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B.A. PARMENTER, M. LANGILL, K. LANNI, S. HAWES, C. BRUEGGEMEIER, K. HILDENBRAND & W. DRAKE. Within condition performance on the n-back paradigm.

Objective: The n-back paradigm is an experimental measure of processing speed and working memory, with some studies using 150 or more trials per condition. We hypothesized that participants would demonstrate improved performance, as measured by shorter reaction time (RT) and more total correct (TC), on later trials in the condition compared to the earlier trials.

Participants and Methods: Thirty male participants were included in the study. All participants were administered three conditions of the n-back (the 0-, 1-, and 2-back), each consisting of 150 trials. Mean RTs and TC were calculated for trials 1-50, 51-100, and 101-150 for each condition.

Results: One-way repeated measures analyses of variance (ANOVA) revealed significantly different RTs on the 2-back ($p = 0.02$), with significantly longer RT for the first 50 trials compared to the last 50 trials. Differences in TC were significantly different on the 0-back ($p < 0.01$) and approached significance on the 2-back ($p = 0.08$). Specifically, TC on the 0-back improved with more trials, with better performance on later trials (51-100 and 101-150) compared to earlier trials (1-50). Because differences in TC on the 2-back approached significance, follow-up analyses were also conducted. TC decreased across trials ($p = 0.03$) with better performance on the middle 50 trials (51-100) compared to the final 50 trials (101-150).

Conclusions: Our results suggest that performance improves with more trials on the 0-back condition, but not on the more challenging 2-back condition where TC is actually reduced despite shorter RTs.

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R. PRIMI, A.G. CAPOVILLA, N.M. DIAS, B.T. TREVISAN & F.C. CAPOVILLA. Neuropsychological Assessment of Oral Language in Brazilian Children.

Objective: One area traditionally studied by neuropsychology is the oral language. Empirical findings have suggested that oral language involves different abilities and, if children present any deficits in some of these abilities, it can be led to a permanent impairment that will probably affect the formal education and personal relationships. The early detection of oral language disturbances enables to plan an intervention, avoiding future problems in these abilities. In doing so, it is essential to develop instruments for such evaluation in early ages.

Participants and Methods: This study aimed to investigate reliability and validity evidences of instruments of oral language assessment. The involved abilities were vocabulary, naming, phonological memory, phonological discrimination, syntactic and phonological awareness. The participants were 363 Brazilian children 1 to 4 graders from elementary school, evaluated in Peabody Picture Vocabulary Test, Naming Test, Words and Nonwords Repetition Test, Phonological Discrimination Test, Syntactic Awareness Test, Phonological Awareness Test and Progressive Matrices Colorings of Raven.

Results: Covariance Analyses, using as covariate age and nonverbal intelligence, revealed increasing performance with scholar progression. It was also conducted correlation analysis between all the scores of the instruments, which revealed significant positive correlations. Cronbach alpha and Spearman-Brown coefficients showed good reliability.

Conclusions: This study supply reliability and validity evidences of instruments of oral language assessment for Brazilian children from elementary school. So, they can be used to help the early detection of oral language disturbances.

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R. PRIMI, M. MUNIZ & A.G. CAPOVILLA. Validity Evidence for the Brazilian Reading Competence Test of Words and Non-Words.

Objective: According to an information processing approach, different reading strategies prevail at different stages and depending on print characteristics. The first stage, logographic, is marked by the prevalence of the logographic strategy in which recognition is limited to a few familiar words. The second stage, alphabetical, is marked by the prevalence of grapheme-phoneme decoding. The third stage, orthographic, is marked by a lexical strategy, with visual recognition.

Participants and Methods: The development of psychological tests to assess three reading strategies is essential to identify problems early in reading deficits as dyslexia, for instance. This study searched for validity evidences for a Brazilian test that assess three reading strategies.

Results: Using Reading Competence Test (RTC), this study analyzed reading strategies used by 2994 Brazilian from 1st to 7th grade. RCT analyzes the ability of using each strategy and is made of seven types of print-picture pairs. The task is to circle correct print-picture pairs (either regularly-spelled or irregularly-spelled words associated with their corresponding pictures) and to cross out incorrect ones (either words associated with unrelated pictures, or nonwords of four types: that sound like words, that look similar to words, that sound similar to words, that neither sound nor look similar to words).

Conclusions: RTC showed sensibility to discriminate reading competence between grades, and the items difficulty was according to the theory. Factorial analyses revealed two factors, one factor including logographic and alphabetical strategies, and other one including orthographic strategy. The results corroborate the use of RTC to assess reading strategies in children.

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K. ROGERS, I. DZIOBEK, S. FLECK, E. TEAGUE & J.C. BOROD. Introducing a New Measure of Empathy: The Cognitive and Emotional Empathy Questionnaire.

Objective: The current study describes the psychometric characteristics of a newly developed self-report measure, the Cognitive and Emotional Empathy Questionnaire (CEEQ), designed to assess both cognitive and emotional components of empathy. Although there are several existing measures of empathy, the fact that the CEEQ provides a state-of-the-art, comprehensive assessment of both components of empathy is unique.

Participants and Methods: The CEEQ is a 39-item questionnaire, consisting of two scales (cognitive and emotional), which are each divided into three subscales (e.g., mental state perception and emotional mirroring, respectively). Two-week test-retest reliability, split-half reliability, and internal consistency were assessed in 123 healthy adults (mean age=25.9±12.7; 56% female). The relationship between the CEEQ and related psychological constructs (e.g., alexithymia, emotion contagion, and social functioning) was also assessed to confirm the questionnaire's construct validity.

Results: The split-half reliability of the CEEQ was high, with a Spearman-Brown coefficient of .84. Test-retest reliability was also high: the coefficient for the whole scale was .85, and the median coefficient for the CEEQ's scales and subscales was .75. However, the questionnaire's internal consistency was somewhat lower than expected for some subscales, with alpha coefficients ranging from .42 to .82 (median=.66). Results also showed that the CEEQ was related in predicted ways to other constructs and to existing empathy measures, thus providing support for the questionnaire's validity.

Conclusions: The CEEQ appears to be a reliable and valid measure of empathy. Therefore, we propose that the CEEQ could be a valuable tool for the characterization of empathy in a variety of clinical populations (e.g., Asperger Syndrome).

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J.C. ROTHLIND, P. DUKARM, V.A. CARDENAS, C. STUDHOLME & M.M. WEINER. Self-appraisal of Neuropsychological Performance: Associations with Actual Test Scores and Regional Cortical and Subcortical Volumes Measured With MRI and Deformation Based Morphology.

Objective: To explore the utility of neuropsychological test norms as standards for appraisal of self-awareness, we asked a research volunteers with a broad range of neuropsychological functioning to estimate their percentile equivalents for several standardized tests.

Participants and Methods: Two hundred sixty-eight volunteers, including healthy controls and HIV+ adults divided further based on presence or absence of heavy alcohol consumption. Self-appraisal information was gathered from 200 participants for test assessing processing speed, attention, motor dexterity, memory, and executive functioning. Published normative data served as the standard for assessing accuracy of self-appraisal.

Results: Significant positive correlations were noted between demographically corrected test scores and self-appraisal across several tasks

(*r*-values ranged from 0.36 to 0.57, *p*<.01). Very high performers (above 90th percentile), were more accurate than very low performers (below 10th percentile) in estimating their performance on some tasks, including phonemic fluency, BVM-T-R, Short Category Test, Symbol Digit Oral (*p*<.05). After adjusting for the association between demographically adjusted test scores and self-appraisal, neither education, age, estimated VIQ, HIV or Alcohol status or mood rating accounted for additional variance in self-appraisal. Deformation based morphometry applied to structural MRI revealed associations between regional cortical and subcortical volume reductions and greater errors of self-appraisal. These findings included an association of smaller right thalamic volume with greater error of self-appraisal on the BVM-T.

Conclusions: Self-appraisal of performance is positively correlated with actual test scores and warrants further investigation as a potential technique for assessment of patients' self-awareness in clinical settings.

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G.P. RYAN, J.P. BAERWALD & B.J. FORREST. Does Processing Speed and Working Memory Relate to Academic Achievement?

Objective: Academic achievement performance requires many different aspects of ability functioning. Many of the required achievement skills in college populations rely on ability performance to meet grade-level expectations. The purpose of this study was to examine the relationship between selected ability and achievement scores.

Participants and Methods: Sixty-six college-aged students volunteered in this study measuring the role of aspects of processing speed and working memory on academic achievement. Volunteers were given the Wechsler Adult Intelligence Scale III (WAIS-III) subtests that measure processing speed and working memory abilities. Additionally, volunteers were given six subtests from the Woodcock-Johnson III Test of Academic Achievement measuring spelling, mathematics, comprehension, and phonological processing.

Results: Participant's WJ-III results were separated into three levels: below academic education level, meeting academic education level, or above academic education level. Results indicated a significant role of the participants working memory index on academic achievement grade level performance. In fact, most achievement subtests demonstrated a significant relationship with the working memory index score. Processing speed index scores also showed a strong relationship with those WJ subtests that incorporate a speed-centered task: Reading Fluency and Math Fluency.

Conclusions: One seemingly obvious trend was found: as WMI and PSI scores increased, appropriate grade-equivalent scores increased. However, some of the participants scoring within normal limits of WMI and PSI demonstrated below grade level performance on the achievement tasks. Of those individuals in the below education level, most acknowledged academic difficulties, however; self-reported memory functioning was not significantly related to performance. An important finding also involved insight to current academic performance and actual achievement skills.

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G.P. RYAN, J.P. BAERWALD & B.J. FORREST. Response Consistency Across Multiple Processing Speed Tasks.

Objective: Comprehensive neuropsychological batteries normally constitute multiple measures of processing speed. Additionally, many cognitive measures incorporate processing speed skills in the subject's performance score. The question within this research protocol looked at participant processing speed similarity between multiple timed measures within undergraduate volunteers.

Participants and Methods: Sixty-six undergraduate participants were given the Trail Making Tests (A & B), selected subtests from the WAIS-III (i.e., Coding, Symbol Search), measures of phonemic and semantic naming, the STROOP test (color & color/word), and selected subtests from the WIJ-III (i.e., Reading Fluency, Math Fluency).

Results: Results indicated significant correlations between many of the processing speed tasks. Specifically, Trails B, STROOP (c/w) and the processing speed subtests on the WAIS (i.e., Coding & Symbol Search) showed the strongest relationships between variables.

Conclusions: Results conclude that many processing speed tasks as well as tests that incorporate a timed aspect to participant's overall score show significant relationships. Results also indicated that not all processing speed task performance results correlate. Understanding these "baseline" results in undergraduates without significant cognitive difficulties may aid in future understanding of specific cognitive deficits related to processing speed, executive functioning and academic performance.

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H. SCHACHTER, M. BREWER, M. PARRY, K. GENT, K. KOWALOWSKI, L. BRIDGEMAN, T.M. ATKINSON & J.P. RYAN. Interchangeable Use of Trail Making Test Variants During Serial Assessment.

Objective: Despite being one of the most commonly used neuropsychological assessment instruments, the Trail Making Test (TMT) is hampered by practice effects that can skew results during serial administration. It has been demonstrated that variants of the TMT can be used interchangeably in a group testing format, a method that allows for rapid and reliable determination of practice effects. Replicating the findings using individual administration would be of practical use for clinicians. To accomplish this, construct validity and order effects were examined in the Trail Making Test of the Delis-Kaplan Executive Functioning System (DK-TMT), Comprehensive Trail Making Test (CTMT) and Connections Task (CT) during serial individual administration.

Participants and Methods: Over a three week period the DK-TMT, CTMT, and CT were individually administered to 136 undergraduate psychology students in each of six possible orders. Structural equation models were used to investigate construct validity of the outcome measures, factorial invariance, and explore potential order effects.

Results: A two factor model (sequencing-switching) was shown to best fit the data and was invariant across groups. A latent mean analysis showed no differences between the factor means for each of the groups, indicating the absence of order effects.

Conclusions: Consistent with the group testing results of Atkinson & Ryan (in press), the DK-TMT, CTMT, and CT share the same underlying factors of sequencing and switching. Structural analyses provide evidence that these measures can be used interchangeably without discernable practice effects, increasing the flexibility of a serial neuropsychological assessment battery.

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A. WALLIS, M. BREWER, A. SMITH, H. SCHACHTER, B. KRUZINSKI, T.M. ATKINSON & J.P. RYAN. Group Neuropsychological Test Administration as an Alternative to Individual Test Administration.

Objective: While individual neuropsychological test administration may seem to be the optimal means for collecting information about psychometric features of tests, this method requires dedicated resources that may not be readily available to all researchers. As an alternative to individual test administration, group neuropsychological testing has been

used recently as a more cost effective means of obtaining essential test data. In order to provide clinicians with confidence that the results of studies using group test administration are parallel to those making use of individual test administration, it is necessary to cross validate results of two studies employing these methods.

Participants and Methods: The datasets consisted of 136 and 168 undergraduate psychology majors, respectively. Data were collected on an individual basis in the first investigation, while the second investigation made use of group administration. Structural equation modeling was used to determine construct validity within each of the studies as well as similarities between obtained models in each dataset.

Results: The two factor solution from the individually collected dataset was crossvalidated with the dataset that employed group administration. Results of structural analyses were statistically equivalent for both group and individual administration.

Conclusions: The viability of group neuropsychological assessment was demonstrated through crossvalidation with results from a study that used individual test administration, offering a rapid and cost effective alternative approach for examining psychometric properties of assessment instruments. Variables such as practice effects and test interactions could be examined by employing group test administration.

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A. SCHAFER, A. BARLOW & B. AXELROD. Cross-Validation of the MMSE Norms as Published by PAR.

Objective: As of 2005, Psychological Assessment Resources, Inc. (PAR) has copyrighted the Mini-Mental State Examination (MMSE). Normative data are included in their package. The objective of this study is to cross-validate the accuracy of the newly published norms.

Participants and Methods: The present sample included 900 participants from a VA in Detroit, Michigan. All participants were referred for neuropsychological assessment, and the data were collected via archival methods. Using the same age categories as the MMSE Pocket Norms Card, the present sample were broken into age categories. Accuracy statistics were computed for each age group, using performance on the Trail Making Test-B (T<40) as the gold standard for cognitive impairment and MMSE T-scores <40 as an indication of impaired test performance.

Results: Combining findings from each age group (impairment base rate=67%, according to TMT-B), the mean PAR MMSE norms demonstrated sensitivity of 79%, specificity of 54%, positive predictive power of 79%, negative predictive power of 56%, and an overall hit rate of 72%. There was a trend toward reduced negative predictive power with increased age.

Conclusions: The newly published MMSE norms by PAR mirror previous findings of the MMSE in their limited accuracy. With negative predictive power falling as low as 21% in the oldest age group (≥ 85), an "intact" screening in this group does not accurately reflect other measures of cognitive status. Post-hoc analyses found that intelligence largely influenced the accuracy of the MMSE classification.

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R. SHIELDS, F. CARONA & M.R. BASSO. 3- and 6-Month Re-Testing on WAIS-III Subtests: Practice Effects and Reliable Change Indices.

Objective: To chronicle cognitive deterioration or improvement in clinical practice and research endeavors, neuropsychological tests are repeatedly administered. However, an accurate assessment of change may be confounded by biases such as measurement error or practice effects. Few studies have established baserates of change on commonly used

instruments, especially the WAIS-III. Additionally, it is uncertain whether the magnitude of practice effects varies according to intertest interval. Basso et al. (1999) examined these issues on the WAIS-III index scores, but no study has reported the magnitude of normal change on WAIS-III subtest scores. The current study addresses these issues.

Participants and Methods: Forty-seven participants without neurological or psychiatric illness were recruited from the community. On average, they were 25 years old and had 14 years of education. All were administered the WAIS-III according to standardization instructions at baseline, and they were randomly assigned to be re-examined either 3 or 6 months later.

Results: WAIS-III subtest scores were entered into a 2 (group) X 2 (time) X 13 (subtest) mixed factor ANOVA, with time and subtest being repeated factors. Results revealed that scores increased by as much as 4 scaled score points on seven subtests, and length of re-test interval had little effect on this improvement. Reliable change indexes were calculated to discriminate clinically meaningful change from random fluctuations.

Conclusions: Paralleling data concerning index scores, similar improvement rates occurred regardless of whether re-examination occurred over 3 or 6 months. Considerable increases in scores were observed on the subtest scores. Reliable change index data indicates that relatively large change must occur to merit clinically meaningful change in performance. Limitations and implications of these data are presented.

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T.E. SITZER, C. VIGEN, W.J. MACK & C. MCCLEARY. Diagnostic Accuracy of Working Memory Measures in Alzheimer Disease: A Comparison of Digit Span Backward and Letter Number Sequencing.

Objective: The Digit Span Backward (DSB) and Letter-Number Sequencing (LNS) subtests of the Wechsler batteries are measures of working memory commonly administered to older adults with suspected Alzheimer disease (AD) as part of a neuropsychological battery. We evaluated and compared the diagnostic capabilities of DSB and LNS for detecting AD.

Participants and Methods: Participants included 23 AD patients and 49 cognitively normal (CN) subjects enrolled in the Alzheimer Disease Research Center at USC. All participants were administered DSB and LNS as part of a larger neuropsychological battery. For DSB, the length of the longest span accurately recalled was analyzed; for LNS, the total number of trials was used.

Results: AD patients performed significantly worse than controls on both measures. The optimal cut-off scores for DSB and LNS using ROC analyses were 4 and 7, respectively. The sensitivity and specificity for DSB at this cut-off score was .87 and .61, respectively, and was .83 and .88 for LNS. The AUC for DSB (.834) was smaller than the AUC for LNS (.886), although the difference was not statistically significant. DSB and LNS were discordant for diagnostic outcome 30.6% of the time with LNS being correct more often. Likelihood ratios are provided.

Conclusions: These results suggested that optimal cut-off scores for both DSB and LNS could be used as relatively sensitive screening measures for AD. However, if time constraints and fatigue necessitate a shorter battery, the LNS cut-off score has an advantage over the DSB cut-off score in that it results in a fewer number of false positive errors.

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R. STEWART. Different Tests Have Different SD Sizes At Different Impairment Ranges And This Affects Accuracy In Test-Retest Situations.

Objective: To determine if heteroscedasticity of neuropsychological tests across impairment ranges can affect test-retest accuracy if one is measuring across impairment ranges

Participants and Methods: A page-by-page review of journals obtained a list of means and SDs for a wide variety of tests and a wide variety of groups and score ranges. Sixty scales were found in which there were at least fifty data points of mean and SD across the groups.

Results: Some tests have a fairly dramatic relationship between impairment level and SD size, with 20% having a correlation of 0.7 or higher between mean and SD, and half having a correlation of 0.4 or higher. The SD size of an impaired group may be two to five times as big as the non-impaired group. Results are presented as a scatterplot of mean and SD size for each test, with the ratio of the SD size for the "impaired" versus "non-impaired" score ranges.

Conclusions: In test-retest situations, a reliable change index uses the SD size for calculation of a significant change using SD size at both time 1 and time 2. If the group SD size is much larger in time 2, the amount of change in raw units needed to be significant is larger (roughly, if SD size at time 2 is double time 1, raw score change needs to be 50% larger for significance). The data here allows a user to choose various measures that will have less heteroscedasticity if a person changes a lot (to the point that a larger SD is needed for time 2 for heteroscedastic distributions), thereby potentially finding significance with smaller amount of raw change, increasing the ability to detect change. It is also noted that the cause of the heteroscedasticity has not been reviewed much in the literature in relation to different tests having different amounts, and this may be an area for future research

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I. STROESCU. A Factor Analytic Examination of the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) in a Mixed Neurological Sample.

Objective: The RBANS, developed as a neurocognitive measure for geriatric populations and as a screening battery for younger adults (Randolph et al., 1998), is commonly used by neuropsychologists (Rabin et al., 2005). Recently, Duff et al. (2006) examined the RBANS' factor structure in a community dwelling elderly sample and concluded that the battery's theoretically derived index structure was not supported, while a two-factor solution was. This study was conducted to further examine the RBANS factor structure in a mixed neurological sample.

Participants and Methods: The RBANS was administered to 243 patients (mean age = 60.2) who were evaluated by a neuropsychology service at a large Midwestern medical center. The sample was 63% male, with an average of 12.8 years of education. Neurological diagnoses included a wide range of conditions (e.g., TBI, CVA, and neurodegenerative diseases).

Results: Exploratory factor analyses were conducted with varimax rotation. The most robust factor structure was a two-factor solution including Verbal Memory-Language and Visual Processing (accounting for 58% of variance). These results were generally consistent with Duff et al. (2006) two-factor solution.

Conclusions: Caution seems warranted when making interpretations based on the RBANS index scores as they are currently aggregated. Interpretations derived from the Verbal Memory-Language and Visual Processing factors may more accurately summarize the neurocognitive abilities assessed by the battery. Researchers should continue to investigate the presence and robustness of these two factors in various neurologically impaired and intact populations.

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C. STRONG & J. DONDEERS. Validity of the CVMT after Traumatic Brain Injury.

Objective: The Continuous Visual Memory Test (CVMT) is a visual recognition task developed to assess memory functioning in adults. The current investigation was conducted to determine the clinical utility of the CVMT in the assessment of traumatic brain injury (TBI).

Participants and Methods: From a series of consecutive clinical referrals, 53 patients with TBI who all had positive intracranial findings on neuroimaging were selected. A group of 53 demographically matched controls was obtained from the standardization sample.

Results: There was a statistically significant main effect of group for CVMT Total Score ($F(1, 104) = 36.80, p < .0001$) and Delayed Recognition ($F(1, 104) = 26.48, p < .0001$). Hierarchical regression analyses using CVMT Total as the dependent variable revealed that after taking age and PIQ into account, brain injury severity was not a significant predictor. Similar regression analyses using CVMT Delayed Recall as the dependent variable showed that brain injury severity did contribute a unique portion of the variance in the CVMT score (6%). Finally, logistic regression analyses using the CVMT Total and Delayed Recall scores as the independent variables, and groups as the dependent variable, revealed that the CVMT scores correctly classified 72.6% of the participants, with a rate of 23.9% false positives and 30.0% false negatives.

Conclusions: Findings support the clinical utility of the CVMT in the assessment of patients with TBI.

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G.M. THORNTON, J.F. BENGE, P.J. MASSMAN & R.S. DOODY. Semantic and Phonemic Fluency Discrepancies: Normative Data and Differences Between MCI And AD Patients.

Objective: It has been repeatedly demonstrated that patients with Alzheimer's disease (AD) typically exhibit relatively worse semantic fluency (SF) than letter fluency (COWA) performances, in comparison to normal controls. However, relatively little research has formally evaluated the psychometric properties of this discrepancy. The current study presents normative values for SF (animal) – COWA (FAS) discrepancies and utilizes this normative data to investigate the validity of the discrepancy score in discriminating between persons along the spectrum of normal aging to AD (from MCI to severely impaired).

Participants and Methods: Participants were evaluated at the Baylor College of Medicine Alzheimer's Disease and Memory Disorders Center, and completed a health screening, physical, and neurological and neuropsychological exams. The average FAS score was subtracted from the animals score. Discrepancy normative data, both percentiles and means, were calculated for 5 age groups and compared to MCI patients and probable AD patients with mild, moderate, or severe dementia.

Results: Most normals showed the expected pattern (semantic > phonemic) although the discrepancy shrank as age increased ($r = -0.192, p < .05$). Utilizing normative data across patient groups, results revealed that the discrepancy decreased over the course of the disease process. MCI patients ($N = 51$) were compared to patients with mild ($N = 296$) and moderate ($n = 272$) dementia. Severely-demented patients ($N = 243$) scored at or near the floor on both measures, mitigating the usefulness of evaluating discrepancy scores.

Conclusions: Results of this study may provide useful information for clinicians evaluating semantic memory integrity as well as lending further support to the hypothesis that semantic memory stores degrade as Alzheimer's pathology worsens.

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T.H. TURNER, M.D. HORNER, K. EDMISTON & D.L. BACHMAN. Insufficient Effort or Severe Impairment? Utility of the Test of Memory Malingering (TOMM) in a Memory Disorders Clinic.

Objective: The utility of effort testing in older adults has been questioned, as patients with dementia might fail even if motivation is adequate. This study explored use of the Test of Memory Malingering (TOMM) in older adults seen in a multidisciplinary memory disorders clinic that included psychiatric interview, neurological examination, and neuropsychological assessment.

Participants and Methods: Effort determination was made during interdisciplinary team meetings, based on TOMM Trial 2 and/or Retention Trial, error patterns across tests, behavioral observations, medical history, and collateral information. Thus, TOMM failure was neither necessary nor sufficient for identifying suboptimal effort. Only participants with team consensus regarding effort were included in the study, leaving 182 (180 male) of 195 participants. Mean age was 72.1 years ($SD = 9.4$), with 11.7 years of education ($SD = 3.7$).

Results: Suboptimal effort was identified in 33 participants; 25 (76%) of these participants failed the TOMM. Amongst participants with good effort, 18 (12%) failed the TOMM; these patients tended to be older (95% CI difference = [1.4, 8.6]) and less educated (95% CI difference = [1.0, 7.7]). 23 of 39 patients (59%) with Clinical Dementia Ratings of 1.0 or higher passed the TOMM. Trial 1 performance was also examined as an index to help discriminate between patients with low effort and those unable to pass TOMM due to severe impairment. A cut-score of 40 offered optimal positive predictive power (0.48) with minimal decline in negative predictive power (0.93).

Conclusions: Results support use of the TOMM, including Trial 1, for effort testing in evaluation of memory complaints in older adults.

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B. UTTL & A. SIEGENTHALER. Cross-validation of a Short Version of NAART (NAART 35) in Normal Healthy and Clinical Samples.

Objective: The North American Adult Reading Test (NAART) is a quick index used to estimate verbal intellectual ability. Uttl (2002) has shown that this test can be shortened by deleting items that do not discriminate between high vs. low scoring individuals and validated a new 35-item version called the NAART 35 on 351 adults across the adult lifespan. We cross-validated the NAART 35 on a new sample of healthy normal adults ranging from 18 to 90 years of age as well as on a clinical sample of individuals with traumatic brain injury.

Participants and Methods: We administered the NAART to a large sample of healthy normal individuals ranging from 18 to 90 years of age and to a clinical sample of individuals with traumatic brain injury together with a battery of cognitive and neuropsychological tests.

Results: The results showed that the NAART 35 is a reliable and valid measure of verbal intelligence comparable in psychometric properties to the WAIS Vocabulary test and with equal psychometric properties in young, middle-aged, and older adults, cross-validating Uttl's (2002) findings in both a sample of normal healthy individuals and a clinical sample.

Conclusions: A short version of NAART (NAART 35) is valid and reliable measure of verbal intellectual ability, as reliable and valid as the much longer original NAART.

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S. WARSCHAUSKY, M. VAN TUBBERGEN & J. DONDEERS. Modified Test Administration Using Assistive Technology: Preliminary Psychometric Findings with Typically Developing Children.

Objective: Most neuropsychological tests are not accessible to children with significant motor and/or communicative impairments. This study

examined the psychometric properties of modified test procedures that were accessible with use of assistive technology. Data from a sample of typically developing children were derived from the initial phase of a study of the psychometrics of adapted procedures in children with and without cerebral palsy (CP) including a subset of children who are not oral communicators.

Participants and Methods: The sample included 26 typically developing children, ages 6-12, 42% male. Children were administered standardized and adapted versions of the Raven's CPM, PPVT-III, CTOPP Elision and PIAT-R Reading Comprehension in randomized order. In the adapted administration, test items were presented on a computer monitor and children responded either through use of a HeadMouse® or a simple dichotomous switch device.

Results: Findings indicate that modified procedures yield comparable scores, with the exception of CTOPP Elision in which there is a trend towards higher scores with the modified version. There are no significant differences in effect of type of device (HeadMouse® or switch) on modified test scores. Correlation matrices of standard and adapted test scores provide preliminary evidence that the nomological nets are comparable across procedures, again with the exception of CTOPP Elision.

Conclusions: Preliminary data support the potential use of assistive technology and accessible procedures for some test instruments. Challenges remain in creating accessible procedures for aspects of phonological processing, in particular. Future directions include examining psychometrics in samples of children with CP.

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K.B. WHITLOCK, J.C. STOUT, S. QUELLER, N. CARLOZZI, D.R. LANGBEHN & J.S. PAULSEN. Individual and Combined Item Analyses Can Shorten Test Length for the University of Pennsylvania Smell ID Test.

Objective: In the Predict-HD study, the University of Pennsylvania Smell ID Test (UPSIT) is one of several markers sensitive to Huntington's disease progression prior to clinical diagnosis. We examined item sensitivity of the UPSIT in the Predict-HD sample to investigate odor recognition deficits and to identify a subset of items for a shortened UPSIT that may be considered for use in future clinical trials.

Participants and Methods: At baseline, 651 CAG-expanded premanifest (pre-HD) and 125 CAG-normal Predict-HD participants completed the UPSIT, which includes 40 scratch-and-sniff odors. 374 pre-HD and 47 CAG-normal participants repeated the test at a two-year follow-up visit. We identified: (a) individual items predictive of estimated proximity to clinical diagnosis at baseline and (2) combinations of items predictive of membership in 4 groups (pre-HD near-, mid-, and far- from clinical diagnosis, CAG-normal) based on baseline and two-year follow-up visits.

Results: Based on individual item sensitivity, we found the five most individually discriminating odors to be rose, watermelon, grape, orange, and bubble gum. Examination of groups of items indicated that together rose, coconut, motor oil, peanut, and dill pickle, were the most discriminating 5-item combination.

Conclusions: We were able to rank individual item sensitivity to disease progression based on item response curves; however, in combination with other items, some sensitive items did not contribute to sensitivity of the overall test. By iteratively building combinations of items that were predictive of group membership, we were able to select a subset of 20 test items that collectively resulted in similar or better sensitivity than the 40-item test.

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D.J. ZGALJARDIC & R.O. TEMPLE. Performance on the Numbers and Letters Subtest of the Neuropsychological Assessment Battery (NAB) Screening Module in a Sample of Individuals with Acquired Brain Injury.

Objective: The Numbers and Letters subtest of the NAB Screening Module is a timed letter cancellation task with two parts (A & B). Part B incorporates an addition component to assess divided attention. However, the scoring criterion for Part B does not incorporate addition accuracy into its efficiency variable. The aim of the current study was to assess task efficiency on Part B while accounting for addition accuracy.

Participants and Methods: Study participants were 35 individuals (age $M = 40.0$, $SD = 14.2$; education $M = 13.7$, $SD = 2.4$) with acquired brain injury. For the purposes of this study the addition accuracy score was derived by obtaining the absolute deviation between the participants' addition score and the correct score. The sample was divided into two subgroups based on a median split of addition accuracy ("high accuracy" ≤ 5 deviations; "low accuracy" > 5 deviations).

Results: A statistical trend revealed that participants in the "high accuracy" subgroup were slower in completing Part B. The two subgroups did not differ significantly on the number of cancellation errors produced. Significant group differences were discovered on the efficiency variable for Part B suggesting that the "high accuracy" subgroup performed less efficiently. Correlation analysis revealed a significant negative relationship between addition accuracy and reaction time for Part B ($r = -.531$; $p < .001$).

Conclusions: These findings, although preliminary, suggest that the Part B efficiency score should be interpreted in conjunction with addition accuracy in this patient population, as addition accuracy appears to inversely impact task efficiency.

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Cross-Cultural Issues

R. BAIRD, D. BYRD, J. BOROD, S. GOLUB & S. MORGELLO. Educational Quality and the Cognitive Performance of Minority and Caucasian HIV+ Subjects.

Objective: We examined the extent to which quality of education (QEd) influenced performance on neuropsychological measures of cognition in an HIV+ sample after accounting for education and reading level. Previous studies have explored the relationship between reading level (one measure of QEd) and cognition. A comprehensive self-report questionnaire, comprised of factors (e.g., student/teacher ratio and attendance/performance) associated with QEd, was developed.

Participants and Methods: Fifty participants were recruited from the Mount Sinai Medical Center. Neuropsychological data, normed for age and gender, from seven domains sensitive to functioning in HIV were collected: motor, information processing speed, attention/working memory, learning, memory, verbal fluency, and executive functioning. All participants completed the QEd questionnaire, which showed internal consistency ($\alpha = .84$) and validity (significant correlations with years of education and reading level).

Results: Data collected revealed a wide range in age (34-62), years of education (9-18), QEd scores (50-167), and WRAT-3 reading level (T-scores=20-62). There were no significant age, gender, ethnicity, or recruitment group differences in QEd performance. Caucasians had significantly more years of education than Hispanics and a significantly higher reading level than Hispanics and African-Americans. Using stepwise regression, reading level accounted for more variance in neuropsychological performance than did years of education and/or QEd for: attention/working memory, learning, memory, verbal fluency, and executive functioning. Reading level was not significantly correlated with motor functioning or information processing speed.

Conclusions: The aggregate measurement our QEd scale produced did not account for variance in neuropsychological testing. Reading level continues to be important when assessing cognition in HIV.

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H.A. BENDER, J.R. COLE, S. SCHAFFER, M. APONTE, D. CRUZ-LAUREANO, W.B. BARR & O. DEVINSKY. Construct Validity of the NeSBHIS in a Neurological Sample.

Objective: Spanish-speaking Latinos(as) are the most rapidly growing segment of the U.S. population and are at elevated risk for neurological disorders according to epidemiological studies. Although Pontón et al. (2000) suggest robust construct validity of the Neuropsychological Screening Battery for Hispanics (NeSBHIS) in a community-based sample, no comparable study has examined the psychometric properties of this battery for individuals with known neurological disorder.

Participants and Methods: One hundred and twenty nine Spanish-speaking Latinos(as) with confirmed epilepsy (mean age = 39.2, SD = 13.6) were evaluated using the NeSBHIS. All participants described themselves as "Hispanic," emigrated from Spanish-speaking countries, and opted for Spanish language assessment. Individuals with non-epileptic seizures, severe psychiatric disturbance, and/or probable developmental delay were excluded. Data were analyzed using principal components extractions with varimax and promax rotations; a factor loading criterion of .45 and an eigenvalue cutoff of 1.00 were used.

Results: Internal consistency among subtests was comparable to Pontón's initial study. Varimax rotation yielded two of the five original factors (verbal learning and psychomotor) and promax rotation yielded three factors (verbal learning, psychomotor, and language). Unlike the community-based sample, expected subtests loaded on the visuospatial factor using the promax rotation.

Conclusions: Our findings suggest that the NeSBHIS has robust construct validity in a neurologically-compromised sample. With one notable exception (attentional-mental control), the promax rotation showed that subtests measured the putative cognitive domains they were originally proposed to assess. This discrepancy could be attributable to seizure activity and/or medication side effects, which may disrupt frontal systems.

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J. BENNETT, S.P. VERNEY & R.E. JUNG. Assessing Creativity and Intelligence in an Ethnically Diverse Sample.

Objective: Creativity and intelligence have been theoretically linked; however, inconsistent findings have been reported for the strength, specificity, and cultural influences of this association. This study investigated the relationship between creativity (i.e., divergent thinking) and general cognitive ability in an ethnically diverse undergraduate sample.

Participants and Methods: Undergraduate students (n=437; 44% Caucasian, 41% Hispanic, 6% American Indian, 3% African American, 4% Asian American, 2% other) completed a brief cognitive ability measure (Shipley Institute of Living Scale; SILS), a brief measure of verbal creativity (Alternate Uses Test; AUT), and a measure of acculturation (Scale of Ethnic Experience; SEE). The SILS consists of verbal and abstraction scores, producing an estimated WAIS-R IQ. The AUT consists of four subscales: fluency, flexibility, originality, and elaboration.

Results: Creativity accounted for 3.8% of WAIS-R estimate ($p < 0.01$), 4.5% of verbal ($p < 0.01$) and 2.6% of abstraction ($p < 0.05$) scores after

controlling for socio-economic status. The Flexibility measure of the AUT (i.e., number of different categories), accounted for most of the creativity-IQ associations. For the ethnic students (but not for the Caucasian group), measures of acculturation were associated with both cognitive ability and creativity.

Conclusions: Creativity and intelligence were significantly associated in this diverse student sample. The AUT Flexibility subscale appeared to be the most influential component in this relationship. Culture may influence the creativity-intelligence relationship for ethnic students; therefore, it is important to understand one's cultural background when investigating creativity and cognitive ability.

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L.A. CYSIQUE, C. SHI, X. YU, K. HONG, Z. WU, D.R. FRANKLIN, C. AKE, T. MARCOTTE, S. LERENDRE, H. JIN, I. GRANT & R.K. HEATON. Neurobehavioral Effects of HIV Infection among Former Plasma Donors in rural China.

Objective: The HIV epidemic in China has expanded rapidly in recent years, but little is known about neurobehavioral effects of HIV infection in this part of the world.

Participants and Methods: 203 HIV+ individuals and 198 HIV- were enrolled in the rural province of Anhui. All participants shared the infection risk of being former plasma donors. Our neuropsychological (NP) battery in Mandarin assesses 7 ability areas and includes tests widely used to study HIV infection in the US. To explore the clinical significance of any NP impairment, cognitive complaints and degree of independence in activities of daily living also were examined.

Results: The HIV+ and HIV- groups were matched for age (40.2 ± 6.3), education (5.6 ± 2.2) and gender (61% males). 56% of our HIV+ sample had AIDS, and took antiretroviral medication. We found that 26% in the HIV- sample, and 46% in the HIV+ sample were infected with hepatitis C virus (HCV) which can also have CNS effects. To classify NP impairment, we developed demographically corrected norms (T-score conversions) using individuals free of both infections (N=141). Using a global summary score, NP impairment was found in 34.2% of the HIV mono-infected group, 37.2% of the HCV mono-infected group, 39.7% of the co-infected group and 12.7% of the controls. Impairment rates of all infected groups differed from controls ($p = .0001$). Medium to large effect sizes on NP functioning were observed for HIV infection ($d = .61$), HCV infection ($d = .64$), and co-infection ($d = .73$). HIV+ participants with AIDS were more likely to be impaired (43%) than non-AIDS individuals (29%, $p < .05$). Lastly, when all infection groups were combined, participants with NP impairment reported more cognitive complaints ($p = .003$) and increased dependence in everyday functioning ($p = .01$).

Conclusions: We found that NP impairment in this large rural Chinese sample was associated with both HIV and HCV infections. Clinical significance of NP impairment in this population is suggested by the participants' reports of reduced every functioning.

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P.R. JANIS, S.T. MOELTER & C.M. CLARK. Clock Drawing Test Differences in Healthy Hispanic and Non-Hispanic Older Adults.

Objective: We compared clock-drawing test (CDT) performances in non-demented Hispanic and non-Hispanic older adults. Our clinical experience suggested that Hispanic older adults experience greater difficulty relative to other ethnic groups on this measure.

Participants and Methods: Participants were 31 female older adults selected from an Alzheimer's disease Center. Subjects were self-identified as Hispanic (n=10), Caucasian (n=10), and African-American

($n=11$) and matched for level of education ($M = 13.84$, $SD = 2.40$). Test scores were evaluated on measures of visuospatial ability, including Constructional Praxis and a CDT, that was rated on a fifteen-point scale, where higher scores represented more error. Psychometricians who were blind to ethnicity determined CDT scores.

Results: Performance on the CDT draw condition revealed more errors in the Hispanic ($M = 2.1$, $SD = 1.0$) and African-American ($M = 1.7$, $SD = 1.6$) samples than the Caucasian group ($M = 0.9$, $SD = 1.1$), $F(2, 30) = 4.45$, $p < .02$. On CDT copy, however, the Hispanic ($M = 2.0$, $SD = 0.9$) group demonstrated more errors than Caucasian ($M = 0.7$, $SD = 0.6$) and African-American ($M = 0.91$, $SD = 0.83$) participants, $F(2, 30) = 7.24$, $p < .01$. In contrast, there were no performance differences between the groups on constructional praxis, $p > .05$.

Conclusions: Older Hispanic participants showed lower scores on the CDT than other ethnic groups. Performance differences were more apparent during the copy phase than the draw phase of the CDT. We suggest that these performance differences are associated with acculturation differences between ethnic groups.

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D.E. JIMENEZ, H.L. GRAY, S.R. KUMBHANI & D. CALLAGHER-THOMPSON. Is Latina Caregiver's Knowledge of Alzheimer's Disease Influenced by Care Recipient's Degree of Cognitive Impairment?

Objective: The number of individuals who suffer from Alzheimer's disease (AD) in the U.S. is expected to significantly increase over the next half century. As the degenerative effects of AD take effect, the individual may need regular assistance with daily living skills. Minority ethnic groups may lack the resources, knowledge, and information enabling them to provide adequate care for family members with AD. This is especially true with regards to Latinos. Formal health services are under utilized; access to care is hindered by language and varying explanatory models concerning disease.

This study examined the relationship between Latina caregiver's knowledge about AD and the level of their care recipient's cognitive impairment. Due to the growing need for medical care as cognitive decline rises, thereby increasing exposure to medical professionals, it is hypothesized that those caregivers who are caring for relatives with high levels of cognitive impairment will have more accurate knowledge of AD.

Participants and Methods: Eighty seven Latinas caring for relatives with a diagnosis of AD (or other dementia) were recruited. The Knowledge of Alzheimer's Disease Questionnaire was used to assess attitudes and beliefs regarding AD. The Mini Mental Status Exam (MMSE) was used to measure cognitive impairment.

Results: The hypothesis was not supported. Latinas caring for relatives with higher MMSE scores exhibited the same amount of knowledge of AD as those caring for relatives with lower MMSE scores.

Conclusions: The findings suggest a need to develop better ways to effectively communicate with Latino patients through the provision of culturally sensitive health education and psychosocial interventions.

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S. PARK, A. WISNIEWSKI, J. GANDOLFI & H. CARUSO-MAXIE. The Effects of Acculturation and Education upon Intelligence Test Performances in Korean Americans.

Objective: This study examined whether different level of acculturation to the US culture and education level affect IQ scores measured by

the Wechsler Abbreviated Scale of Intelligence (WASI) among Korean Americans living in the US. In addition, the study also investigated whether there was more impact of acculturation on IQ test performance among those with a lower level of education than among those with a higher level of education.

Participants and Methods: The study included 65 Korean Americans between 18 years to 37 years old with 33 males and 32 females. Participants were assessed using the WASI, the Wide Range Achievement Test-Third Edition Reading Subtest, the Verbal Fluency Test from the Delis-Kaplan Executive Function System, and the Suinn-Lew Asian Self-Identity Acculturation. Data were analyzed using a series of 2x2 factorial analyses of variance and a series of multiple hierarchical regressions.

Results: The study found that level of education significantly affected only WASI PIQ scores while years of residence had a significant influence on VIQ and FSIQ, but not PIQ scores. There was no interaction between level of acculturation and years of residence on IQ scores. Level of acculturation as measured by SL-ASIA was positively correlated with VIQ and FSIQ, but not PIQ scores, indicating that level of acculturation has more significant effects on language related portions of WASI IQ test performance.

Conclusions: Acculturation affects IQ test performance among Korean Americans.

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J.L. PONSFORD & H. SALTAPIDAS. The Influence of Cultural Background on Experiences and Beliefs about Traumatic Brain Injury and their Association with Outcome.

Objective: In examining outcomes following traumatic brain injury (TBI), little is known of the experiences of individuals from culturally and linguistically diverse (CALD) backgrounds. This study aimed to compare beliefs and experiences of traumatic brain injury in patients with TBI from the dominant English-speaking culture versus those from minority Culturally and Linguistically Diverse (CALD) backgrounds and to examine the relative influence of beliefs and acculturation, along with demographic and injury-related variables on outcome.

Participants and Methods: Participants included seventy individuals, aged 17-72 years, with mild to severe TBI, sustained an average 2.25 years previously, including 38 of English-speaking background (ESB) and 32 from culturally and linguistically diverse (CALD) backgrounds. They completed the Brief Acculturation Scale, the Illness Perception Questionnaire-Revised (IPQ-R) as a measure of injury beliefs and Craig Handicap Assessment and Reporting Technique (CHART) as a measure of outcome.

Results: Although similar to the ESB participants in education, pre-injury employment status, injury severity and experience of TBI, the CALD participants differed significantly from ESB participants on acculturation variables. CALD participants also experienced greater negative emotions and were less likely to have internal locus of control causal beliefs than ESB participants. Regression analyses indicated that describing one's value system as other than that of the dominant ESB culture, having poorer understanding of TBI and greater negative emotional reactions, along with fewer years of education were associated with poorer outcomes on the CHART.

Conclusions: In treating patients from different cultural backgrounds it is important for health professionals to understand beliefs about and responses to TBI, as they could potentially impact on coping, emotional adjustment and long-term outcome.

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N.D. SILVERBERG & R.A. HANKS. Reading Level Accounts for Racial Differences in Neuropsychological Outcome from Traumatic Brain Injury.

Objective: Reading level and years of education completed frequently differ in minority groups. Correcting for the former strongly attenuates Caucasian/African-American differences in neuropsychological test scores in healthy older adults, presumably owing to racial discrepancies in education quality. The aim of the present study was to replicate this finding in a younger traumatic brain injury (TBI) sample.

Participants and Methods: Fifty-one patients with mild-complicated to severe TBIs at an urban Midwestern medical center completed a neuropsychological test battery for research purposes at one year post-injury that including a measure of oral reading (Wechsler Test of Adult Reading; WTAR). 69% were African-American and 77% were male. They were 38.5 years old (range 17-65) with 11.8 years of education (range 9-18), on average. A test battery mean was computed by averaging demographically-unadjusted T scores.

Results: Caucasians had higher WTAR scores than African-Americans despite being matched on years of education (as well as age, gender, and injury severity). They also obtained higher mean neuropsychological test battery scores, although these differences were eliminated by controlling for WTAR performance. Racial differences were not apparent in race-adjusted (via Heaton et al. 2004 norms) mean test battery scores.

Conclusions: The present findings extend on previous research with healthy older adults by demonstrating that racial differences in post-acute neuropsychological outcome from TBI are attributable to reading level – what Manly and colleagues (2002) purport as a proxy indicator of literacy/education quality. They also suggest that race-specific norms are a practical interim solution to the problem of neuropsychological overpathologizing in African-Americans.

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P.A. SUAREZ. Performance on Tests of Everyday Functioning in Spanish Speakers with and without HIV Infection.

Objective: HIV/AIDS disproportionately affects Latinos but consequences of the illness remain understudied in this group. Many HIV+ Latinos from the US-Mexico border region are primarily Spanish speaking, and properly validated instruments are needed to evaluate changes in daily functioning that may occur as a result of HIV-associated cognitive impairment.

Participants and Methods: We examined 49 HIV+ and 38 HIV- Spanish speakers of Mexican origin. HIV+ participants completed Spanish versions of a comprehensive neuropsychological (NP) test battery. Clinical ratings of impairment were assigned using demographically corrected T-scores derived from a large Spanish-speaking normative group. Sixteen (33%) of the HIV+ participants were NP impaired (HIV+ NPI). HIV+ NPI and HIV+ NP normal (NPN) subjects were demographically and medically comparable. Both HIV+ and HIV- participants received measures of instrumental activities of daily living (IADL) (medication management, finances, shopping, cooking, restaurant scenario). Raw IADL scores were standardized as z-scores. An Average Functional z-score (AF-z) was computed to index overall IADL performance.

Results: HIV+ NPI participants performed significantly worse than HIV+ NPN and HIV- controls on the overall functional battery ($p < .002$), and particularly on advanced financial management ($p < .0001$) and complex medication management tasks ($p < .0001$). There were no significant differences in performance between HIV+ NPN and the HIV- participants.

Conclusions: These results suggest that the laboratory IADL measures are sensitive to HIV associated brain dysfunction in this population. Findings parallel work in English speakers showing that functional declines relate to cognitive compromise in HIV infection.

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S.P. VERNEY, L.L. JERVIS, A. FICKENSCHER, Y. ROUBIDEAUX, A. BOGART & J. GOLDBERG. Symptoms of Depression and Cognitive Functioning in Older American Indians.

Objective: Depression and lower cognitive functioning are common conditions in older populations. While links between psychopathology and neuropsychological performance have been studied in the White majority population, little is known about such links in the American Indian population.

Participants and Methods: American Indians age 60 and older ($n=140$) completed structured interviews that included a depression screener and two cognitive screening measures, the Mini-Mental State Examination (MMSE) and the Mattis Dementia Rating Scale (MDRS).

Results: Participants had mean values of 26.7/30 on the MMSE and 125.8/144 on the MDRS. Forty-two participants reported a recent history of depression symptoms. The depression screen was not associated with the MMSE or MDRS total scores. However, older American Indians who screened positive for depression scored lower than did those American Indians who screened negatively for depression (27.7 vs. 29.8 respectively) on the MDRS conceptualization subscale after adjusting for sociodemographic and health variables.

Conclusions: The combined effects of psychopathology and cognitive impairment are likely to adversely impact the health and welfare of American Indians and their families. More research is needed to provide a better understanding of the relationship between psychopathology and cognition that will help inform clinical treatment for psychopathology in older ethnic minorities.

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Cross-Cultural Test Development

N.S. ARGOLLO-VIEIRA, O.A. BUENO, B. SHAYER, K. GODINHO, K. ABREU, P. DURÁN, A. ANDRÉA, F. VARGENS, S. TATIANE, G. JULIANA, C. RENATA & I. MOURA. Cross-cultural Adaptation of NEPSY Developmental Neuropsychological Assessment: Brazilian Pilot Study.

Objective: The objectives of this study were to describe the performance of a sample of Brazilian children submitted to a translated and adapted version of the Central Part of NEPSY and compare them to the American version

Participants and Methods: The subtests of the Central Part of NEPSY were translated by back-translation and adapted with the participation of a team of specialists; 98 children between 3-12 years of age from both public and private schools in Salvador-BA were submitted to this version. The statistical analysis was accomplished with weighted and raw scores from the subtests, through non-parametric tests, and Spearman correlation.

Results: The female gender presented better scores in the following subtests: Visual-motor Precision, Naming Parts of the Body and Statue. The best performances occurred in the Dominions Executive Attention/Function, Sensor-motor, and Memory and Learning. The Brazilian sample remained within the average variation with a standard deviation (100 + 15), the lowest score being found in Sensor-Motor Dominion (88.05 + 14.89) and the highest in Visual-spatial Dominion (102.25+19.39). We observed statistically significant differences in the age group 3-4 years and between it and the other age groups.

Conclusions: NEPSY adapted and translated version proved to be adequate, being capable of discerning the performance of children in different age, social-economic groups, and according to the parents school level. The results of this sample show that this Central Part of NEPSY is equivalent to the American version, and can be used in the experimental study for a Brazilian standardization.

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N.S. ARGOLLO-VIEIRA, O. BUENO, B. SHAYER, K. GODINHO, K. ABREU, P. DURÁN, I. MOURA, A. SANTIAGO, S. REIS, F. DIAS, D. CHOW, C. SOUZA & A. SANTOS. Cross-cultural Adaptation of “NEPSY Developmental Neuropsychological Assessment”: Criterion Validation with WISC-III.

Objective: The goal of this study was to describe the performance of the Central Part of NEPSY, translated and adapted, with the WISC-III test
Participants and Methods: Sixty children, between 6-12 years of age, from both public and private schools in Salvador-BA, were selected randomly to undergo both battery of tests: WISC-III and NEPSY. For statistical analysis, we compared weighted scores of NEPSY dominions and subtests, with the WISC-III's subtests through Pearson correlation, with qualitative and quantitative interpretation.

Results: The Dominions Executive Attention/Function, Language, Visual-spatial Processing, and Memory and Learning were moderately or strongly correlated to IQ and factorial group scores. The Sensory-motor Dominion was weakly correlated to IQ Execution and Resistance to Distraction, and moderately, with the other IQ and factorial group scores. When NEPSY and WISC-III subtest correlations were analyzed we observed weak correlations only between: Tower and Arithmetic; Touching with Finger Tips and: Information, Cubes and Searching Symbols; Visual-motor Precision and: Cubes and Numbers; Copying Drawings and: Information and Assembling objects. The sensory-motor Dominion presented the highest number of weak and very weak correlations with WISC-III subtests. The highest number of moderate correlations occurred between NEPSY Language and Memory and Learning Dominion with WISC-III subtests.

Conclusions: NEPSY adapted and translated version presented statistically significant correlations with all WISC-III tests, while there was no very strong correlation, therefore, both battery of tests are interchangeable. Moderate correlations between the following Dominions: Executive Attention/Function, Language, Visuo-spatial Processing, and Memory and Learning with WISC-III subtests support the criterion validity, and the low correlations of Sensor-motor Function subtests with WISC-III subtests, which are not sensor-motor evaluation tests, support the validity of the construction.

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D.R. BABBAGE, J.M. LEATHEM & S.J. HASLETT. Does the World Need New Zealand Norms?

Objective: Smaller English-speaking countries face a particular cross-cultural challenge in psychometric testing. In a largely native English-speaking population, there is reasonable face validity in administering many North American- or UK-developed tests unmodified. In many cases there are no local norms, and psychologists interpret performance relative to overseas samples. This practice risks unknowingly misinterpreting performance. Large test publishing companies have understandably found it difficult to justify standardization studies, let alone substantial normative studies, in small populations. Where they have been conducted by local researchers, sample sizes are almost invariably small, and demographic stratification results in small cell sizes. It is arguable whether such studies achieve their goal: to provide a more robust baseline for local testing.

Participants and Methods: With around four million people, New Zealand is one of the smallest English-speaking countries in the world. This paper asks, “Does the world need New Zealand norms?” We will present a model for examining whether local normative studies should be used, extended, or abandoned in favor of the original overseas norms. The approach will be demonstrated with New Zealand normative data.

Results: There can be no general rule for this issue. Analysis will likely be required for each test, in each context. The model presented provides a new starting point on this important issue.

Conclusions: In the authors' view this is an often hidden issue in the cross-cultural context implicit in working in smaller English-speaking populations around the world. This issue likewise has implications for other countries and language groups.

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J.J. GONTIER, A.E. PUENTE, J.L. LABRAÑA & R.E. NEIRA. The Relationship Between Age and Performance in Trail Making Test in a Chilean Population.

Objective: Provide adaptability and normative information about commonly used tests, such as the Trail Making in Chilean Spanish speakers.
Participants and Methods: Trail Making Test, with instructions in Spanish (and available from the authors in written or video form), was administered by three independently licensed professionals to 160 Chilean subjects with ages ranging from 21 to 81 years and a minimum of 12 years of education.

Results: TMT is sensitive to normal cognitive decline in Chilean Spanish speakers. Variability in TMT performance in parts A and B is significantly explained by age in more than 60%. Years of education is significantly correlated to Part B and A and it explains most of the difference in performance variability.

Conclusions: TMT A-B can be used as a sensitive instrument to detect cognitive changes in Chilean Spanish speaker population.

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S.C. LANTING, M. CROSSLEY & D. MORGAN. The Clinical Utility of Two Modified Screening Measures in the Detection of Cognitive Impairment and Dementia in Canadian Aboriginal Seniors Referred to a Rural and Remote Memory Clinic: A Case Study Approach.

Objective: The development of culturally appropriate cognitive screens that are not confounded by educational and linguistic factors remains important for accurate clinical diagnosis and cross-cultural research. This research uses case study methodology to evaluate the utility of two instruments, developed for cross-cultural adaptability, in detecting cognitive impairment and dementia in Aboriginal seniors.

Participants and Methods: Two screening instruments, the Community Screening Interview for Dementia (CSI-D; Hall et al., 1993), and the Cognitive Abilities Screening Instrument (CASI; Teng et al., 1994), chosen for their cross-cultural adaptability and further modified to reflect Canadian Aboriginal identity and experience, were administered to three Aboriginal seniors. Using a translator as required, FB (68 yrs, male), JM (83 yrs, male) and VE (66 yrs, female) completed the CSI-D and the CASI, and a modified neuropsychological battery.

Results: Following conversion to estimated 3MS and MMSE scores, FB's scores fell above cut-off (MMSE: 27; 3MS: 85); based on modified neuropsychological testing, he was diagnosed with mild cognitive impairment. JM performed in the borderline range (MMSE: 23; 3MS: 88); he showed mild to moderate impairment on neuropsychological measures and was diagnosed with Dementia with Lewy Body. VE was well below cutoff on the screens (MMSE: 20; 3MS: 76) and showed significant impairment on neuropsychological measures; she was diagnosed with Alzheimer's Disease.

Conclusions: Scores from the modified screening instruments were consistent with the neuropsychological test results and predicted team consensus diagnosis. The screens were well-tolerated by the Aboriginal seniors, and preliminary findings suggest they can be administered using a translator.

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Other

H.B. COSLETT, A. BURKEY & A.P. RAJKUMAR. Mental Motor Imagery as a Measure of Low Back Pain.

Objective: We demonstrated that patients with chronic shoulder/arm pain are slower to identify the painful extremity in conditions requiring imagined movement of the arm; this slowness improved with therapy, suggesting that the effect was caused by pain associated with IMAGINED movements. To test the generality of this finding and to determine if mental motor imagery may provide a useful measure of low back pain controls and subjects with low back pain were asked to perform a mental motor imagery task in which some items required a movement of the low back.

Participants and Methods: Subjects included 80 subjects with chronic low back pain and 73 normal controls matched for age. Pain subjects were divided into Mild (1-4, N=21), Moderate (5-7, N=23) and Severe (8-10, N=36) on the basis of self-report (0-10 scale). All pain and most control subjects were recruited from a Pain Control Center. Subjects were shown two names of body parts on a computer screen (e.g., LEFT ANKLE - RIGHT ELBOW or CHIN - RIGHT THUMB) and asked to indicate with a keypress if AT THAT TIME they would be able to touch the named body parts together. They were instructed to not move and responded by keypress (yes/no). RTs and Accuracy (defined by previous norming) were collected. There were 60 items, 41 of which were scored.

Results: Mean correct response for controls (93.3 ±3.8%) was significantly higher than for all pain subjects (85±10%; $p < .000001$). Additionally, all subgroups differed significantly in accuracy from controls and each other: Severe = 82.3±12%, Moderate = 86±11%, Mild = 88±10% (all $p < .0001$). Additional analyses of selected items confirmed the results.

Conclusions: A novel mental motor imagery task discriminated normal subjects from subjects with pain; furthermore, the task differentiated between groups of subjects defined by pain severity. These data suggest that mental motor imagery reflects the current state of the body (the body schema) and that the tasks may provide another measure of pain severity and, perhaps, response to treatment.

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M. CROSSLEY, C. D'ARCY, M. CROSSLEY, J. POOCK & S. LANTING. Joys and Challenges of Transdisciplinary Research and Practice: Neuropsychology in an Innovative Interprofessional Memory Clinic.

Symposium Description: This symposium highlights the role of neuropsychology within an interprofessional, research-focused memory clinic that was established to increase the accessibility of rural and remote residents to specialist dementia assessment and care. The first paper will describe the critical ingredients to successful interprofessional team building and sustainable transdisciplinary practice and research, and describe the evaluation research methods that indicate high levels of acceptability and satisfaction with this same-day integrative interprofessional clinic.

The second paper in the symposium will describe the clinical components of the interprofessional rural and remote memory clinic, and high-

light the contributions of neuropsychology to interprofessional dementia diagnosis, cross-cultural assessment, intervention and consultation, and health science education. Videoconferencing is used for knowledge transfer, consultation with referring clinicians, preclinic assessments, and follow-up care across large and sparsely populated geographic areas. Clinical case material will exemplify the benefits of interprofessional assessment and diagnosis.

The third paper will describe the integrative, transdisciplinary research conducted by the Clinic team, with an emphasis on the role of neuropsychology in collaborative research with neurology, neuroradiology, physical therapy, and human geography.

The final paper in this symposium will provide an example of innovative neuropsychological research that is focused on test development and cross cultural assessment, and informed by non-traditional interdisciplinary partners (i.e., human geography and cultural anthropology) and methods (field studies, focus groups, collaboration with Aboriginal seniors and health care workers).

Although team sustainability is an ongoing challenge, there are unquestionable benefits for neuropsychologists and other scientist practitioners who participate in collaborative research and practice.

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M. CROSSLEY, S. LANTING, L. LEJBAK, M. BURNETT, J. GITLIN, A. KIRK, V. DAL BELLO-HAAS, J. BASRAN, S. HARDER, L. HOLFELD & D. MORGAN. Interprofessional Diagnosis in a Memory Clinic for Rural and Remote Residents: The Contributions of Clinical Neuropsychology are Enhanced within the Context of a Diverse and Innovative Health-Care Team.

Objective: The Rural and Remote Memory Clinic provides an interprofessional, "one-stop", same-day assessment for rural residents who require investigation for symptoms of early-stage dementia. This paper describes the contributions of clinical neuropsychology to the transdisciplinary diagnostic and consultation process and demonstrates the mutually beneficial effects of transdisciplinary input to neuropsychology decision-making.

Participants and Methods: The clinic team members include neuropsychology, neurology, neuroradiology, physical therapy, and geriatric medicine. Clinic members participate in shared clinical interviewing, an end-of-day team meeting involving telephone consultation with family physicians, a team-based clinical diagnosis informed by international research and consensus guidelines, and subsequent same-day feedback to patients and their with families. Additional methods include innovative services such as telehealth for preclinic interviews and follow-up, and availability of culturally appropriate assessment protocols and modified procedures when translation is required.

Results: Neuropsychology results are generated efficiently using a carefully designed test battery; findings are incorporated into end-of-day team discussions in the context of neuroimaging (CT), neurological, physical therapy, and geriatric medicine, and family and patient questionnaire data. A case demonstration with a patient diagnosed by the team with frontotemporal dementia, semantic subtype, is used to illustrate the transdisciplinary diagnostic process.

Conclusions: Integrated same-day assessment has the potential to improve diagnosis and management of individuals who present to a memory clinic, and to increase the timely accessibility of specialized services for residents in rural and remote regions, including non-majority seniors.

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M. CROSSLEY, S. LANTING, M. CROSSLEY, L. MCBAIN & D. MORGAN. Modifying Neuropsychological Assessment Protocols for Individuals Referred to a Rural and Remote Memory Clinic: Incorporating Insights and Research Methods from Human Geography and Cultural Anthropology.

Objective: In establishing a interprofessional Rural and Remote Memory Clinic, one challenge for neuropsychology was to develop an assessment protocol that incorporated culturally appropriate procedures to facilitate accurate diagnosis and sensitive recommendations for Aboriginal seniors. This paper describes the contributions of human geography and cultural anthropology to this process.

Participants and Methods: This development work was informed by both traditional psychological approaches and by research methods borrowed from human geography and cultural anthropology. These included: (1) initial telehealth meetings and travel to remote communities to form partnerships with health care providers (2) ethnographic fieldwork with individuals residing in remote communities (3) normative data collection in remote communities and (4) focus groups with an Aboriginal seniors to ensure that assessment protocols reflected their identity and experience.

Results: The fieldwork, data collection in remote communities, and focus groups highlighted the importance of incorporating familiar and colorful images and humour into neuropsychological assessments, and identified appropriate translation procedures. The resulting protocol was based on modifications of existing measures that incorporated culturally and geographically appropriate exemplars. Preliminary results indicate that the modified screening and neuropsychological measures provide a valid assessment of cognitive status and episodic and semantic memory functions, respectively. The modified neuropsychological tests also elicited an unusually positive response in patients, normal adults, and examiners, and resulted in high levels of engagement during test administration.

Conclusions: Neuropsychological tests designed for dementia assessment that incorporate colorful, familiar, and humorous images can contribute to valid cross-cultural assessment and differential diagnosis, and enhance engagement in the assessment process.

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M. CROSSLEY, J. POOCK, M. CROSSLEY, V. DAL BELLO-HAAS, S. HARDER, S. LANTING, N. HAUGRUD, J. BASRAN, A. KIRK, L. MCBAIN & D. MORGAN. Interprofessional Research in a Rural and Remote Memory Clinic: The Role of Neuropsychology in Collaborative Research on Differential Diagnosis in Early Stage Dementia.

Objective: This presentation will highlight the contributions of neuropsychology to interprofessional research on early stage dementia through partnerships with physical therapy (e.g., gait assessment and dual-task analysis), neuroradiology (cognitive correlates of MRS and structural imaging), neurology (cognitive strategies and unique cognitive profiles associated with dementia subgroups), and human geography (development of culturally appropriate test protocols).

Participants and Methods: Dual-task methodology, previously used to investigate attentional capacity in early stage dementia, is extended to a gait dual-task (e.g., combinations of speeded walking and counting trials) within the context of a physical therapy analysis of gait in dementia subtypes, and a prospective study of risk factors for falls and near falls. Neuropsychology and neuroradiology extend the traditional investigation of associations between cognitive data and structural neuroimaging to a study of mild cognitive impairment and dementia using magnetic resonance spectroscopy (MRS). Neuropsychology and behavior neurology enable the careful investigation of cognitive tasks and neuropsychological test performance (e.g., strategy use during semantic and phonemic fluency; regular vs. irregular word reading rates and accuracy, etc.; semantic, episodic, and prospective memory) according to diagnostic subgroups and stages of illness.

Results: The rural and remote memory clinic is generating a rich, shared database, and is fostering complementary research projects among team members. This interprofessional clinic provides a natural setting for cross-cultural research and test development that is informed by human geography and cultural anthropology.

Conclusions: The potential for clinical neuropsychology and related disciplines to contribute to our understanding of cognitive decline in early stage dementias is enhanced by transdisciplinary research.

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C. D'ARCY, D. MORGAN, N. STEWART, A. KIRK, J. BIEM, D. FORBES, L. MCBAIN, M. CROSSLEY & A. CAMMER. Establishing and Evaluating an Interprofessional Rural and Remote Memory Clinic: Making Transdisciplinary Collaboration Work.

Objective: This paper describes the challenges of interprofessional team-building and factors required for sustainability. Program development and ongoing evaluation research are dependent on relationships that are based on trust, respect, and open communication among team members who share common goals and complementary skills.

Participants and Methods: Disciplines include neuropsychology, research nursing, neurology, neuroradiology, physical therapy, geriatric medicine, human geography, medical epidemiology and sociology. The team was established through research funding secured collaboratively and facilitated by strong leadership. Team development required clearly articulated, shared goals (i.e., the need for an interprofessional memory clinic to serve rural and remote residents), mutual academic interest (i.e., in research related to early stage diagnosis), a commitment to regular meetings and in a variety of forums (retreats, working groups, northern and rural travel, clinic team meetings, seminars and rounds, social gatherings), and careful attention to group dynamics and early conflict identification and resolution. Evaluation of the established clinic is ongoing and includes satisfaction ratings of clinic day activities and services, and of telehealth technology for pre-clinic interviews and follow-up.

Results: Satisfaction ratings are high for both clinical service and for technology enhanced delivery. There has been excellent retention of the original team members, new contributors, many graduate students and clinical and research trainees, and numerous spin-off research projects and rich collaborations.

Conclusions: Interprofessional collaboration can enhance the delivery of clinical services to rural residents, the satisfaction ratings of patients, families, clinicians, and researchers, and the quality of applied and basic research conducted by the team members.

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J.F. LINCK & W. LEBER. The Relationship Between the Saint Louis University Mental Status Examination (SLUMS) and other Neurocognitive Tests.

Objective: The purpose of the current study is to examine the relationship between the Saint Louis University Mental Status Examination (SLUMS), a recently developed mental status examination, the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) and several other neurocognitive instruments. Additionally, the utility of the SLUMS as a predictor of neuropsychological functioning was explored.

Participants and Methods: Using 116 individuals referred to the Oklahoma City VAMC for an outpatient or inpatient neuropsychological

assessment, correlation analyses were conducted to identify the relationship between the SLUMS, RBANS, and several other instruments. Discriminant analyses were conducted to explore whether the SLUMS could differentiate between a group diagnosed with DSM-IV psychiatric disorders and a group diagnosed with DSM-IV cognitive disorders.

Results: Moderate to high correlations ranging from .40-.79 were found between the SLUMS and RBANS and several other neurocognitive measures. Discriminant analyses suggest that the SLUMS was useful in distinguishing between the two groups of diagnostic patients, classifying 70.4% of patients correctly, but the RBANS total score, RBANS delayed memory index, and Trails B test were also useful in classifying these patients, classifying 86% correctly when the SLUMS and RBANS total score were used in the analysis, and 76% when the SLUMS, RBANS delayed memory, and Trails B were entered.

Conclusions: The SLUMS may be a useful instrument in predicting cognitive functioning and helping to select a battery of tests. The current results suggest that it may be a useful screening instrument with populations other than the elderly who are referred for cognitive complaints. Correspondence: *John F. Linck, Ph.D., Psychiatry, University of Oklahoma Health Sciences Center, PO BOX 591264, Okc, OK 73189. E-mail: John-Linck@ouhsc.edu*

K. MORDECAI, M. LOPEZ & J.L. WOODARD. The Use of Computer-Based Assessment for Detection of Cognitive Deficits in MCI.

Objective: To investigate the utility of a computer-based test in detecting cognitive deficits that may differentiate mild cognitive impairment (MCI) from healthy controls, we examined performance on eight subtests from the Automated Neuropsychological Assessment Metrics (ANAM) computer battery.

Participants and Methods: We studied 77 healthy controls (HC) aged 65 years and older, and 16 individuals with MCI, defined as performance more than 1 SD below the age and education adjusted mean on the long term percent retention measure from the Rey Auditory Verbal Learning Test and intact performance on the Mattis Dementia Rating Scale and Lawton IADL scale. HC performed above the 16th percentile on all measures. Participants were administered ANAM as part of a larger neuropsychological battery.

Results: Code Substitution (CS) subtests were particularly sensitive to deficits in MCI. Although MCI had more exposure to the stimuli during learning (due to longer reaction times), their accuracy scores during immediate and delayed memory trials were impaired compared to HC. Throughput (correct items per minute) during learning and immediate and delayed recall was consistently greater for HC. Performance on working memory subtests (Matching to Sample and Sternberg Memory Search), a visuospatial task (Matching Grids), and simple and two-choice reaction time did not differ between MCI and HC.

Conclusions: The brief computer-based ANAM battery identified fundamental cognitive deficits in MCI. These findings are particularly noteworthy because this MCI group exhibited significant psychometrically defined memory impairment but had not sought treatment. Therefore, CS subtests of ANAM can detect subtle impairments occurring early in the MCI disease process.

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D.A. MORERE. Neuropsychology and Deafness: Relevant Issues for Critical Evaluation of the Data.

Objective: This presentation will introduce the factors critical to the understanding and evaluation of data on the neuropsychological functioning and assessment of deaf individuals. The concepts of medical, audiological and cultural deafness will be presented. The linguistic variability within the deaf population and the impact of these factors on neuropsychological data will be discussed. A summary of the demo-

graphic information impacting research on neuropsychological functioning and assessment, including incidence of deafness, use of hearing aids and cochlear implants, parental hearing status, and the use of sign languages and other forms of communication will be presented. Research on the cerebral lateralization of language in deaf users of American Sign Language (ASL) will be discussed. The potential benefits and drawbacks of interpreter use on research and clinical data will be introduced. In addition to the standard vulnerability to additional disabilities shared with their typically hearing peers, many of the etiologies of deafness can place deaf individuals at risk for additional disabilities. The incidence of comorbid neuropsychological, sensory, and physical disabilities among the deaf population and the potential impact of such conditions on both research and clinical data will be addressed. The inclusion of deaf individuals in test norming and development will be discussed. The value and difficulties of standardized modifications to neuropsychological instruments will be addressed.

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P. DEAN. Older Adult and Geriatric Issues in Neuropsychology and Deafness.

Objective: This presentation will offer a review of current data on the neuropsychological functioning of and the use of neuropsychological assessment instruments with the deaf older adult and geriatric population. The aging of the population as a whole has increased the awareness of the need to understand the effects of normal aging on neuropsychological test performance and determine which instruments are appropriate for use with older adults to detect and rule out both age related neuropathology and conditions which may affect individuals at any age. This presentation will add to that awareness the impact of deafness on such factors. The presentation will address the heterogeneity of the older deaf adult population and the limited nature of research on the neuropsychological functioning of older deaf adults in general. It will review the available data on the use of neuropsychological instruments with this population. It will address generational issues, such as the differences in educational backgrounds in this age group and differences in language usage and abilities on assessment in this population. It will address the impacts of limited access to information in this population, which grew up before access to communication and information became available via captioning, TTYs, relay services, the internet, and professional interpreters. The impact of these impediments to information access on test data, both clinical and research, will be discussed.

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J. REESMAN. Pediatric and Young Adult Issues in Neuropsychology and Deafness.

Objective: Research over the recent decades has suggested that the performances of deaf children and adolescents on neuropsychological measures often differ from those of their typically hearing peers. The research has suggested a number of factors, including the etiology of the deafness, age of onset of the hearing loss, degree of hearing loss, parental hearing status, communication methodology used, and educational environment, can affect the outcomes on neuropsychological assessment instruments. This presentation will review available evidence on the performance of deaf children and youth on neuropsychological instruments. It will address the demographic and medical impacts on the data and the information needed to make an informed evaluation of such data. The presentation will describe limitations of the research that has gen-

erated these data as well as the difficulties in investigating these issues. The importance of neuropsychological assessment for deaf children within the school setting will be discussed as well as issues within in young adult population such as head injury, serial assessment issues, and adaptive functioning issues.

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J.R. SAMEK, M.M. HOSEY, R.J. SPENCER, C. RICE, L.I. KATZEL, S.L. SELIGER & S.R. WALDSTEIN. Supplemental Data of the Grooved Pegboard: Rule Violations, Time to Remove, and Dropped Pegs.

Objective: The Grooved Pegboard (GP) is a commonly used test of manual dexterity and perceptuo-motor speed. The primary outcome measure is time to insert pegs. We examined several additional measures including rule violations, time to remove, and number of dropped pegs as potential GP supplements.

Participants and Methods: Ninety-three participants [mean age = 68.5(8.3), 55% male, mean education = 15.0(3.4)] completed the GP as part of a study assessing relations of either hypertension or chronic kidney disease to brain and cognition.

Results: Rule violations were associated significantly with poorer performance on Trails A, Trails B, Stroop Color-Word test, Symbol-Digit Modalities and Verbal Fluency ($r = -.22$ to $-.32$; p 's < 0.05). Time to remove was highly associated with time to insert for both the dominant ($r = .80$, $p < 0.001$) and non-dominant ($r = .63$, $p < 0.001$) hands. Both removal and insertion time correlated significantly with Trails A, Trials B, Digits Forward, Digits Backward, Stroop Color-Word test, Judgment of Line Orientation, Symbol-Digit Modalities test and Verbal Fluency ($r = .20$ to $-.70$; p 's < 0.05). Dropped pegs did not correlate with any other measure (p 's > 0.05).

Conclusions: Results suggest that rule violations may provide useful supplemental data to the GP test. Although removal time may not provide additional information beyond insertion time, it could be clinically useful when the insertion task is too difficult to complete.

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Dementia Alzheimer's Disease

M. FEARING, P. SHI, R. JONES & S. INOUE. Impact of Delirium on Cognitive Trajectory in Patients with Alzheimer's Disease.

Objective: Studies have shown that patients with dementia, who also experience delirium, encounter a more rapid progression of cognitive dysfunction. The goal of this study was to examine the impact of delirium on the cognitive trajectory of Alzheimer's disease. Our hypothesis was that there would be a significant increase in cognitive trajectory in patients who developed delirium.

Participants and Methods: The sample included patients enrolled in the Massachusetts Alzheimer's Disease Research Center since 2003. The delirium group included 23 patients with 3 Blessed Dementia Rating Scale-Information-Memory-Concentration scores (BDRS-IMC) to track cognitive trajectory, and who were rated as having delirium prior to their 3rd visit. The non-delirium control group, matched by baseline BDRS-IMC score, consisted of 46 patients with AD only.

Results: ANCOVA analysis, controlling for covariates, was used to determine if change in cognitive trajectory of patients with AD would worsen after delirium. The slope of the trajectory in the time period prior to the reported delirium episode was compared with the slope in the time period following delirium. The mean slope point difference

for the time period prior to delirium was not statistically significant ($p = .75$) between delirium ($1.2 \pm SD 1.1$), and no delirium ($1.6 \pm SD .75$) groups. During the follow-up period when delirium was reported, the mean slope difference was statistically significant ($p = .03$) between delirium ($3.4 \pm SD 1.0$) and no delirium ($.97 \pm SD .58$) groups.

Conclusions: These findings support our hypothesis that cognitive decline is more rapid after delirium onset in those with AD. Clinical and theoretical implications will be discussed.

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Epidemiology

E. KAPLAN, E. KAPLAN, S. DEVINE, W. RINN, M. O'CONNOR & H. DENISON. Epidemiologic Studies of the Clock Drawing Test: Findings from the Framingham Study.

Symposium Description: The Clock Drawing Test (CDT) is a widely used instrument because of its ease of administration and demonstrated sensitivity for detecting cognitive dysfunction in a wide range of neurological disorders, including Alzheimer's disease (AD). With current research in AD focused on identifying preclinical markers there has been increased interest in developing neuropsychological indicators that can identify subtle cognitive changes in people who are still largely asymptomatic. Within the Framingham Heart Study, we administered the CDT to the dementia- and stroke-free, mostly middle aged Offspring cohort and used a 24 point error scoring system, an expansion of the one originated by Freedman, Kaplan et al. In this symposium, we present normative data from the standard command and copy conditions, as well as from the newer predrawn measures. We then report findings from two additional studies. The first investigates whether there is differential performance on the CDT for subtypes of mild cognitive impairment (MCI), specifically amnesic MCI versus an executive function MCI. Our second study examines whether a recent neuropathological finding that areas in the visual association cortex show AD pathology is linked to CDT error scores. Taken together, these four studies represent one of the first studies to look at CDT performance in a large, cognitively normal community-based cohort and the utility of the CDT as a tool for detecting cognitive deficits well before the onset of clinical disease.

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S. DEVINE, R. AU, A. BEISER, Y. DU, H. DENISON, W. RINN, M. O'CONNOR, S. SESHADRI, P. WOLF & E. KAPLAN. Normative Data for the Clock Drawing Test: Results from the Framingham Offspring Cohort.

Objective: Qualitative analyses of the Clock Drawing Test (CDT) have shown greater sensitivity in not only making differential diagnoses, but also in detecting subtle cognitive changes. To date, there has been no community-based normative study of CDT performance to facilitate differentiation of normal from early/preclinical disease. This study provides normative data for the CDT in a community based cohort.

Participants and Methods: 427 women and 393 men in the dementia and stroke-free Framingham Offspring group were administered the CDT as part of a neuropsychological battery (mean age = 68.01 +/-

9.04.) Expanding from the Freedman, Kaplan, et al. scoring protocol, we developed the Framingham Heart Study Clock Scoring protocol which includes 38 qualitative CDT features. Computed error scores included an overall summary score, and subscale scores related to Outline, Numeral Placement and Time-setting.

Results: As expected, the distributions of all error scores were significantly skewed in the direction of “normal.” Adjusted for education, age was significantly associated with higher Overall Summary Score for the command ($p < 0.0001$) but not the copy condition ($p = 0.34$). This same pattern was seen with the Outline Summary Score (command: $p = 0.042$; copy: $p = 0.019$; copy: $p = 0.182$). In both conditions, age was significantly associated with the Numerals Summary Score (command: $p = 0.003$; copy: $p = 0.024$).

Conclusions: These results raise the question of how aging affects CDT performance. Longitudinal follow-up is needed to determine how “erroneous” clock productions can be distinguished from “normal” clock drawings.

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W. RINN, R. AU, A. BEISER, S. DEVINE, Y. DU, H. DENISON, M. O’CONNOR, S. SESHADRI, P. WOLF & E. KAPLAN. Normative and Clinical Characteristics of a Clock Drawing Test Protocol Using Large Preprinted Circle Stimuli.

Objective: This investigation assessed the normative characteristics and clinical utility of an alternative procedure for administering the CDT.

Participants and Methods: 820 community dwelling, dementia and stroke-free participants from the Framingham Offspring cohort completed a preprinted circles protocol, which employs a full-page preprinted circle for the numeral placement exercise and a full-page preprinted clock face for the time setting exercise. Stratified first by age and then further by education, we analyzed the frequency of each of 24 clock drawing errors, clustered into three summary error scores (numerals, time setting and centering).

Results: This CDT protocol demonstrated low normative frequencies of errors; 20.6% had errors on numeral placement, 8.7% on time setting and 28.1% on centering. In an unadjusted model, age was marginally associated with time-setting ($p = 0.040$), but was not significant after adjusting for education. Age was not significantly associated with any of the other measures. Education, however, was associated with numerals ($p = .001$) and time-setting ($p < 0.001$), even after adjusting for age.

Conclusions: Our findings demonstrate that clock drawing errors that are common in clinical patients are relatively infrequent in normal individuals; we provide normative data that documents the baseline frequency of each type of error in this community based cohort. The preprinted CDT protocol removes any potential influence of poorly drawn circles on numeral placement performance. It also eliminates any potential time setting errors that are artifacts of poor numeral placement. Correspondence: *Edith Kaplan, Ph.D., Neurology, Boston University, 715 Albany Street, Boston, MA 02332. E-mail: ekaplan@bu.edu*

M. O’CONNOR, R. AU, A. BEISER, S. DEVINE, H. DENISON, W. RINN, S. AUERBACH, S. SESHADRI, P. WOLF & E. KAPLAN. Relationship of Mild Cognitive Impairment to Clock Drawing Performance in the Framingham Offspring Study.

Objective: Mild cognitive impairment (MCI), often a transitional stage between normal aging and dementia, includes amnesic (MCI-A) and executive function (MCI-EF) subtypes that reflect different etiologies.

Current quantitative cognitive measures cannot always detect subtle changes associated with MCI. The Clock Drawing Test (CDT) is widely-used, but available scoring systems do not provide sufficiently sensitive qualitative information about performance. This project examines whether a qualitative CDT error scoring system can differentiate between MCI subtypes.

Participants and Methods: Clock drawings from 610 Framingham Offspring participants (mean age=62, 52% female, stroke and dementia free) were examined using a 24-point error scoring system. Participants with MCI-A ($n = 31$) and MCI-EF ($n = 41$) were separately compared to controls who had no significant deficits (1.5 s.d. below mean) in any cognitive domain ($n = 538$) using logistic regression, adjusting for age, sex, and education.

Results: Participants with MCI-EF, but not MCI-A, differed from controls on the CDT summary error score for command ($p = 0.007$) and copy conditions ($p = 0.031$). On the command condition MCI-EF were more than twice as likely as controls to commit errors in placing numerals (OR 2.27, $p = 0.029$) and setting the time (OR 2.29, $p = 0.016$). Similarly, on the copy condition, OR = 1.90 and 2.00 for placing numerals and time-setting, respectively, although these did not reach statistical significance.

Conclusions: CDT errors were associated with MCI-EF and not MCI-A. This is likely due to the high demands the task places on frontal systems. These results suggest that the CDT qualitative error scoring system is useful for distinguishing between MCI subtypes.

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H. DENISON, R. AU, A. BEISER, A. MCKEE, J. HIMALI, S. DEVINE, W. RINN, M. O’CONNOR, S. AUERBACH, S. SESHADRI, P. WOLF & E. KAPLAN. AD Pathology in Visual Association Cortex linked to Clock Drawing Performance in the Framingham Heart Study.

Objective: A recent neuropathological finding from the Framingham Heart Study described AD pathology in the visual association cortex, Brodmann area (BA) 19, not only for autopsy cases who were deemed to be demented at the time of death, but also for 52% of cases who were determined to be cognitively intact. The clinical significance of this finding, however, has not been determined. We examined whether AD pathology in BA 19 is associated with performance on the Clock Drawing Test (CDT).

Participants and Methods: 36 participants (24 not demented, 12 demented) enrolled in the Framingham Heart Study brain donation program came to autopsy and had been administered the CDT within 5 years of death. CDT measures included an overall summary error score, and subscale scores for Outline, Numeral Placement and Time-setting. Neuropathological measures included neurofibrillary tangles (NFT), diffuse plaques (DP) and neuritic plaques (NP) within BA 19. Analyses were adjusted for age, sex and education.

Results: Significantly related to NFT in BA 19 were the CDT summary score ($p = 0.011$), and error scores for numeral placement ($p = 0.050$) and time setting ($p = 0.004$). Similarly, CDT summary score ($p = 0.011$) and error scores for numeral placement and time setting were also related to NP in BA 19 ($p = 0.037$, $p = 0.013$, respectively.) No CDT measures were significantly related to DP.

Conclusions: AD pathology in BA 19, including cases considered cognitively intact at the time of death, was associated with poorer performance on the CDT. These findings link this potential neuropathological marker of preclinical AD to functional outcome.

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THURSDAY AFTERNOON, FEBRUARY 7, 2008

Poster Session 4: Imaging, Cognitive Neuroscience,
Demyelinating Diseases

12:45–2:15 p.m.

Cognitive Neuroscience

M.M. ADAMSON, B. HUTCHINSON, S. RAPAKKO, V. SAMARINA, Q. KENNEDY, A. ROSEN, A. WAGNER & J. TAYLOR. **Neurocorrelates of Perspective-Dependent Spatial Memory in Middle-aged and Older Pilots.**

Objective: Age-related deficits in spatial learning and memory are reported during navigation in both allocentric (survey) and egocentric (route) perspective tasks. Impairments in navigation tasks are also reported in early Alzheimer's disease (AD) patients. Neuroimaging findings from navigation studies reveal perspective-dependent differential activation in retrosplenial, parietal cortices and in the medial temporal lobe (MTL), an area compromised in aging and AD. Recent findings from Stanford/VA Aviation studies point to the potential protective impact of expertise on flight simulator performance in older pilots. As spatial navigation skills are employed during aviation performance, we evaluated the behavioral and neural patterns of spatial learning during perspective-dependent encoding in healthy middle-aged to older pilots.

Participants and Methods: Fifteen FAA-certified general aviation pilots (ongoing longitudinal Stanford/VA Aviation study) viewed two movies (route and survey tasks) alternating with fixation and a dot control task while undergoing fMRI. Spatial recall was tested post-scan with map drawing and a board-sticker task.

Results: Individual task comparisons with fixation revealed activations in retrosplenial, fusiform and visual association cortices in both survey and route perspectives. Route vs. survey and route vs. dot control comparisons revealed additional bilateral posterior hippocampal and parahippocampal activations. Similar to prior studies, survey perspective failed to activate hippocampal and/or parahippocampal regions in any comparison. Mean survey scores were higher overall than route scores in both recall tasks.

Conclusions: Discussion includes analysis of the neural circuitry required for allocentric and egocentric perspective processing and its status in the aging population at genetic risk for AD.

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L. BERKELHAMMER, A. STUDAWAY & J.S. BERMAN. **Neuropsychological outcomes of children with sickle cell disease: A meta-analysis.**

Objective: The neuropsychological sequelae of pediatric sickle cell disease (SCD) are largely within the areas of IQ, attention, executive functions, and reading skills. We sought to determine the overall severity rate of neuropsychological deficits in children with SCD and analyze the relationship between neuropsychological outcomes and degree of insult. Methodological factors which accounted for the discrepancies were also examined.

Participants and Methods: A search of previously conducted research on the neuropsychological functioning of children with SCD was conducted using the Medline and PsycInfo databases for the period 1988–06/2007. Studies were included in the meta-analysis if the mean, standard deviation, and number of participants were reported in the text

or obtained following query to the author(s). Fifty-six articles met criteria and were coded on genotype, neuroimaging, comparison group type, age, gender, educational placement, neurocognitive domain, measure type (test), and metric. A d-score was calculated for the measure level variables and used in subsequent analyses.

Results: Compared to sibling controls, SCD with no cerebral vascular incidents (CVI) scored significantly lower on Language measures ($d = .648$). Compared to healthy controls, SCD-CVI demonstrated significant deficits in IQ ($d = .7566$), Achievement ($d = .683$), and Language ($d = 1.04$). SCD groups presenting with silent infarct performed significantly lower than those without CVI on measures of IQ ($d = .608$), Achievement ($d = .784$), and Visual/Motor skills ($d = .537$). Additional analysis was conducted examining variation in deficits among the SCD subgroups with various CVIs and genotypes.

Conclusions: The present study demonstrated that control groups are relevant factor in determining the magnitude of deficits. Additionally, it was demonstrated that neurocognitive deficits presented differently as a function of the type and severity of CVI (i.e. infarct, stroke, infarct, or lesion) as well as the SCD genotype.

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M.C. CAMPBELL, S.E. ZAUBER, D. DEALWIS, P. WEAVER, S. TABBAL, J.S. PERLMUTTER & T. HERSHEY. **Effects of Vim DBS for Essential Tremor on Working Memory.**

Objective: Cognitive deficits, including impaired working memory (WM), are more prevalent in patients with essential tremor (ET) than controls (Lombardi et al., 2001). Dysfunction of thalamocortical pathways may contribute to tremor as well as WM deficits in ET. Since deep brain stimulation (DBS) of the ventral intermediate (Vim) nucleus of the thalamus reduces tremor in ET, we investigated the effects of bilateral and unilateral stimulation of the Vim on WM.

Participants and Methods: In this pilot study, 10 Vim DBS ET patients completed both simple and complex versions of a spatial and verbal span task while manipulating stimulation condition (i.e., bilateral ON, bilateral OFF, Left ON, and Right ON).

Results: Bilateral stimulation improved performance on spatial and verbal span tasks as compared to the bilateral OFF condition. In addition, there was a significant interaction between DBS conditions (Right ON, Left ON, Both ON) and modality (verbal vs. spatial) ($F(2,8) = 4.6, p = .047$). Left Vim stimulation improved spatial span performance greater than right Vim stimulation ($p = .03$); right Vim stimulation tended to improve verbal span ($p = .076$).

Conclusions: The results of this pilot study indicate that bilateral and unilateral Vim DBS generally improve WM performance. Left Vim stimulation improves spatial while right Vim stimulation tends to improve verbal WM. Since the right hemisphere is associated with spatial WM and the left is associated with verbal WM, our findings raise the possibility that the main effect of Vim DBS on WM may be primarily contralateral, possibly via interhemispheric connections.

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C. CARBON, M. GRUETER & T. GRUETER. **Prosopagnosia. Transdisciplinary links between neuropsychology, genetics, and cognitive neurosciences.**

Objective: Faces are of essential importance for human social life. Recent face processing models assume highly interconnected neural structures between different temporal, occipital and frontal brain areas with several feedback loops. A selective deficit in the recognition of familiar

faces is known as prosopagnosia, which can be found both in acquired and congenital form. Recently, a hereditary sub-type of congenital prosopagnosia with a very high prevalence rate and a clearly circumscribed face processing deficit characterized by a great homogeneity of clinical symptoms has been identified. Realized by intense transdisciplinary research between genetics, neuropsychology and cognitive neurosciences, the study of hPA will help to reveal the key essence of face processing in general and the neural and genetic foundations of face blindness (Grueter, Grueter, & Carbon, in press).

Participants and Methods: The paper provides a review on already described cases of prosopagnosia, including hereditary prosopagnosia (hPA), congenital prosopagnosia (cPA)/developmental prosopagnosia (dPA) and acquired prosopagnosia. As the focus lies on hPA, a sample of 56 people with hPA were tested and compared in detail with 54 controls that were age- and sex-matched.

Results: Hereditary prosopagnosia is accompanied by a well defined pattern of symptoms not always related with “pure” prosopagnosia. False recognition, a familiarity decision deficit, no need for gaze contact in social interaction, and a general visual recognition impairment define this condition, while other capabilities like emotion recognition are not affected.

Conclusions: A unitary and common impairment of face perception like the hereditary type of prosopagnosia opens a big window of opportunity to improve our knowledge about face processing and its genetic base.

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F. CONSTANTINIDOU. Common Object Categorization in TBI and Normal Aging: Executive Network Functioning and Implications for Rehabilitation.

Objective: TBI and normal aging could affect similar cognitive networks. This study will determine the effects of TBI and normal aging on common object categorization.

Participants and Methods: Forty nine subjects distributed in 3 groups of 13 subjects per group participated: A. Young adults with TBI ages 17-50 years, B. Noninjured adults ages 19-47, C. Noninjured older adults ages 53-82. Subjects were matched for education and other variables. The study consisted of 3 parts. Initially, each subject described 10 common objects. Following the spontaneous description of objects ss received categorization training to learn 8 perceptual features (color, shape, size, weight, construction, texture, detail, and function). Following the feature training, ss described 10 new common objects using the 8 features.

Results: MANOVA ($\alpha = .05$) revealed significant improvement in categorization as a result of the feature training for all 3 groups ($p = .0001$). There was no significant difference between the total number of features described by the older adults and the TBI ss throughout the study. Non-injured young adults performed better than adults with TBI and non-injured older adults ($p = .008$).

Conclusions: Normal aging and TBI result in similar declines in feature use and common object categorization. This could be due to interference in the function of executive networks, associated with categorization. The training of features results in performance improvement. Implications for quality of life and the use of systematic neuropsychological retraining for TBI, normal older adults, and older adults with TBI will be discussed.

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A.I. DUMER, K. FUNG, A. VOUSTIANIOUK, D. WEISZ & M. GOLDSTEIN. Position effect in IGT performance.

Objective: The Somatic Marker Hypothesis (SMH) contends that certain kinds of somatosensory feedback, termed “somatic markers,”

have a causal role in decision-making under ambiguous circumstances. Nearly all prior studies investigating the SMH have used skin conductance responses (SCRs) on the Iowa Gambling Task (IGT) as a measure of somatic markers that may affect decision-making. We extended previous research by addressing the following questions. First, which other measures, besides SCRs, can be used as measures of somatic markers? Second, do SCRs and other aspects of physiologic activity during the IGT reflect processes affecting decision-making or anticipation of gain or loss? Third, is there a relationship between sensitivity to somatosensory feedback and quality of decision-making? Finally, all else being equal, do participants prefer choosing items (card decks) on the right side during the IGT (“position effect”)?

Participants and Methods: Twenty-five healthy adults (mean age = 33.0, SE=2.5) were tested on two measures of sensitivity to somatosensory feedback, Rogers Decision Making Task (RDMT) and a modified version of the IGT. SCRs, EKG, blood pressure, and EMG were recorded during the IGT and RDMT.

Results: The study revealed a strong trend for the “position effect,” $t(24) = 1.42$, $p = 0.08$, one-tailed, in behavioral choices on the IGT. Participants scored higher when advantageous decks were on the right ($M=19.1$) than left side ($M=6.3$).

Conclusions: “Advantageous decks” (picking from which increases the IGT score) are on the right side in virtually all IGT versions used in prior studies. These results suggest that positioning advantageous decks in the middle and not on the right side may substantially improve IGT format.

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S. FARNHAM, C. CLOAK, B. HEDEMARK & L. CHANG. Slower Development of Visual Motor Integration and Expressive Language in Preschoolers with Prenatal Exposure to Methamphetamine.

Objective: Determine if cognitive function differs between preschool-aged children with prenatal methamphetamine- exposure (PME) and age-matched controls.

Participants and Methods: PARTICIPANTS: 36 PME (12 female and 24 male) and 62 controls (29 female and 33 male). Inclusion criteria for PME subjects: age 36-59 months and had PME. Inclusion criteria for controls: age 36-59 months. Exclusion criteria for all subjects: maternal age < 18 years at time of child’s birth, maternal IQ < 80, or confounding medical condition or maternal drug dependency (except nicotine in all subjects and meth in the PME) during pregnancy; child preterm or mother non-English speaking. Subject groups did not differ in terms of age and parent education level. METHOD: Each subject was administered measures of intellectual function (SB-5th Edition), expressive and receptive language (EOWPVT-2000; PPVT-III), visual attention (NEPSY), and visual motor integration (VMI-5th Edition). Subjects also underwent brief physical and neurological examination and magnetic resonance spectroscopy and imaging.

Results: Analysis with nonparametric t-tests showed that PME and control subjects did not differ significantly on measures of intelligence, receptive language, or visual attention. However, compared to controls, PME subjects performed significantly worse on VMI (standard score: -8.4%, $p=0.009$; percentile: -17.9%, $p=0.006$), and on EOWPVT-2000 (percentile: -12.5%, $p=0.02$).

Conclusions: PME children appear to have slower development of visual motor integration skills and expressive language. Longitudinal study will further determine whether these group differences will persist. Correlating cognitive performance with brain imaging measures will also provide further evidence whether PME leads to abnormalities in brain development. Correspondence: *Sara Farnham, Queens Medical Center, UH Tower, University of Hawai-Manoa, 1356 Lusitana St, 7th floor, Honolulu, HI 96813. E-mail: sfarnham@hawaii.edu*

Y. HASHIMOTO, K. SAWADA & F. MATSUDA. Feedback Effects on Time Estimation in Patients with Brain Injury.

Objective: One of the most important aspects of psychological time is the internal experience of how much time passed since the occurrence of some event. Some previous studies have suggested that the ability of time estimation in the seconds to minutes associated with various cortical and subcortical areas. In the current study, patients with unilateral lesions due to stroke and patients with TBI were tested on a time production task to investigate the role of feedback that could affect on learning of time estimation.

Participants and Methods: Thirteen patients with brain damage and 11 normal adults participated in this study. Participants were tested on a time production task. The task was consisted of two phases. In the training phase, participants were required to produce 10 s with feedback. The test phase followed five successive precise productions of 10 s in the training phase. In the test phase, participants were required to produce 10 s without feedback.

Results: (a) Three participants of patient group could not reach the learning criterion within 20 trials. Generally, the result revealed that patients needed more trials than the normal adults to learn 10 s duration. (b) To analyze the effect of feedback, the rate of valid trails was calculated in each participant. The valid trial means that the produced duration in the trial became longer (or shorter) than that in the previous trial where the feedback of "too short" (or "too long") was given. The result showed that the average rate of valid trials in the patient group was as high as that in the normal group. (c) In the test phase, the patients could produce 10 s without feedback as precisely as the normal adults.

Conclusions: The findings mentioned in (a) and (b) in the results suggest that it is more difficult for the patients to adjust their produced duration based on the feedback than for the normal adults. According to findings mentioned (c), the ability to learn based on the feedback seems to differ from the ability to retain the learning.

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T. HEITZMAN, A. CALIGIURI, N. ZDROJESKI & V. O'HARA. Evaluating Relationships Between Temperament, Executive Functioning, Personality and Attentional Networks in Young Adults: Integrating Cognitive Neuroscience, Neuropsychological and Developmental Theory.

Objective: Through an integration of development and cognitive neuroscience, Rothbart and Posner have developed a theoretical model associating temperament and attentional networks. Much of the support for this theoretical relationship has come from research with young children. This study evaluated the relationship in young adults using instruments based in Rothbart's and Posner's theory. Secondary associations to personality and executive functioning were also considered.

Participants and Methods: Fifty-six undergraduates completed self-report scales of temperament (ATQ), personality (BASC-SRP College) and executive functioning (BRIEF-Adult), followed by the Attentional Network Test (ANT).

Results: Results revealed significant relationships between temperament and attentional networks. Alerting Attention showed the strongest association to temperament as it was significantly correlated with three of the four factor scales of the ATQ: Emotional Control, Extraversion and Orienting Sensitivity. Executive Control showed much weaker association to temperament, though it was significantly correlated with three of the thirteen subscales: frustration, high pleasure, and associative sensitivity. Orienting Attention was not significantly associated with any component of temperament. Surprisingly, temperament factors were not associated with personality factors other than a relationship between the activation subscale of Effortful Control and the Inattention/Hyperactivity composite on the BASC. In contrast, temperament was much more intimately associated with executive functioning (BRIEF).

Conclusions: Results of this study (a) support the temperament-attentional network theory and empirically extend it to young adult levels; (b) highlight the need to consider the overlap between temperament and executive functioning within research and clinical practice; and (c) raise questions about the well accepted relationship between temperament and personality.

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S. KAZANDJIAN, E. GAASH, I. LOVE, M. DE AGOSTINI, A. ZIV-OTOFISKY & S. CHOKRON. The Direction of the Written Language on the Representation of Phrases.

Objective: Following the theory that language and space are interconnected (Bloom et al, 1999), the possibility of language directionality and its role on the representation of phrases was addressed in the current study: would a right-to-left language result in actions represented with a right to left directionality? The current study followed on Chatterjee (1999) by comparing the performance of Hebrew-English bilinguals within the two language environments.

Participants and Methods: Conducted in two language conditions (English/Hebrew), 15 Americans, with Hebrew as a second language, and 27 Israelis, with English as a second language, were read sentences depicting sequential or chronological events. Images of the three key nouns from each sentence were selected to place in an order that best depicts the sentence. Order of the placement of the images was recorded (left-to-right, right-to-left, or other).

Results: A repeated-measures, mixed ANOVA with the within-subjects factors Language Condition (2: English, Hebrew), Sentence Type (2: Sequential, Chronological), and Trials (5), the between-subjects factor Native Language Group (2: Hebrew, English) was conducted. A significant overall between-subjects main effect of Native Language Group was found, $F(1, 47) = 13.16, p = .001$, showing American participants placing the images in the left-to-right direction more frequently than the Israeli participants. A significant main effect of language condition was also seen, $F(1, 47) = 5.19, p = .03$, indicating that a left-right order was used more frequently in the English condition as compared to the Hebrew condition.

Conclusions: The findings suggest that the directionality of the native language plays a role in the representation of the phrase, regardless of whether the phrase is sequential or chronological. However, even among native Hebrew speakers, English sentences induce a left-right order. These results support the hypothesis that language directionality effects the spatial representation of events.

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A.L. KROL & M. MRAZIK. Post-Concussion Symptom (PCS) Reporting using Different Interview Techniques.

Objective: The measurement of post-concussion symptoms (PCS) is an important assessment tool when evaluating outcomes of concussion in athletes. Recent studies have shown that post-concussion symptoms are negatively correlated with neurocognitive performance and brain activation patterns. Routinely, athletes are asked to report the severity of symptoms by responding to an examiner's questions. To date, studies have not investigated optimal methods of collecting this data. This study explored whether differences in how data was collected would impact the disclosure of concussive symptoms.

Participants and Methods: Prior to the start of competitive seasons, a cohort of 83 college football athletes were asked to complete a 21-item

Post-Concussion Symptom Scale (PCSS) in conjunction with baseline neuropsychological testing. Athletes were randomly assigned to complete the PCSS scale in one of two ways. One half of the athletes completed it alone; the other half completed the PCSS with a clinician who verbally read the questions and recorded the athlete's responses.

Results: Independent sample t-tests did not reach statistically significant levels ($p=0.10$) for total scores on the PCSS. However, ratings of sleep ($M=0.26$; $SD=0.61$) and fatigue ($M=0.36$; $SD=0.57$) were significantly higher ($p<0.05$) in the self-report group than compared with sleep ($M=0.94$; $SD=1.37$) and fatigue ($M=0.74$; $SD=0.83$) in the interviewer group.

Conclusions: Although composite scores did not reach statistically significant levels, there was a trend for athletes who self-reported symptoms on the PCSS to report higher levels of symptoms. Results suggest a possible interviewer effect when obtaining symptoms from athletes. Future research is needed in this area.

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K.A. NIELSON, W.L. GROSS, A. GANDER, L. GUIDOTTI, J.L. WOODARD, M. SEIDENBERG, S. DURGERIAN, Q. ZHANG & S.M. RAO. Event-related fMRI Evaluation of the Common Semantic Networks Associated with Identifying Familiar Faces and Names.

Objective: The neural systems mediating the recognition of familiar people still lack clear definition, including the similarities and differences underlying the processing of names and faces. Indeed, studies evaluating such stimuli within the same study are rare. The current event-related fMRI study directly compared familiar faces and names to identify their common and distinct networks.

Participants and Methods: Twenty participants performed a fame recognition task consisting of names and faces (25 famous and 25 unfamiliar each), presented in pseudorandom order (4s each); subjects indicated famous/unfamiliar by button press. SPGRs and 36 contiguous 4-mm axial echo-planar images were collected at 3T ($TR=2s$; $TE=25$ ms; $flip=77$ dg; $FOV=24$ cm; matrix 64×64). Hemodynamic response functions for each condition were extracted by deconvolution with a 2-Fame X 2-Type ANOVA against area-under-the-curve (4-8s).

Results: Activation for faces>names was primarily right lateralized, including bilateral occipital and fusiform; left cerebellum; and right insula, posterior cingulate, inferior frontal, and parahippocampal gyrus. Activation for names>faces was more bilateral, including left precentral, insula, and middle temporal; right postcentral and cerebellum; and bilateral premotor, precentral, medial frontal, supramarginal, temporoparietal, and medial occipital regions. Fame activated an extensive network, including bilateral posterior cingulate, hippocampus and middle temporal; right superior temporal; left prefrontal regions; and left temporal pole, insula, and temporoparietal junction. Few interactions were observed.

Conclusions: The results suggest differential pre-semantic processing of faces and names, but shared semantic processing for the identification of person identity. These shared processing systems were left lateralized and included regions commonly associated with long-term memory retrieval, consistent with the retrieval of person-specific semantic information.

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P.S. QUINLAN, A. NORDLUND, K. LIND & A. WALLIN. The Impact of Stress in Mild Cognitive Impairment: Endocrine Alterations and Cognitive Dysfunction.

Objective: Chronic stress and subsequent hypothalamus-pituitary-adrenal (HPA) axis activation are known to cause hippocampal atrophy,

impair cognitive function, and have been associated with the severity of Alzheimer's disease. Related to cognitive function and identified as independent risk factors are hormones of the reproductive-, somatotrophic-, and thyroid axis, which are primarily suppressed by the HPA. The objective of this study was to investigate the relationship between these stress related endocrine axes and their impact on cognition in mild cognitive impairment (MCI).

Participants and Methods: Data for serum TSH, total T4, free T4, T3, oestradiol, testosterone, IGF-1, and saliva cortisol prior and after a 0.5 mg dexamethasone test for 43 MCI patients and 26 healthy controls was available. All participants underwent a comprehensive neuropsychological test battery.

Results: No endocrine differences explaining the deviations in cognitive function could be found between the MCI and control group. Within the MCI group a positive association between the HPA and thyroid axes was found. T3 levels were strongly related to impaired function in all cognitive domains. MCI patients with T3 levels below the normal range showed better overall cognitive function.

Conclusions: Thyroid hormones, which correlated positively to the HPA axis, were inversely associated with cognitive function in the MCI group. Multiple studies reported that more stressful life events increase the risk for hyperthyroidism. This raises the hypothesis that less stressful life with reduced wear and tear of the stress system lowers energy requirements modulated by cortisol and thyroid hormones in older age. Within the MCI population, this might be a protective factor.

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M. RIES, M. FITZGERALD, S. ASTHANA & S. JOHNSON. The Role of the Ventral Posterior Cingulate Cortex in Episodic Retrieval and Self-Appraisal: An fMRI Study.

Objective: Various studies implicate the ventral posterior cingulate cortex (vPCC) in both episodic retrieval and self-appraisal. This study varied episodic retrieval and self-appraisal within the same task, and tested the hypothesis that both cognitive constructs influence vPCC activity.

Participants and Methods: 29 healthy young adults participated in this event-related fMRI memory study. Participants completed a training session prior to the MRI scan in which they learned trait-adjective words in two conditions: a self-appraisal condition (i.e., yes/no to the statement, "The word describes me") and a semantic condition (i.e., yes/no to "The word is positive"). During the fMRI scan, participants performed a memory test, indicating whether words were previously-learned (old) or new. Voxel-wise whole brain analyses tested the hypothesis that the vPCC is active during presentation of old items (i.e., memory retrieval) and particularly when old items are encoded in a self-appraisal context.

Results: Participants showed significant vPCC activity during memory retrieval (old > new contrast; $T = 5.59$, $p_{FWE} > .05$). Participants also showed significant vPCC activity to words that had been encoded in a self-appraisal context (old-self > old-semantic contrast; $T = 5.55$, $p_{FWE} > .05$).

Conclusions: Results demonstrate that the vPCC is involved in both episodic retrieval and particularly memory for information encoded in a self-appraisal context. These results lay the foundation to conduct analyses ascertaining vPCC connectivity with other brain regions under these varying cognitive conditions. This type of work is important because vPCC dysfunction may underlie both memory impairment and impaired awareness of deficit in amnesic Mild Cognitive Impairment and Alzheimer's disease. Knowledge gained about vPCC's role in healthy young adults' memory retrieval and self-awareness guides hypothesis-driven investigation of vPCC contributions to the symptomatology of these disease states.

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F.W. SABB, S. PARKER, C. BEARDEN, D. GLAHN, N. FREIMER, R. POLDRACK, D. KALAR, N. BROWN, T. CANNON, E. LONDON, A. TOGA & R. BILDER. Phenowiki: An Online Collaborative Knowledgebase for Cognitive Phenomics Research.

Objective: Phenomics is an emerging transdisciplinary for the study of phenotypes across multiple scientific domains. The study of complex cognitive phenotypes typically associated with neuropsychological disturbances will require sophisticated collaborative bio-informatics approaches. While these informatics approaches are revolutionizing knowledge discovery in other aspects of biomedical science (e.g. the human genome project), the representation of neuropsychiatric and cognitive phenotypes in knowledge repositories is rudimentary.

Participants and Methods: As part of the Consortium for Neuropsychiatric Phenomics, we have developed an online 'wiki'-style database (www.Phenowiki.org) to support the collaborative knowledge-building of information related to these complex cognitive phenotypes. We have populated this database initially with phenotypes related to cognitive control, providing details about their 1) psychometric properties with test-retest and convergent validity statistics; 2) neural validity, through indexing neuroimaging studies, and 3) genetic validity by examining effect sizes in genetic association studies.

Results: We will present examples related to cognitive control phenotypes in schizophrenia, bipolar, and ADHD, including a review of heritability data for cognitive tasks and neuropsychological tests used in research of cognitive control, as well a practical demonstration of the features of this new application.

Conclusions: This database can be used for phenotype selection for research protocols, and eventually for online meta-analyses through standardized effect-size data. This represents an important step in transdisciplinary research by providing researchers with an online tool to extend cognitive phenomics.

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E.D. SHEARD, S. SEKHARAN, M. WILLIAMSON, D. MABBOTT & J. ROVET. A Case Study of the Neuroanatomic Underpinnings of Cognitive Deficits in Higher Order Multiple Birth Children.

Objective: Children born preterm show a pattern of cognitive deficits suggestive of underlying neural abnormality, however the brain-cognition relationship is poorly understood. The aim of this study was to investigate the neural correlates of memory and attention in preterm higher-order multiples.

Participants and Methods: Three siblings from a set of 10-year old quadruplets born 30 weeks gestation with low birth weights (737.09g-1446.00g) and three matched singleton controls born full term with normal birth weights participated. Children underwent comprehensive neuropsychological evaluation emphasizing memory and attention and MRI analysis including volumetrics, MRS, and DTI measures.

Results: The quadruplets showed modest memory deficits affecting immediate and delayed verbal recall and deficits in selective attention. Anatomically, intracranial volume was reduced 7.5% ($p = .34$) and ventricular size enlarged (left - 58%, right - 48%; $ps = .01$ and $.39$.) in quadruplets relative to singletons. Left hippocampus was 11% larger in quadruplets ($p = .08$) and MRS analysis showed atypical hippocampal concentrations of metabolites associated with myelination (inositol), neuronal integrity (N-acetyl aspartate) and metabolism (creatine), $ps < .05$. No volume or symmetry differences were evident in the caudate. DTI measures will be examined to determine if differences in white matter architecture are present.

Conclusions: This case study revealed memory deficits that may be connected to abnormalities in hippocampal structure and composition. The attentional deficits are not linked to caudate structural integrity, but may reflect caudate or frontal dysfunction. Overall, the findings underscore the influence of neural abnormality in multiples on cognitive performance in pre-adolescence.

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E.D. SHEARD, K. WILLOUGHBY, K. NASH, S. SEKHARAN, M. DESROCHER & J. ROVET. The Neuroanatomy of Cognitive Dysfunction in Fetal Alcohol Spectrum Disorder.

Objective: This research aimed to bridge impairments in memory, attention, and executive function in FASD to the underlying neuroanatomic pathology.

Participants and Methods: 23 children with FASD and 20 control children, aged 10-14 years, completed a comprehensive clinical battery emphasizing memory, attention, and executive function and underwent MRI in a 1.5T scanner. Two raters masked to group status manually traced the hippocampal formation and the caudate nuclei to determine volume. MRS was employed to measure metabolite concentrations in voxels placed over the left and right hippocampi.

Results: After controlling for IQ, FASD were outperformed by controls in everyday memory and verbal memory and selective executive functioning tasks (all $ps < .05$). Structurally, no differences were found in right or left hippocampal volumes; however, disturbed maturational changes in hippocampal volume were evident ($p < .05$): Age was correlated with volume in controls, but was no effect for FASD. Furthermore, decreased glutamine/glutamate hippocampal concentrations in FASD ($p < .05$) indicate perturbed metabolism. Left and right caudate volumes were also reduced in FASD ($p < .05$). Hippocampal volume and metabolite levels correlated with a unique set of memory tasks and caudate volume with a unique set of executive functioning tasks in FASD relative to controls.

Conclusions: Although we did not find evidence of abnormal hippocampal volume, differences from controls were observed in maturational trajectory, metabolic composition, and structure-function correlations. Caudate volume was reduced in FASD and structure-function relations were similarly atypical. These findings suggest brain damage caused by prenatal alcohol exposure continues to impact cognitive function into adolescence.

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M. SINDEN, N. BOGOD, C. HONEY & F. CASTRO. Cognitive Effects of Thalamic DBS in Essential Tremor.

Objective: Evaluate neuropsychological functioning, mood, and health-related quality of life (QoL) in patients with treatment resistant essential tremor (ET).

Participants and Methods: 16 ET patients with treatment resistant tremor were assessed using the Profile of Mood States (POMS), SF-36, and a comprehensive neuropsychological battery including measures of verbal, visual and working memory, attention, language, visuospatial, and executive functioning. Patients were assessed within 1 week prior to surgical intervention and 2 months post-operatively. 5 patients received bilateral thalamic DBS, 7 Patients received left hemisphere thalamic DBS, and 4 patients received right hemisphere thalamic DBS. Paired sample T-tests were used to compare pre- and post-operative scores.

Results: No significant changes in mood or QoL were found. A significant decline ($p = .005$) was found in RAVLT delayed recall. No significant changes were observed on any other neuropsychological measures.

When the sample was divided by hemisphere of surgery only the bilateral group showed a significant decrease ($p=.003$) on RAVLT delayed recall. The left hemisphere surgical group showed a trend towards decreased delayed recall, while the right hemisphere group showed no significant difference.

Conclusions: Preliminary investigations in this modest sample suggest that thalamic DBS for ET is a relatively safe procedure without obvious side-effects in terms of declines in mood, health-related quality of life, or overall neuropsychological functioning. The risk of impairment in verbal delayed recall appears to be highest with bilateral thalamic DBS, with possible risk associated with left thalamic DBS, and no change associated with right thalamic DBS. Our research group is investigating DBS treatment for ET further with blind evaluation of mood, QoL and neuropsychological functioning pre- and post-surgically in patients receiving either standard thalamic DBS or zona incerta DBS (a proposed new target in essential tremor).

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K. STEINHAEUER. The Neuro-Cognitive Dynamics of Late Second Language Acquisition: Evidence from Event-Related Brain Potentials (ERPs).

Objective: Unlike learning in most other cognitive domains, adult learners of second languages (L2) have more difficulties than younger learners, and most never reach native-like language attainment (Johnson & Newport, 1989). Both linguists and neuroscientists seek to determine whether the differences between children and adult L2 learners exist because the brain is subject to maturational constraints in the form of 'critical' periods for language learning (Birdsong, 1999; Doughty & Long, 2003). Here, we present data from our ERP studies testing if proficiency rather than age of acquisition predicts the brain activity reflecting real-time language processing in late L2 learners.

Participants and Methods: EEG was recorded from a total sample of more than 150 late second language learners with various language backgrounds (English, French, Chinese) and different levels of L2 proficiency while they read or listened to sentences in their respective second language (English, Spanish, or a well controlled artificial language). Half of the target sentences contained linguistic violations. ERPs were computed for critical target words and compared to those of native speakers.

Results: Low proficiency L2 learners generally displayed patterns of brain activity distinct from native speakers. In contrast, high proficiency learners, despite their late onset in L2 acquisition, showed the neural activity typical for native speakers, including early ERP components taken to reflect automatic language processing (LANs). The finding held across language background and target language.

Conclusions: Contra strict maturational constraints, these data suggest that even late language learners are, in principle, able to involve the same brain mechanisms on which native speakers rely.

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Y. TANAKA, M.L. ALBERT, M. MIYAZAKI, K. FUJITA & S. YAMAMOTO. Effects of GABA-ergic Therapy on Cognition in Vascular Dementia.

Objective: In a prior, preliminary study, we demonstrated that GABA-ergic therapy improved manipulospatial function in mild to moderate vascular dementia. In the present, follow-up study, we wished to challenge that conclusion by evaluating the effects of GABA-ergic therapy on other cognitive functions in vascular dementia.

Participants and Methods: Fourteen subjects from the prior study who exhibited abnormalities on the clock-drawing test and who demonstrated improved manipulospatial skills following treatment with a GABA-ergic agent were selected for the current study (7 male, 7 female; 65-82 years old, mean age 76). Each participant carried the diagnosis of mild-moderate vascular dementia.

The current study was open label. We administered the GABA-transaminase inhibitor sodium valproate, 200 to 300 mg/day, for one month and compared pre- and post-treatment performances on the following tests, selected to evaluate different aspects of cognition: 1) the draw-a-clock test (to confirm prior test results); 2) word list generation (FAS, Animals); 3) verbal recall (5 words after 5 minutes), 4) a test of visual disambiguation (ten superimposed images of objects), and 5) a test of prosopagnosia.

Results: All participants demonstrated statistically significant improvement on the clock-drawing test (as they had in the previous study). No statistically significant improvement was found on any of the other cognitive tests.

Conclusions: GABA-ergic therapy seems to improve manipulospatial behavior selectively in vascular dementia.

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P.A. TAYLOR-COOKE, J.G. CHACKO, K.C. CHELETTE & M.S. MENNEMEIER. Image Fading Altered by rTMS Targeted to Parietal Cortex.

Objective: Images in peripheral vision fade from awareness during sustained fixation (Troloxer fading: TF). We hypothesized that TF is regulated by the interplay of signals arising from magnocellular (MC) and parvocellular processing (PC) pathways. In this study, low frequency, repetitive Transcranial Magnetic Stimulation (rTMS) was used to inhibit cortical function at sites implicated in PC and MC processing to learn their effects on TF.

Participants and Methods: Nine healthy subjects aged 22 to 27 participated. TF times were assessed for 8 points in peripheral vision before and after rTMS targeted to sites in the posterior temporal (PC), posterior/superior parietal (MC) and dorsolateral frontal convexity of both hemispheres. PC (texture detection) and MC (motion detection) function was similarly assessed. Analyses used residualized scores and contrasts to assess change from baseline by rTMS location.

Results: TF times were slower following left parietal rTMS and faster following right parietal rTMS, $t(1)=3.78, p=.05$. PC processing was slower in upper than lower visual quadrants following right frontal rTMS, $t(1)=5.16, p<.05$. PC processing was slower in the upper quadrants [$t(1)=4.16, p<.05$] and slower contralateral [$t(1)=3.56, p=.06$] to left temporal rTMS. MC processing was faster contralateral to rTMS and slower ipsilateral to rTMS after right frontal stimulation, $t(1)=4.10, p<.05$.

Conclusions: Whereas stimulation of the parietal cortex, in both hemispheres, altered TF; stimulation of the right frontal and left temporal cortex altered PC and MC performance. Inhibiting the right parietal cortex resulted in faster fading (less resistance) - consistent with lesion studies and with the presumed dominance of the right hemisphere for attentional processing. PC and MC processing were not dissociable by the location of rTMS, which is consistent with the view that PC and MC are not functionally segregated systems. While TF is supported by PC and MC processes, it is the disruption of attentional systems that has a greater impact on TF.

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E.J. WALDRON & A.E. HERNANDEZ. The Impact of Second Language Age of Acquisition and Proficiency on Left Hemisphere Broca's Area and Supramarginal Gyrus: An fMRI Study.

Objective: Previous research has implicated the importance of left hemisphere (LH) BA 44/45 in tasks of syntax, modulations of second language (L2) proficiency, and age of acquisition (AOA) (Weber-Fox & Neville, 1996; Tatsuno & Sakai, 2005). Similarly, LH supramarginal gyrus activity can also be modulated by proficiency (Wartenburger et al., 2003). The question, however, remains as to the exact role of these two structures in syntactic tasks. Using fMRI, we address these questions using a past tense generation task.

Participants and Methods: N= 32. Fourteen monolinguals, 11 early bilinguals, and 7 late bilinguals completed language proficiency assessment, and were scanned while 80 regular and 80 irregular present tense verbs were presented visually. Participants were instructed to covertly produce the past tense form of the verbs.

Results: Regression analyses reveal activity in LH inferior parietal regions. Region of interest analyses of LH BA 44/45 reveal increased activity for stimuli in native and early AOA participants, though late bilinguals display lesser BA 44/45 activity. Cross group comparisons reveal LH IFG and inferior parietal activations, while the reverse contrasts show activations in LH posterior MTG and RH MFG.

Conclusions: Consistent with the literature base, our analyses revealed decreased activity of LH BA 44/45 for increased proficiency and earlier AOA in analyses of native speakers and early bilinguals. Late bilinguals, however, display reduced BA 44/45 activity and seemingly rely on non-syntactic brain regions. That the supramarginal gyrus is more active for earlier learners may be due to these individuals relying more on phonological processing strategies to perform this task.

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C. WESTON, M.M. MANDE, T.A. BARBOUR, R.R. MELVIN & L.L. SYMONDS. Effect of a Brief Meditation Intervention on Pain Perception.

Objective: Determine if meditation compared to distraction and baseline control tasks significantly increases tolerance of experimental pain.

Participants and Methods: Participants were 13 healthy women, ages 18 to 25. Study design included two sessions, seven days apart. During session #1, the cold pressor task was used to assess baseline pain tolerance. Participants then learned a meditation routine, and received a meditation CD and journal. After meditating daily for one week, they returned and were administered three separate cold pressor trials. The first trial was a baseline with no intervention. During the next two trials, subjects either performed a distraction task (listening to a nonfiction story), or meditated while listening to the meditation CD. Order of these two trials was counterbalanced.

Results: Repeated-measures ANOVA comparing mean tolerance times across baseline #1, baseline #2, distraction, and meditation conditions revealed a main effect ($p = .002$). Within-subjects contrasts revealed that tolerance time was significantly increased for meditation compared to both of the baseline measurements. ($p = 0.011$, $p = 0.016$, Bonferroni corrected) and was somewhat increased compared to the distraction task. (trend: $p = 0.077$) Finally, mean tolerance time was somewhat greater for the distraction task than both baseline measurements. (trend: $p = 0.069$, $p = 0.051$)

Conclusions: An easily learned and implemented meditation routine increased tolerance to pain. This increase is not likely due to distraction, since the results suggest that meditation may be more effective, even, than a distraction task designed to be as similar as possible to the meditation routine.

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E.L. WODKA, D. SIMMONDS, E.M. MAHONE & S.H. MOSTOF-SKY. Evidence That Inter-Stimulus Jitter Facilitates Performance on Computerized Go/No-Go Tasks.

Objective: Inter-stimulus jitter (ISJ) is the randomization of the interval between successive stimulus events in a task. While ISJ is often necessary in event-related fMRI, it is unclear how ISJ affects performance. We examined effect of ISJ on performance (reaction time, variability, errors) on four go/no-go tasks differing in ISJ around a standard inter-stimulus interval (ISI; 1000 ms).

Participants and Methods: Participants included 22 healthy adults (Mage = 27.4, SD = 6.3, range 18-40). Four go/no-go tasks incorporated an overlearned stimulus-response association (green = go, red = no-go), so that cognitive demands extraneous to response selection/inhibition were minimized. Each task was presented in two 3-minute blocks of 300 trials (80% "go" and 20% "no-go"). The tasks were the same except for ISJ: The 0% jitter had a fixed (1000ms) ISI, the 10% jitter range was 900-1100ms, the 30% jitter range was 700-1300ms, and the 50% jitter range was 500-1500 ms.

Results: Repeated measures MANOVA revealed a main effect for ISJ on reaction time $F(2,20) = 11.7$, $p < .01$ (0% ISJ trial slower than 50% ISJ trial), and a significant block by ISJ interaction for reaction time variability $F(2,20) = 5.5$, $p < .02$, such that as ISJ increased, block 2 variability decreased.

Conclusions: In healthy adults, increased ISJ appears to facilitate performance on computerized go/no-go tasks (i.e., faster reaction times, less variability, less fall-off of performance over time). Future research should examine the impact of ISJ on performance in clinical populations; this may have therapeutic implications, guiding optimal presentation of information during school and other relevant tasks.

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Imaging: Functional

M.D. ALLEN, A.K. FONG-ICHIMURA & T.E. OWENS. fMRI Adaptations of Standardized Neuropsychological Assessments: A Case Study in Persistent Post Concussive Syndrome.

Objective: In this study, we demonstrate the use of functional MRI (fMRI) as a powerful assessment tool in clinical neuropsychology by comparing imaging and cognitive performance data from a single subject with persistent post-concussive syndrome (PPCS) to normative fMRI data from 26 neurologically unimpaired subjects. We then use this data to address current controversies about the physiological basis of PPCS.

Participants and Methods: fMRI data were obtained by means of specialized scanning protocols, modelled after six of the most commonly used neuropsychological tests in contemporary assessment batteries, designed to optimize the similarity of cognitive tasks performed within the physical and temporal limitations of the scanning environment to those performed on conventional "paper and pencil" tests. These tests include Raven's Progressive Matrices, Trails B, Facial Recognition Task (Wechsler Memory Scales-III), Verbal Fluency, Verbal Memory (Rey Auditory Verbal Learning Task), and the Boston Naming Test.

Results: Our analyses reveal striking correspondences between the selective cognitive deficits present in this patient on cognitive performance tests, restricted primarily to verbal memory performance, and the equally selective patterns of deviation present in his fMRI data, which reveal activation deficits exclusively in left hemisphere language areas.

Conclusions: Much of the controversy surrounding PPCS derives from the fact that patients often show marked cognitive deficits in the absence of obvious structural brain injury. Although this patient suffered only mild brain injury, his fMRI pattern provides compelling physiological

evidence for a significant disruption to his verbal memory system, which is mirrored by his poor performance on conventional assessment tests. These data not only demonstrate the usefulness of fMRI in addressing theoretical issues surrounding PPCS, they also validate fMRI as a viable tool in clinical settings, for use at the single-subject level.

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M.M. BERL, J. MAYO, B. YERYS, L. ROSENBERGER, L. YARGER & W.D. GAILLARD. The Role of Middle Frontal Gyrus in Verbal Working Memory.

Objective: Language processing involves core language skills and non-linguistic aspects. Functional imaging may be one method of parceling out which factors contribute to impairments in processing. This is a pilot fMRI study of a novel verbal working memory task to determine the functional signature of working memory in a language task. Hypothesis: Middle frontal gyrus (MFG) activation will vary with working memory demands and be correlated with neuropsychological measures.

Participants and Methods: 14 healthy volunteers (Mean age 10; 9F) underwent neuropsychological testing of intellectual and working memory skills. Functional imaging was conducted using whole brain 3T fMRI (EPI BOLD) employing a box car design. 3 conditions were contrasted: Reverse Speech (baseline), Auditory Category, and Auditory Category Nback. Imaging data was analyzed with SPM2 to determine the functional network and Marsbar using a region of interest to calculate percent signal change in MFG.

Results: 8 working memory variables were transformed to z scores and averaged for a working memory composite. Verbal IQ was strong (Mean SS=112) with comparable working memory abilities (Mean z=.43). Single sample t-tests for each contrast revealed activation of a complex, bilateral network of inferior frontal, middle frontal, superior frontal, cingulate and parietal areas. In particular, left MFG was activated in the tightest contrast that was hypothesized to isolate working memory processes (Exp 2-Exp1). Analyses revealed that greater signal change in left MFG was correlated with stronger working memory skills ($p < .01$).

Conclusions: This novel working memory task contains comparisons that highlight the functional correlates of working memory contributions. Having methods that potentially reveal the different functional contributions within a complex cognitive task may have clinical implications. For example, in planning language interventions, knowing one's functional signature may be important in determining what intervention may be the most effective.

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L. BLONDER, J. SLEVIN, C. SMITH, F. SCHMITT, R. KRYSIO, M. LINEBERRY, C. MARTIN & A. ANDERSEN. Amygdala Activation to Emotional Faces in Unmedicated Parkinson Patients: Preliminary Findings.

Objective: The aim of this ongoing study was to compare brain activation to emotional facial expressions in patients with Parkinson's disease (PD) on versus off anti-Parkinson medication.

Participants and Methods: Participants were five right-handed, non-demented mild to moderate PD patients and five right-handed controls. Using fMRI, patients and controls were shown photographs of happy, angry, sad, and neutral facial expressions. Each participant had two fMRI sessions about 17 days apart. During one scan, the patient was taking anti-Parkinson medication and during the other, medication was discontinued the previous night. Controls simply repeated the scans. The order of scans relative to medication state was randomized.

Results: Off medications, PD patients showed greater activation to emotional faces in the amygdala and middle frontal gyrus bilaterally than

they showed on medication. In both medication conditions, little activation was present in these regions in response to neutral expressions. Furthermore, PD patients off medication had greater activation in the amygdala and middle frontal gyrus than controls, who showed a pattern similar to the patients on medication. Lastly, PD patients off medication showed less de-activation in the parietal lobes than they did while on medication. There were no statistically significant differences between on and off states on the Geriatric Depression Scale or the Benton Face Recognition Test.

Conclusions: These preliminary results suggest that unmedicated PD patients may have disinhibited response to emotional faces, particularly in the amygdala. Dopaminergic agents may restore normal amygdala and middle frontal gyrus response to emotional faces via inhibition of connected regions.

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C. ELFGREN, M. JOHANSSON, J. OLSRUD, U. PASSANT & D. VAN WESTEN. The Role of the Medial Temporal Lobe in the Acquisition of Semantic Memory.

Objective: The neural basis of semantic memory is still unclear, specifically concerning the importance of different regions in the medial temporal lobe (MTL). Our objective was to identify neural correlates of semantic memory acquisition in the MTL.

Participants and Methods: We studied 15 healthy subjects (mean 29 yrs) with event-related fMRI. Subjects viewed 48 unusual Swedish words (not previously experienced) together with the name and picture of one of four different persons who explained the meaning of the word. The subjects' task was to classify the word into one of four categories (animal, clothes, food or word for music). After 10 minutes the subjects were re-exposed to the 48 words (one at a time) and were asked two questions supposed to denote episodic (EM) and semantic memory (SM): 1) "Which of the 4 persons told the meaning of the word" (EM) and 2) "Which of the 4 categories did the word belong to" (SM). We compared encoding activity for subsequently remembered versus forgotten trials.

Results: Statistical parametric maps (SPM2) were calculated for the contrast hit vs miss of the SM trials. Random effects analysis was performed for the whole brain ($p < 0.001$, uncorrected) and for an anatomically defined region of interest comprising the medial temporal lobe including the hippocampus, parahippocampal gyrus and amygdala ($p < 0.05$). Successful semantic encoding (hit>miss) activated a left sided frontotemporal network with a peak (large cluster) in the left parahippocampal gyrus, Brodmann area 36 [-30, -22, -22].

Conclusions: The findings suggest that successful encoding of semantic knowledge is associated with parahippocampal activity. This is consistent with findings in amnesia patients who in spite of hippocampal damage early in life, were able to form semantic memories (Vargha-Khadem et al. 1997). Thus perirhinal and entorhinal cortices may be largely sufficient to support the formation of semantic memory, with only the episodic memory being fully dependent on the hippocampus.

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J.A. FIELDS, S.F. LONG, A.L. HESTER, L.H. LACRITZ, C.M. CULLUM & G. ALLEN. Functional Connectivity of the Posterior Cingulate in Mild Cognitive Impairment and Alzheimer's Disease.

Objective: To investigate patterns of functional connectivity between the posterior cingulate (PC) and the rest of the brain in subjects with mild cognitive impairment (MCI) and Alzheimer's disease (AD). Pathologic and functional changes in the PC have been found early in the course of AD. Thus, it was hypothesized that a reduction in PC connectivity would be seen in our MCI and AD groups.

Participants and Methods: Subjects with MCI or AD and normal controls (NC) were studied (N=5 per group). Groups did not differ significantly in terms of age, education, or sex. AD and NC groups differed significantly on the MMSE ($p = .02$). Patterns of coherence in the magnetic resonance signal between the PC and all other brain regions were examined. Connectivity results from the 5 subjects within each group were examined and within-group t-test analyses were conducted to produce group connectivity maps.

Results: NC subjects showed functional connectivity between the PC and prefrontal, subcallosal, insular, superior temporal, parahippocampal, thalamic, and anterior cingulate regions. MCI subjects demonstrated PC connectivity with prefrontal, parietal, thalamic, striatal, and cerebellar regions. In AD subjects, only striatal regions showed connectivity with the PC.

Conclusions: These results illustrate altered PC connectivity in MCI and striking reductions in PC connectivity in AD, supporting our hypotheses. Such findings are consistent with prior studies showing pathologic changes in the PC, which precede the memory deficits in AD. Exploration of the relationship between disconnection of the PC and neuropsychological functioning in MCI and AD is warranted.

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J.G. FINE, M. SEMRUD-CLIKEMAN, D. ZHU & J. BLEDSOE. Greater Differential Activation to Emotions in Video Vignettes vs. Photos.

Objective: Studies of how we process human emotions have largely utilized photographs of human faces. A more naturalistic presentation would be video vignettes of emotional social interaction, which capture the dynamic nature of our daily experiences. This study presented both photographs of happy and sad faces as well as happy and sad video vignettes. Comparison of BOLD activation between happy and sad emotions in each condition are the focus of the study, with the hope of better understanding the neural correlates of social perception.

Participants and Methods: Participants: 20 healthy right-handed undergraduates (10 males), age range 19-26 yrs. No group differences on WASI FSIQ. All brain scans were read as normal.

Methods: Echo planar and structural images were obtained on a GE Excite 3T short bore scanner. Activation above fixation was calculated based on $p \leq .001$ with minimum 4 voxels per cluster. Participants were exposed to four runs including blocks (17.5s) of 3 happy and 3 sad sets of human facial photos, 3 happy and 3 sad videos, and fixation blocks (15s).

Results: Both the photo and video presentations elicited differences in the happy and sad conditions. For photographs, increased activation appeared in the right dorsolateral frontal area to the sad condition relative to happy. For video sad, increased activation occurred in the medial-frontal regions and increased dorsolateral activation for happy video.

Conclusions: There may be differences in the valence of positive and negative emotions structurally with 'hot' (negative) emotions being more frontal/limbic and 'cold' (positive) being more dorsolateral/cognitive.

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J.G. FINE, M. SEMRUD-CLIKEMAN, D. ZHU, J.A. OGG & J. BLEDSOE. Gender Differences in Activation to Happy and Sad Video Vignettes.

Objective: To better understand the neural correlates of social perception in men and women, we presented happy and sad video vignettes of

human social interaction to healthy participants in the scanner. Few studies have looked at perception of dynamic and fluid emotional stimuli, and in particular, at differences between genders. We hypothesized that there would be sexually dimorphic patterns of activation in amygdala, fusiform gyrus, inferior frontal gyrus, and temporal lobe.

Participants and Methods: Participants: 20 healthy right-handed undergraduates (10 males), age range 19-26 yrs. No group differences on WASI FSIQ. All brain scans were read as normal. All were strongly right-handed.

Methods: Echo planar and structural images were obtained on a GE Excite 3T short bore scanner. Activation above fixation was calculated based on $p \leq .005$ with minimum 7 voxels per cluster. Participants were exposed to four runs including blocks (17.5s) of 3 happy and 3 sad sets of video vignettes, and fixation blocks (15s).

Results: Males showed significantly stronger activation compared to females in the inferior frontal gyrus and middle temporal gyrus for both emotions. Males had significantly more activation than females for happy videos in the fusiform gyrus and superior temporal gyrus. Females showed stronger activation than males in the superior temporal gyrus, but to sad videos only. No gender differences were found for the amygdala. With the exception of the middle temporal gyrus, all findings were in the right hemisphere.

Conclusions: These findings are intriguing and warrant further investigation as to the underlying theoretical foundations.

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I. GALÁN. Neuropsychology and laterality of language evaluation in temporal epilepsy patients.

Objective: Show the value of neuropsychology examination in patients with temporal epilepsy and study the relationship between dichotic test and studies of functional magnetic resonance images (fMRI) to know their utility in language laterality evaluation.

Participants and Methods: Eight patients with temporal epilepsy participate in this study, we assess their general cognitive status with PIEN (integrated program of neuropsychological exploration), we applied a dichotic test and IRMF task and get a lateralization index.

Results: The results showed a neuropsychological profile characterized by a slow performance in the test, problems on lexical access, verbal and visual memory deficit, and fails related to executive function. Also found strong association between the lateralization index of both test.

Conclusions: This work emphasizes the role of neuropsychologic evaluation in patients with temporal epilepsy describing the usual deficit in these patients. Also showed the relevance and valid use of dichotic test and IMRF task in language lateralization assessment.

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E. GREEN, A. JACOBSON, L. HAASE & C. MURPHY. Relationships Between Body Fat and Central Taste Processing Differ for Young and Elderly Adults.

Objective: In many cases, waist circumference is a better measure of body fat than BMI. A high waist circumference with a high BMI is associated with increased risk for developing type II diabetes, hypertension and cardiovascular disease. Recent research suggests relationships between metabolic disease and development of cognitive impairment. The objective of this analysis was to investigate associations between brain activation during central taste processing and waist circumference in young and elderly adults.

Participants and Methods: Participants fasted for 12 hours prior to entering the scanner where they were given .3ml of a sucrose solution 16 times. T2*-weighted echo planar images were acquired using an event-related paradigm on a 3T GE scanner. A region of interest analysis was conducted and resulting fit coefficients were correlated with waist circumference for the young adults and elderly separately.

Results: A significant negative correlation was found in the young adults for waist circumference and brain activity in the right hippocampus, amygdala, and bilaterally in BA 47 and parahippocampal gyri. The elderly had significant negative correlations between waist circumference and brain activity in the right hippocampus, anterior cingulate, insula, hypothalamus, and nucleus accumbens.

Conclusions: Age-associated differences in relationships between body fat indices and fMRI activation to sucrose in reward brain regions, (e.g. BA 47, hypothalamus and nucleus accumbens) suggest a cortical substrate that may reflect differences in energy intake. Investigating differences in brain activity in regions involved in taste processing and reward may assist in understanding energy intake in individuals of all ages with differing levels of body fat.

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W.R. HARRELL, P.F. ICARD, J. BIZZELL, R. KITSON, A. BELGER, S.R. HOOPER & D.S. GIPSON. Functional MRI and Working Memory in Children with Chronic Kidney Disease.

Objective: Previous investigations of neurocognitive function in pediatric patients with chronic kidney disease (CKD) have suggested that these patients are more than usually likely to show deficits in memory and executive function. This study examines visual working memory performance and activation of relevant brain regions in CKD patients.

Participants and Methods: Three male participants with CKD (GFR < 90 > 15 ml/min/1.73m² for > 3 months; mean age 14 years) were compared with 3 male controls (mean age 16 years). Structural images were acquired using full brain MP RAGE (1 mm³ isotropic voxels). During the working memory task, functional images were acquired using gradient-echo MPI (2+ oblique slices; TE: 30 ms; TR: 1500 ms; flip angle 80). The task entailed determining whether a visual stimulus matched any of 4 visual stimuli presented 17 seconds previously.

Results: Activation in the parietal lobe and prefrontal regions was lower in CKD patients, and CKD patients displayed less change in activation from baseline when the task began. CKD patients also responded less accurately to the memory task (40% correct, vs. 56% for controls, in "matching" conditions; 49% correct, vs. 73% for controls, in "non-matching" conditions).

Conclusions: Based on these preliminary data, pediatric CKD patients appear more likely to experience difficulties with visual working memory, and these performance differences appear to correlate with reduced activity in expected brain areas. A larger sample size will be needed to confirm these results and explore possible moderators and mediators, such as CKD severity.

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S. HUANG, S. TSANG, S. SUNG, P. CHEN, N.M. TROST, W.I. TSENG & S.A. CHEN. Middle Age Effects on Hippocampal Activations in a Memory Encoding Task: a fMRI Study.

Objective: Neural correlates of memory decline in the elderly have been widely reported. However, hippocampal changes in middle age have not been systematically studied. The current study examined gradual age effects on hippocampal activations.

Participants and Methods: Healthy young (mean age = 27 years, SD = 4.6) and middle-aged (mean age = 45 years, SD = 5.6) participants were imaged in a 3 Tesla MRI scanner while performing a scene and pattern judgment task. Four regions of interest (ROIs) of the hippocampus (left-anterior, left-posterior, right-anterior, right-posterior) were traced on a normalized T1-weighted image. Number of activated voxels within each ROI were obtained from contrast t-maps of novelty and relational processing for each subject. Group by hippocampal ROIs differences in terms of activated voxels were examined with a two-way ANOVA for each contrast.

Results: There were no significant differences in task accuracy and reaction time between the two groups, but poorer post-scan recognition of presented stimuli for the middle-aged group. Compared to the young adults, an increased number of activated voxels in the right anterior hippocampus with a decrease in activation for the left posterior hippocampus were found during novelty processing for the middle-aged. Greater anterior than posterior hippocampal activation was found for relational processing in both groups.

Conclusions: Our results for the young adults replicated previous reports indicating the anterior hippocampus to be involved in relational processing, and the posterior hippocampus in contextual encoding. ROI analyses suggested that while relational processing appears intact, subtle decline in contextual encoding may have begun with a shift in activation patterns in the hippocampus at middle age.

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T. IKUTA, L.L. MURRAY & S.D. NEWMAN. Dopaminergic System in Grammar and Linguistic Comprehension: fMRI Study of Parkinson's Disease.

Objective: The goal of this study was to investigate the relation of dopamine to grammatical processing and working memory during sentence comprehension. To examine the effect of dopaminergic medication, PD patients completed a grammatical judgment task during fMRI imaging once on and once off their dopaminergic medication. Age- and education-matched control participants also completed the experimental tasks and scanning to evaluate the effects of PD itself.

Participants and Methods: During fMRI scanning, participants read sentences (25 sentences/type for a total of 100 sentences) and for each sentence, indicated via a key-press whether the sentence was grammatical or ungrammatical. Sentences were presented using a whole sentence presentation paradigm (6 s/sentence, Event-Related design).

The stimuli included the following sentence types: i) Working Memory: varying the length/distance between who and its associate position; ii) Grammaticality: presenting both grammatical and ungrammatical sentences; and iii) Two Types of Ungrammaticality: presenting two types of ungrammatical sentences that varied in the cause of ungrammaticality (anaphor vs. wh binding).

Results: Preliminary results from younger participants revealed an effect of distance in working memory regions (e.g., left inferior frontal gyrus, inferior parietal lobe, right frontal lobe). An effect of two types of ungrammaticality was found in several regions including Broca's area and the inferior parietal lobe. Sentences containing ungrammatical wh-links elicited greater activation in the left inferior frontal gyrus, left parietal lobe, and superior temporal lobe than sentences with ungrammatical anaphor links.

Conclusions: These preliminary results suggest that the left inferior frontal gyrus, in particular Broca's area, plays a central role in syntactic processing. Furthermore, the basal ganglia showed differential activation by both syntactic processing and working memory.

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F. IRANI, L.H. SWEET, A.P. HALEY, R.C. MULLIGAN, J.J. GUNSTAD, A. POPPAS, B.A. JERSKY, P. NYALAKANT & R.A. COHEN. An fMRI Study of Verbal Working Memory, Cardiac Output and Ejection Fraction in Elderly Patients with Cardiovascular Disease.

Objective: Cardiovascular disease (CVD) is associated with cognitive decline even without stroke. A hypothesized mechanism contributing to brain dysfunction in CVD is systemic hypoperfusion. We examined the relationship between systemic perfusion and brain activity during a verbal working memory (VWM) task in CVD patients.

Participants and Methods: Seventeen CVD patients (age 67+7) completed a 2-back VWM task during fMRI. Cardiac output (CO) and ejection fraction (EF) were calculated from echocardiogram. Task-related activation was averaged in empirically-defined and a priori regions of interest (ROIs). Relationship between CO, EF and 2-back-related activity were modeled using partial correlations (two-tailed $p < .05$) controlling for age.

Results: Mean accuracy was 78+9% while reaction time averaged 1027+192 ms. In empirically-defined ROIs, there was a positive relationship between right middle frontal gyrus (MFG) activity and CO. A priori ROI analysis revealed that less left insula activity was related to less EF and CO and slower performance. Supplementary motor area (SMA) activity was unrelated to performance, but associated with greater CO. This was significant on the right and a trend ($p < .10$) on the left.

Conclusions: Task-related activity and performance were consistent with previous literature. Systemic hypoperfusion was related to less activity in the right MFG, left insula, and bilateral SMA. MFG and SMA have been associated with executive function, which may be disproportionately influenced by hypoperfusion and not necessarily performance. Insular activity appears related to perfusion and processing speed. This region has been related to integration of autonomic functions and may be involved in the cardiovascular response to mental stress.

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L.M. JACOLA, M.B. SCHAPIRO, B.J. PATTERSON, F.J. HICKEY, M. CHALFONTE-EVANS, V.J. SCHMITHORST, A.W. BYARS, S.L. HOTZE, J. VANNEST & S.K. HOLLAND. fMRI Reveals the Neural Basis of Semantic Processing in Persons with Down Syndrome.

Objective: Persons with Down syndrome (DS) exhibit disproportionate language deficits relative to their overall level of cognition. The neural basis for this is unclear. We used fMRI to investigate semantic processing in persons with DS compared to typically developing controls (TD) using an object decision task involving semantic processing, object recognition, and decision making. This task was chosen to ensure adequate performance from all participants.

Participants and Methods: During fMRI scanning, participants pressed a button to indicate whether a visually presented animal lived on a farm. In the control task, participants pressed a button when presented with a scrambled image. Ten healthy persons with trisomy 21 DS (M 7; F 3) and 13 TD (M 6; F 6) completed fMRI scanning. Ages ranged from 12-25 years.

Results: Persons with DS performed the tasks above chance levels. **TD group:** Bilateral activation was seen in the occipitotemporal and fusiform regions, posterior cingulate gyrus, and inferior parietal lobe. Left-sided activation was seen in the superior, middle, and inferior frontal gyrus and superior parietal lobe. **DS group:** Left-sided activation was seen in the middle frontal gyrus and inferior parietal lobe. A between groups comparison revealed stronger activation in occipitotemporal regions in the TD group.

Conclusions: Areas of activation in the TD group correspond closely with previous reports for similar tasks. In contrast, our results suggest that persons with DS may not be engaging the same brain regions to the same degree as TD persons. Persons with DS may rely more on anterior brain regions when performing tasks involving semantic processing, object recognition and decision making.

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H. KOBAYASHI, M. MIMURA, K. SEKI, T. YOKOI, Y. HAYAKAWA, A.J. ISOMURA & M. URANO. Effects of subject-performed tasks in memory of action events: A fMRI study.

Objective: The subject-performed task (SPT), in which an individual actually performs presented actions while learning, is known to be associated with better recall as compared to verbal learning of action sentences. Such superiority of SPT or enactment effect is believed to result from multi-modal encoding process; however, its mechanism still remains unclear. In this study, to examine the neural basis of the SPT effect, brain activation during recognition phase of the task was evaluated by using functional magnetic resonance imaging (fMRI).

Participants and Methods: Seven right-handed healthy individuals participated in the study. The participants learned action sentences under three learning conditions; i.e., verbal tasks (VT), experimenter-performed tasks (EPT), and SPT. In VT, the participants orally read and learned the sentences. In SPT, the participants performed each action with an object. In EPT, the participants viewed a videotape in which the experimenter performed each action. The 1.5 T GE SIGNA MRI was used and EPI BOLD images were obtained during recognition phase.

Results: Left frontal activation including the operculum was observed while the participants were recognizing the verbally learned materials. In contrast, bilateral parietal activation including the supramarginal gyrus was obtained during the recognition phase of materials learned under SPT.

Conclusions: Results supported the findings by Russ et al., 2003 and such specific activation pattern for enactment may suggest complex multi-modal associative processing of SPT. The left frontal activation including the operculum observed in VT-related recognition suggests that these regions are associated with language processing of naming actions.

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E. KOZORA, D. ARCINIEGAS, M. BROWN, C.M. FILLEY, D. MILLER, A. GRIMM, M.D. DEVORE, C. WINGROVE, L. ZHANG & S. WEST. Visual Memory Impairment in nonNPSLE: Relationship to Right Hippocampal Glutamate and Glutamine.

Objective: This study aimed to evaluate verbal and visual memory function in relation to left and right hippocampal N-acetylaspartate (NAA), glutamate (Glu), glutamine (Gln), and myo-inositol (mI) neurometabolites in SLE patients with no prior overt neurological or psychiatric symptoms (nonNPSLE).

Participants and Methods: Subjects included 19 nonNPSLE patients with a mean age of 38.2 (SD=7.5), mean education of 14.9 years (SD=2.3), mean length of SLE diagnosis of 78.6 months (SD=43.1), and mean SLE disease activity index of 5.4 (SD=7.8). Subjects were administered learning and memory measures as part of a larger study on cognition in SLE. Left and right Glu and Gln neurometabolites were determined by MRS procedures.

Results: Using demographically corrected normative data, 26% of the nonNPSLE patients were impaired on CVLT-Learning, 31% were impaired on CVLT-Delayed Recall, 57% were impaired on Rey-Osterrieth Immediate Recall, and 58% were impaired on Rey-Osterrieth Delayed Recall. The mean verbal memory (CVLT-Learning plus Delayed Recall) was 45.2 (SD=14.9); the mean visual memory (Rey-Osterrieth Immediate Recall plus Delayed Recall) was 38.1 (SD=9.1). Lower visual memory was significantly related to lower right hippocampal Glu+Gln/Cr ratio ($r = 0.55, p = 0.02$) and showed a trend towards lowered Glu/Cr ratio ($r = 0.43, p = 0.06$). There was no relationship between left hippocampal neurometabolites and verbal memory.

Conclusions: Decreased lower visual memory and low Glu and Gln in the right hippocampal area were reported in this sample of nonNPSLE patients. Overall, visual impairment detected in these nonNPSLE patients appears to represent significant neurometabolic changes in the hippocampal area.

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A.E. LANSING, J.E. PERTHEN & R.B. BUXTON. Functional MRI as a Tool to Track Brain Physiological Changes in Response to Pharmacological and Behavioral Interventions.

Objective: We investigated caffeine as a model for studying pharmacologically induced changes in cerebral metabolic rate of oxygen (CMRO₂) and blood flow (CBF). The BOLD signal used in fMRI studies is a sensitive tool for mapping brain activation, but is quantitatively difficult to interpret. Hypercapnia-calibrated fMRI is a more powerful physiological probe, using measured BOLD and CBF responses to hypercapnia and functional, or in this case pharmacological, stimuli to estimate induced changes in CMRO₂. However, acquiring accurate BOLD responses to slow-acting medications is challenging since agent-related signal changes within the T2*-weighted time series may be obscured by scanner and physiology signal drift between pre- and post-dose scan sessions. Instead, assessment of absolute tissue/physiological properties is required. We calculated BOLD responses using the apparent transverse relaxation rates, R2*, from dual echo data to improve the stability of repeated measurements.

Participants and Methods: Ten moderate caffeine consumers were scanned pre- and post-caffeine (200mg dose), and pre- and post-placebo. Subjects were removed from the scanner for caffeine/placebo administration and subsequently re-positioned. Dual echo arterial spin labeling was used to measure the CBF and R2*-based BOLD responses to visual stimulation, caffeine/placebo and hypercapnia.

Results: The subject-wise CBF and BOLD data showed good reproducibility between the pre- and post-placebo scans, thus validating the protocol used. The pre- and post-caffeine data revealed no significant change in CMRO₂ after caffeine consumption, despite a significant CBF decrease.

Conclusions: A calibrated-fMRI methodology, using R2* to calculate BOLD responses, is a promising approach for evaluating CBF and CMRO₂ changes in response to pharmacological and behavioral interventions. Correspondence: *Amy E. Lansing, Ph.D., Psychiatry, University of California, San Diego, S950 Villa La Jolla Drive, Suite C212, La Jolla, CA 92037. E-mail: alansing@ucsd.edu*

M.R. MADORE, J. ALLENDORFER, M. LAMY, K. KARCHES, J. HALL, J. ELIASSEN, M.A. CERULLO, P.K. SHEAR & S.M. STRAKOWSKI. Dissociation of Emotional and Attentional Processing for Healthy Individuals.

Objective: An understanding of healthy brain function provides a foundation for studying impairments associated with neuropsychiatric disorders. This study examined neural function during processing of emotional and attentional stimuli. It was hypothesized that activation in attentional and emotional areas are inversely related.

Participants and Methods: Thirty-eight healthy participants between the ages of 18 and 45 were included in the study. Participants were excluded if they had Axis I diagnoses, a first-degree relatives with affective or psychotic disorders, lifetime drug or alcohol dependence, medical or neurological disorder that could influence fMRI results, history of mental retardation or an estimated IQ score <85. During an fMRI scan, participants completed a continuous performance task that re-

quired them to respond to geometric figures or emotional stimuli. 70% of stimuli were squares, 10% circles (attentional target), 10% neutral distractor pictures, and 10% emotional distractor pictures. Emotional and neutral images were taken from the International Affective Pictures Set (IAPS).

Results: Consistent with the literature, t-tests revealed that individuals displayed significant activation levels for attentional and emotional stimuli in distinct areas (bilateral superior frontal gyrus for attentional and bilateral middle frontal gyrus for emotional). A 2 x 2 (region of activation x stimulus type) ANOVA of the fMRI region of interest (ROI) results revealed a significant interaction indicating that these two sets of regions respond differentially to their complementary stimulus type and significantly less to the non-complementary.

Conclusions: These findings extend the current literature by providing quantitative evidence that activity in these regions is inversely dependent on attentional or emotional processing.

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R.K. MAHURIN & K. MARAVILLA. Brain Activation in Dual Task Performance: An fMRI Study of Attention and Effort.

Objective: Concurrent performance of two tasks requires information processing resources beyond that of either task alone. This fMRI study investigated whether increased cognitive demands of dual-task performance are associated with changes in brain activation patterns elicited by the component single tasks.

Participants and Methods: Ten healthy participants were recruited from volunteers at a local medical school (M = F, age = 29.1 years, education = 16.8 years). The two tasks were verbal working memory (digit recall forward and backwards) and repetitive finger sequencing (right and left hand). Pre-scan testing provided a performance index with which to compare single and dual-task test conditions. fMRI was performed on a 1.5T scanner, tasks were presented in boxcar design and data analyzed with FSL software.

Results: A derived efficiency index revealed a drop in performance level ($p < .05$) in dual-task versus single-task performance (right hand = 90%; left hand = 82%). Finger sequencing activated motor, premotor and supplementary motor areas of the brain. Working memory activated dorsolateral prefrontal and parietal-occipital regions. All regions showed increased spatial extent of activation during dual-task performance, with additional anterior cingulate activity that was not present during either task alone. Extent of activation significantly correlated with level of task performance and self-reported effort.

Conclusions: As predicted, the demands of dual-task performance appeared to decrease cognitive efficiency, effectively requiring greater neuronal recruitment to achieve equivalent levels of task performance. Activation of the anterior cingulate may reflect executive coordination of the single task components during dual-task performance.

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M.W. PARSONS, W. BOLING, M. LANCASTER & M. KRASZPULSKI. Correlating FMRI and Neuronavigation: Demonstration of a "Whole Hand" Area in Central Cortex.

Objective: FMRI is used for planning neurosurgical intervention, but neuronavigation software has not previously integrated FMRI. We used a combination of FMRI and neuronavigation software to examine a unique finding in the hand area of primary sensorimotor cortex, known

as the *Pli de Passage Moyen* (PPM). Previous fMRI has confirmed the consistency of the PPM as an anatomic landmark associated with hand function. However, the hand area occupies a larger region over central cortex. The aim of this study was to elucidate the function subserved by the PPM and test the hypothesis that it serves a 'whole-hand' function.

Participants and Methods: Of 28 patients undergoing neurosurgery for tumors or epilepsy, 14 had cortical stimulation performed in or around the PPM, and 12 of those (86%) experienced "whole hand" motor and/or sensory responses. fMRI of hand sensory and/or motor function was performed for 9 of these 12 individuals. fMRI analysis was conducted in AFNI and results were transferred to the BrainLab neuronavigation system to examine co-localization.

Results: fMRI activation for sensory and/or motor function was localized to the region of the contralateral PPM in all subjects. Peak of fMRI activation ranged from a mean of 4.1 to 5.0 mm from the stimulation site that produced a whole hand response, depending on the analytical method used. Two methods for determining co-localization were compared and were not significantly different from one another ($t < 1.0$; $p = ns$).

Conclusions: This study established a method for integrating fMRI data into neuronavigation software and demonstrated consistency between activation and stimulation mapping. In addition, the study demonstrated a uniquely integrative region within primary sensorimotor cortex. During intraoperative mapping, several subjects had individual digit responses, distant from the central PPM region, raising the possibility of distinct regions within M1 subserving the hand representation. The implications of this finding are discussed.

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Y. PENG, C. WU, C. LU, J. YU, W.I. TSENG & S.A. CHEN. Mapping Semantic and Phonological Processing in Chinese Left-handers using fMRI.

Objective: Word generation and rhyming tasks have been shown to reliably activate the dominant inferior frontal gyrus. In the present study, we evaluated Chinese versions of these two types of language tasks using fMRI to determine if their ability to lateralize language function is as robust in left-handers as in right-handers.

Participants and Methods: 15 right- and 15 left-handed healthy adults, matched for gender, age and education were imaged in a 3 Tesla MRI scanner while performing semantic word generation and homophone judgment. Functional images were preprocessed and normalized to standard stereotaxic space using SPM5. Bilateral region of interests (ROIs) were obtained for Broca's Area (BA44/45) and semantic processing in the frontal lobe (including BA45/46/47). Number of activated voxels extracted from each ROI was used to calculate the lateralization index (LI) for Broca's area and semantic processing within each task for each subject.

Results: All right-handers showed left hemisphere lateralization in both tasks for both Broca and semantic processing ROIs. 10 of the 15 left-handers show consistent hemispheric lateralization in both tasks and ROIs (6 left, 3 right and 1 bilateral). 3 left-handers had bilateral lateralization for both ROIs in the word generation task, but left lateralization in the homophone judgment task. 2 left-handers showed discrepant lateralization in ROIs for homophone judgment and consistent lateralization for word generation.

Conclusions: The two fMRI tasks which emphasized either semantic or phonological processes were shown to be highly reliable in defining language dominance in right-handers. Our preliminary findings suggest that different language functions such as semantic and phonological processes in native Chinese speakers, may be lateralized in different hemispheres for some left-handers. Therefore, more caution in fMRI task selection needs to be taken when mapping the eloquent cortex in left-handers.

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M. SCHALLMO, D. HSU, S. WRIGHT, M. BRINKMAN, B. MICKEY, E. YOUNG, H. AKIL, D. NOLL, J. ZUBIETA & S. LANGENECKER. Depression, Cortisol, and Age but not Stressful Events Predict fMRI Activation Responses to Words with Negative Valence.

Objective: Emotion-based stimuli are often used with psychiatric populations to emulate excessive reactivity associated with these disorders. The present study used negative and neutral words in a block design fMRI study. Multiple relevant predictors were used to best understand neural mechanisms of abnormal responses to emotional stimuli in Major Depressive Disorder (MDD). We expected that depression status, life events, cortisol, age, gender, and behavioral memory performance would predict unique areas of activation, and that some areas of activation might be related to more than one predictor.

Participants and Methods: Fifteen patients with MDD and 12 healthy controls completed an emotional word processing task inside the scanner. Upon exiting the scanner, they were asked to recall and recognize these words.

Results: Age, depression, and cortisol levels were related to performance on cognitive and memory tasks (all p s $< .05$). Preliminary results of functional analyses ($p < .0001$) indicate that 1) activation in the right superior temporal gyrus is related to depression; 2) activation in the right amygdala/uncus and left inferior frontal gyrus is related to age; and 3) there is a negative relationship between cortisol and activation in bilateral amygdala/uncus. The depressed group had significantly higher stressful life events, but stress was not a significant predictor of brain activity.

Conclusions: The present results suggest that depression, age, and cortisol appear to mediate activation affects of stressful life events on brain activation to negative word prompts. As expected, age, depression, and cortisol affected cognition, and stressful life events were also related to specific cognitive skills.

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M. SEMRUD-CLIKEMAN, J. FINE, D. ZHU & J. BLEDSOE. Right-Left Asymmetry in fMRI to Happy and Sad Photos.

Objective: Understanding social communication requires interpreting facial expressions. Social communication has been linked to successful adaptation in adults. The right hemisphere has been hypothesized to be integral to the interpretation of emotion. This study hypothesized that the right hemisphere would show more activation in specific regions of interest compared to the left in normally functioning adults when viewing emotionally-charged facial expressions.

Participants and Methods: Participants: 20 undergraduate students, ages 19 to 26 years old with equal numbers of females and males. All students were normally functioning and all brain scans were read as normal. All participants were also strongly right-handed.

Each subject participated in an MRI scan using a GE 3T Excite MR scanner. The stimuli were assembled so that they made "blocks" of 17.5 seconds each ($TR = 2.5$). Blocks with photos contained either 7 happy or 7 sad photos with a single photo duration lasting 2.5 seconds.

Results: The average BOLD percent signal change for all voxels in an ROI was computed for each subject as a function of condition and hemisphere. Significant differences were found with greater right than left activation for sad and happy photos for the amygdaloid complex ($p < .005$) and for sad photos for the thalamus ($p < .005$). No significant R-L difference was found for the caudate or the fusiform gyrus ($p > .05$).

Conclusions: These findings support the hypothesis that the right hemisphere is more active in interpretation of positive and negative emotions.

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M. SEMRUD-CLIKEMAN, J. FINE, D. ZHU, J. OGG & J. BLEDSOE. Right-Left Asymmetry in Happy and Sad Videos Using fMRI.

Objective: Most social communication occurs in a dynamic, fluid setting. The right hemisphere has been hypothesized to be integral to the interpretation of emotion. Early studies used static stimuli such as photos. This study developed vignettes of common social situations portraying happy and sad events for use in an fMRI. This study hypothesized that the right hemisphere would show more activation in specific regions of interest compared to the left in normally functioning adults.

Participants and Methods: Participants: 20 undergraduate students, ages 19 to 26 years old with equal numbers of females and males. All students were normally functioning and all brain scans were read as normal. All participants were also strongly right-handed.

Each subject participated in an MRI scan using a GE 3T Excite MR scanner. Blocks with video vignettes contained either 17.5 seconds of happy or sad videos ranging from 2 to 4 scenes per 17.5 second block. The resulting paradigm was a block design experiment including four runs of 12 blocks each.

Results: The average BOLD percent signal change for all voxels in an ROI was computed for each subject as a function of condition and hemisphere. Significant differences were found with greater right than left activation for sad and happy videos for the amygdaloid complex, the inferior frontal gyrus, thalamus, fusiform gyrus, and temporal gyri (superior, medial, and inferior) ($p < .005$).

Conclusions: These findings support the hypothesis that the right hemisphere is more active in interpretation of dynamic social information processing.

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J.L. WINWARD, A.D. SCHWEINSBURG, K. HANSON & S.F. TAPPERT. fMRI Brain Activation to Spatial Working Memory in Adolescent Marijuana and Polysubstance Users.

Objective: Functional magnetic resonance imaging (fMRI) studies have identified different brain functioning during spatial working memory (SWM) among adolescent marijuana (MJ) users compared to non-using controls. Yet it remains unclear how other drug use may contribute to these differences. Here, we compared fMRI response to SWM in adolescent MJ and polysubstance users.

Participants and Methods: Participants were 16 – 18 years old and included 19 MJ users (<5 lifetime uses of other drugs; MJ-only), 18 MJ and polysubstance users (5-37 lifetime uses of other drugs; MJ-poly), and 22 demographically similar, non-using controls. Participants performed a SWM task during fMRI acquisition after 28 days of monitored abstinence. Differences in fMRI response between MJ-only and MJ-poly were identified after controlling for gender. In regions showing a difference between user groups, follow-up analyses characterized fMRI response within MJ-only, MJ-poly, and control groups.

Results: No group differences were found in task performance. MJ-poly teens showed greater activation than MJ-only or controls in the left middle frontal gyrus, and greater response among MJ-poly was linked to less accurate performance. MJ-only teens showed greater activation than others in the right superior temporal gyrus, left middle temporal gyrus, left medial frontal gyrus, left inferior frontal gyrus, and right superior frontal gyrus, and greater response among MJ-only was related to poorer performance (p 's < .05, clusters >1646 microliters).

Conclusions: MJ-only and MJ-poly teens' brains activated differently than controls during SWM. Moreover, greater divergence from control-like response patterns was seen among poorer performers. These results could suggest unique influences of marijuana and other drug use on brain functioning in adolescents.

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J.L. WOODARD, S. DURGERIAN, Q. ZHANG, A. GANDER, K.A. NIELSON, M. SEIDENBERG, P. ANTUONO, M. FRANZAK & S.M. RAO. Functional Recruitment During Fame Discrimination in Patients with Mild Cognitive Impairment.

Objective: Cognitively intact individuals at-risk for developing Alzheimer's disease (AD) frequently show increased brain activation presumably associated with compensatory recruitment. However, increased activation is not often observed in fMRI studies of mild cognitive impairment (MCI) patients, presumably due to reduced neural reserve. However, these studies typically use episodic memory tasks, placing MCI participants at a performance disadvantage. In this event-related fMRI study, we administered a low effort, high accuracy semantic memory task to MCI patients, persons at-risk for AD, and healthy controls.

Participants and Methods: Fifty-seven participants, aged 65-85, comprised three groups (n=19 each): amnesic MCI patients; healthy participants at-risk for developing AD based on having at least one APOE $\epsilon 4$ allele and a positive family history; and healthy control participants. fMRI was conducted on a 3T MR scanner using an echo-planar pulse sequence while participants performed a fame discrimination task. Participants also underwent neuropsychological testing.

Results: Groups did not differ on demographic variables or on fame discrimination performance (>90% for all groups). MCI participants demonstrated lower episodic memory performance on neuropsychological testing. Spatial extent of activation during fame discrimination differentiated the groups (Controls=0 ml, At-Risk=8.6 ml, MCI=33.6 ml). MCI and At-Risk participants showed greater activation than Controls in 5 of 14 functionally-defined regions, including medial temporal lobe, temporoparietal junction, and posterior cingulate. MCI participants showed greater activation than Controls in two frontal regions.

Conclusions: MCI patients demonstrated functional compensation in brain regions subserving semantic memory systems while performing comparably to controls. This compensation generally equaled or exceeded that of healthy at-risk individuals.

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S. WRIGHT, M.L. BRINKMAN, E.T. AVERY, L.J. RAPPORT, L.A. BIELIAUSKAS, E.A. YOUNG, D.C. NOLL, J. ZUBIETA & S.A. LANGENECKER. Functional Activation and Behavioral Correlations in Emotion Processing by Gender.

Objective: Gender differences in emotion processing have consistently favored women. Functional activation patterns in response to emotion stimuli have also been found to differ between women and men. We examined gender differences in performance and functional activation related to processing of facial emotions. We hypothesized that 1) women would be superior in accuracy compared to men; 2) women would show more bilateral activation than would men; and 3) gender differences would be detected in midline limbic structures and basal ganglia regions.

Participants and Methods: Twenty-one healthy women and eight healthy men (M age= 32.28) performed a facial emotion perception task prior to and during fMRI. This task assesses accuracy and speed of recognition of facial expressions and animal categorizations.

Results: T-tests demonstrated that women and men made a similar number of errors outside ($p = .76$) and inside ($p = .17$) the scanner.

Women were faster in processing facial emotions outside ($p < .001$) and marginally faster inside ($p = .06$) the scanner. Preliminary results (5 males, 15 females, $ps < .0001$) suggest that activation was greater for women in left hippocampus, temporal pole, right amygdala, fusiform gyrus, superior temporal gyrus, and parieto-occipital junction. Males exhibited greater activation in left middle temporal gyrus, right fusiform gyrus, posterior cingulate, globus pallidus, bilateral superior parietal lobule and medial frontal gyrus.

Conclusions: Results support past studies finding superior performance among women for processing facial emotions, in terms of speed. Preliminary functional data suggests that women and men process emotions differently, and this may underlie behavioral differences in emotion processing between women and men.

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C. WU, Y. PENG, C. LU, S. HUANG, W.I. TSENG & S.A. CHEN. Activation of the Middle Frontal Gyrus (BA9) in Phonological Processing in Left-handed Chinese Speakers.

Objective: The middle frontal gyrus (BA9) has been noted as an important area responsible for orthography-to-phonology conversion and visuospatial analysis in Chinese reading. It has been well studied in right-handed native Chinese speakers. This study examined the role of BA9 in the phonological processing of Chinese characters with respect to handedness and language lateralization using functional magnetic resonance imaging.

Participants and Methods: 16 right- and 16 left-handed healthy adults matched for age and gender were imaged in a 3 Tesla MRI scanner while performing a homophone judgment task presented in a block design. Image processing and analyses were performed using SPM5. Regions of interests (ROIs) were traced for BA9 on a high resolution T1-weighted image. Number of voxels extracted from the ROIs were used to calculate the laterality index for each subject.

Results: For right-handed subjects, left lateralization was found in Broca's area (100%) and BA9 (81.25%). Majority of the left-handers (75%) showed consistent lateralization for both Broca's area and BA9; however, others showed opposite lateralization for these two regions.

Conclusions: The finding of BA9 activation is consistent with previous studies, suggesting that reading Chinese may recruit additional regions to convert orthography to phonology and perform visuospatial analysis due to the more complex logographic characteristics of the characters. Our findings suggest that the lateralization of activation in BA9 is more consistent with conventional language areas in right-handers, but less so in left-handers. These results may have important implications for pre-surgical planning in native Chinese speakers.

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L. YANG, M.M. MANDE & L.L. SYMONDS. Neural Substrates of Spirituality in a General Population: A Preliminary fMRI Study.

Objective: Several studies have reported the relationship of spirituality/religion to health and quality of life. However, the biological basis of this relationship is poorly understood. A few neuroimaging studies have investigated brain activity during meditation among experienced participants (Newberg et al., 2003; Aziri et al., 2005). This study examines neural activity during less profound spiritual feelings, and compares brain activation to that during happy feelings.

Participants and Methods: Five women, ages 18-45, received separate fMRI scans during which either spiritual or happy feelings were induced using our visual paradigm. After each scan, participants verbally rated their spirituality and happiness on a scale (0-10). Image analysis was performed using AFNI software.

Results: Spiritual and happy feelings were successfully enhanced during the relevant scan in all five subjects (mean ratings = 7.7 for both). During both happy and spiritual states, significant BOLD activity was observed in bilateral inferior frontal and superior temporal gyri. Activation in bilateral medial frontal gyri and posterior superior parietal lobule was only observed during spiritual feelings. Activation in subcallosal gyrus and thalamus was only seen during happy feelings.

Conclusions: Spiritual feelings in participants from the general population are accompanied by activity in regions of the frontal and parietal lobes. Medial frontal and posterior superior parietal activation is remarkably similar to results of neuroimaging studies with experienced practitioners. This is consistent with the view that the ability to experience spiritual feelings is a built-in feature of the human brain common to both profound mystical and more "everyday" spiritual/religious experiences.

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Imaging: Structural

B.A. DODDS, M. PRIOR, V. ANDERSON & M. COOK. Volumetric MRI Analysis and Developmental Dyslexia in a Paediatric Group: a critical analysis of current theoretical models of reading/spelling.

Objective: To determine whether different forms of dyslexia based on nonword reading and irregular word reading scores will be associated with 'separable' underlying neuroanatomical systems and different underlying brain structure volumes

Participants and Methods: Volumetric MRI techniques are used to explore neuroanatomical aspects of developmental dyslexia in a sample of forty-eight children aged 9-14 years. Dyslexic subgroups were determined using regular, irregular and nonword reading performances, in accordance with the dual-route model of reading, and recent genetic evidence for dissociable lexical and nonlexical reading systems. A number of regions-of-interest were identified from previous studies including the cerebellum, which has been described as one of the most consistent locations for structural differences between dyslexic and control participants; and were measured by hand. Of particular interest was the right anterior cerebellum, which has been associated with poor nonword reading; and slowed rate of word and text reading. Post-hoc voxel based morphometry comparisons were also conducted using SPM5 software to identify any volume differences in areas not examined with manual methods.

Results: Preliminary results suggest there are no measurable differences in brain volume ratio between the dyslexic subgroups; and no relationship with nonword reading score in the specified regions-of-interest. Reduced reading rate and picture naming speed, however, were associated with reduced right cerebellar volume ratios. There was some support for independence between nonword reading and naming speed deficits, however, irregular word and nonword reading score were better predictors of regular word reading, text reading accuracy, text reading rate, and spelling performance than naming speed. The VBM analyses are currently underway and these results will also be reported.

Conclusions: No evidence of separable structures related to nonword and irregular word reading

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A.J. JAK, L. DELANO-WOOD, C. WIERENGA, J. COREY-BLOOM & M. BONDI. Hippocampal Volumes and Relationship to Cognition in Clinical Subtypes of Mild Cognitive Impairment.

Objective: Mild cognitive impairment (MCI) has evolved to include multiple clinical subtypes, though the etiology and course of different subtypes, particularly non-amnesic presentations, is limited and unclear. Therefore, we examined MRI-derived hippocampal volumes in amnesic and non-amnesic MCI to better characterize brain structural correlates of different MCI subtypes.

Participants and Methods: Fifty-six nondemented participants were diagnosed based on comprehensive neuropsychological criteria as either cognitively normal (n=31), amnesic MCI (multiple or single domain; n=16), or non-amnesic MCI (multiple or single domain; n=9). Groups were comparable on age and education. Hippocampal volumes were obtained via manual outlining and were adjusted for whole brain volume.

Results: Left, but not right, hippocampal volumes were significantly different between groups. Specifically, the normal and amnesic MCI groups did not differ statistically on left hippocampal volumes, while the non-amnesic group exhibited significantly larger hippocampal volumes than both the normal and amnesic groups. Hippocampal volumes were significantly correlated with memory in the amnesic group but not in the normal or non-amnesic groups. In contrast, hippocampal volumes were significantly correlated with executive functioning in the non-amnesic group but not in the normal or amnesic groups.

Conclusions: These findings add support to the concept of multiple MCI subtypes, which appear to be associated with different neuropathological processes and correspond to differential neuropsychological domains. Results also highlight the importance of neuropsychological testing to identify early changes that distinguish between cognitively normal and MCI groups, often before structural changes are apparent on MRI.

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K.B. KORTTE, V. KANNAN & A. HILLIS. Neural Circuitry in Anosognosia for Hemiplegia.

Objective: There is limited understanding of anosognosia for hemiplegia (AHP), an impairment in self-awareness of motor impairment that typically follows right hemisphere stroke. Identification of the underlying neuropathological factors related to AHP may identify the biomarkers related to AHP.

Participants and Methods: Six participants with hemiplegia, neglect, and documented anosognosia (AHP) and six individuals with hemiplegia and neglect but without anosognosia (HP) were included in this study. No differences in age, sex, or education were revealed between groups. All participants received a diffusion and perfusion weighted MRI within the first 24 hours post onset of symptoms. AHP was examined using the Bisiach et al. (1986) anosognosia scale in which the degree of anosognosia is graded from 0 to 3. The AHP group had gradings above 2, whereas the HP group had gradings of 0.

Results: Lesions (infarcted tissue and ischemic penumbra) within the posterior cingulate and insular cortex were consistently identified within the AHP group. Within the HP group, lesions were consistently identified within the parietal cortex and internal capsule, but not consistently in the cingulate and insula.

Conclusions: These preliminary results provide identification of the biomarkers underlying AHP in individuals with right hemisphere stroke. Damage to the insular cortex and cingulate may lead to a disconnection between the emotional valence and sensory information important for reward/aversion behaviors. If an individual's ability to process the meaning (importance) of general sensory information is impaired, then the change in functioning is not meaningful and therefore, not recognized. Correspondence: Kathleen B. Kortte, Ph.D., Physical Medicine & Rehabilitation, The Johns Hopkins University, 600 N. Wolfe Street, Phipps 174, Baltimore, MD 21287. E-mail: kbecht1@jhmi.edu

T.M. LAUDATE, A. BEISER, R. AU, K. STAVITSKY, D. SEICHEPINE, Y. DU, S. SESHADRI, P.A. WOLF & C. DECARLI. Descriptive Brain Morphology in an Ethnic Minority Sample: Findings from the Omni Cohort of the Framingham Heart Study.

Objective: To compare previously reported measures of brain morphology of the Framingham Offspring cohort with the Framingham multi-ethnic Omni cohort

Participants and Methods: Quantitative structural brain MRI was performed on the Framingham Offspring (n=2170), and on Framingham's Omni cohort, which consists of three ethnic groups: African-American (n=83), Hispanic (n=80), and Asian/Pacific Islander (n=65). Quantitative measures of total brain, lobar, and white matter hyperintensity (WMH) volumes were adjusted for total cranial volume; WMH volumes were additionally log-transformed to normalize their distribution. Mean volumes were compared using ANCOVAs adjusted for age and sex; post-hoc pairwise comparisons among the four groups were made using Tukey's procedure with significance defined using a 5% level.

Results: We found significant differences ($p < 0.01$) among the groups in mean total cranial volume (TCV), total brain volume (TBV), and parietal, occipital and temporal lobar volumes. There were no significant differences among the groups in mean frontal lobar volume ($p = 0.115$) or WMH ($p = 0.09$). Post-hoc analyses revealed no consistent pattern of differences between ethnic groups for TCV, TBV and lobar volumes, but did find numerous group differences between individual ethnic groups.

Conclusions: Although results were largely similar between Caucasian, African-American, Hispanic, and Asian-Pacific Islander samples, some differences in brain lobar volumes between the groups were found. These subtle differences may have important ramifications for genetic or cultural risk or resistance to disease.

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D. MABBOTT, C. ROCKEL, M. NOSEWORTHY & E. BOUFFET. White matter injury and core cognitive processing in pediatric brain tumor patients: A Diffusion Tensor Imaging Study.

Objective: White matter injury following cranial radiation for pediatric brain tumors is associated with poor intellectual outcome. Intelligence measures reflect multiple core cognitive processes, however. Our objective was to delineate the impact of white matter injury on 3 of these core processes.

Participants and Methods: We examined whether DTI measures of hemispheric white matter were related to differences in processing speed, sustained attention, and working memory for children treated with radiation for medulloblastoma (n=3) relative to controls (n=5). Imaging data were acquired with a GE LX 1.5T MRI scanner using a single shot spin echo DTI sequence with EPI readout (25 directions, TE/TR=100/6000ms, 22 contiguous axial slices, 3 mm thick, FOV = 24 cm). FA was calculated for frontal, parietal, temporal, and occipital white matter bilaterally using an anatomically defined template.

Results: Based on analyses of variance, mean FA across all regions of hemispheric white matter was lower in patients relative to controls, $p < .05$ (i.e., left frontal white matter = .17 versus .31). Attention did not differ between groups, $p > .10$. Working memory and processing speed did differ between groups, $p < .05$, but regression analyses demonstrated that these effects were not significant when controlling for mean FA across multiple regions of hemispheric white matter, $p > .10$.

Conclusions: Poor cognitive outcome may be due to the impact of white matter damage on working memory and processing speed. Our findings are preliminary due to the small sample size and will need to be confirmed within a larger sample which we are currently acquiring.

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K.A. O'BRIEN, R. YALLAMPALLI, E.A. WILDE, E.D. BIGLER, J.V. HUNTER, Z. CHU & H.S. LEVIN. Longitudinal Analysis of the Temporal Lobes in Children with Traumatic Brain Injury.

Objective: Magnetic Resonance Imaging (MRI) volumetry has revealed changes in white and gray matter that are related to normal maturation of the brain. Traumatic brain injury (TBI) in childhood has been hypothesized to disrupt this developmental trajectory, but no longitudinal studies have been reported to date to confirm or refute this possibility. In addition, the long-term course of degenerative change following TBI is incompletely understood.

Participants and Methods: 12 children (4F, 8M, aged 7-16 years) with TBI (CCS mean=7.92, range=3-15), and 10 orthopedically-injured children (2F, 8M, aged 7-15 years) of comparable ethnicity, socio-economic status and handedness underwent high-resolution T1-weighted and T2-weighted volumetric imaging on a 1.5T Philips scanner at 3 and 18 months post-injury. Temporal lobe volumes (i.e., white matter, gray matter, cerebrospinal fluid) were calculated using Analyze 7.0 software using previously published protocols.

Results: In the TBI group as a whole, significant differences between 3- and 18-month temporal volumes were not observed statistically in this small sample, though white matter volume was slightly less in the 18- as compared to the 3-month imaging data. However, we did observe noticeable temporal volume loss in a subset of patients where there was hemorrhagic contusion in the temporal lobes and/or a greater degree of general atrophy.

Conclusions: It is likely that the nature, location, mechanism, and degree of brain injury may differentially impact recovery from TBI in children. Some deleterious changes evident at three months may remain relatively stable, but others may lead to additional changes.

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J. ROVET, S. SEKCHARAN, J. SKOCIC, E. SHEARD, S. WHEELER & M. DESROCHER. Reduced Caudate and Hippocampal Volumes in Adolescents with Congenital Hypothyroidism.

Objective: Congenital hypothyroidism (CH) is a disorder of newborns arising when thyroid hormone (TH), which is essential for normal brain development, is lacking. Although early treatment following newborn screening has eliminated the previously associated mental retardation, affected children show attention and memory problems suggestive of abnormal caudate and hippocampus development. These findings converge with animal evidence demonstrating vulnerability of caudate and hippocampus to TH insufficiency. To date, no study has examined the effect of TH on these structures in humans.

Participants and Methods: 15 CH (11 dysgenesis) and 17 healthy controls aged 10-15 years underwent MRI scanning and comprehensive neuropsychological testing emphasizing attention and memory performance.

Results: CH with dysgenesis had smaller caudate volumes than controls (left: 3137, 3468 mm³; right: 3240, 3579 mm³; $p < .05$). CH generally also had smaller hippocampal volumes than controls (left: 1709, 2058 mm³; right: 1749, 1947 mm³; $p < .001$). Furthermore, CH failed to show the age-related increases in caudate and hippocampal volume observed in controls. Interestingly, caudate volume in CH was correlated with indices of attention (e.g., TEA-Ch, Conners' ADHD) and hippocampal volume was correlated with indices of memory (CVLT, Rey-O, BRIEF) whereas in controls, only Rey-O recall and left hippocampal volume were correlated. Increased CH severity predicted smaller caudate and hippocampal volumes; longer hypothyroidism duration also predicted smaller hippocampal volume.

Conclusions: TH insufficiency contributes to reduced caudate and hippocampal volumes. In CH adolescents, abnormal neuroanatomy of caudate and hippocampus is associated with attention and memory problems and a unique pattern of structure/function relations relative to controls.

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M.B. SACH, C.M. SHARPE, C.N. LUDLUM, D.M. VU & D.A. TRAUNER. Detecting Language-related Disconnection Syndrome with Lesion Overlap Analysis.

Objective: We investigated the relationship between the localization of focal brain lesions and expressive language deficiency in children with pre- and perinatal stroke. The left hemisphere has traditionally been associated with language comprehension and production. However, children with pre- or perinatal stroke resulting in a left hemispheric lesion do not typically show the same language lateralization patterns of controls or adults with comparable injuries. Such discrepancies can be attributed to the remarkable plasticity of the developing brain after damage. This study employs a new technique known as voxel-based lesion symptom mapping (VLSM). VLSM does not require pre-specified groups of patients based on either lesion site or behavioral deficit as in traditional lesion mapping but rather maintains the continuity of lesion and behavioral information. The lesion-behavior correlation was assessed in children with focal brain lesion.

Participants and Methods: 20 subjects with lesion in the middle-cerebral-artery (MCA) territory on the right or left side participated in the study (mean age: 10.7 ± 2.7 yrs). Lesions covered both sides equally. All subjects received the CELF-3 subtest 'formulated sentences' for expressive language function. High-resolution T1-weighted images were acquired on a 3T scanner. Lesions were drawn on each slice of the re-oriented T1 in MRICRO. Images were normalized in SPM2 using cost-function masking. Non-parametric statistics were calculated between the cognitive data in voxels with lesion versus voxels without lesion.

Results: Voxels where lesions correlated with reduced CELF-scores were located in the bilateral inferior frontal and superior temporal lobe including the connecting fibers ($p < 0.05$, FDR: Z-score > 2.1).

Conclusions: Lesion-behavior correlation identified the arcuate fasciculus in children with lesion in the MCA territory as the anatomical correlate for expressive language function. VLSM allows a localization of fibers connecting different language areas within the overlapping lesions. Correspondence: *Miriam B. Sach, MD, PhD, Neurosciences, Pediatric Neurology, University of California San Diego, 9500 Gilman Dr. MC 0935, La Jolla, CA 92093-0935. E-mail: msach@ucsd.edu*

D.R. SEICHEPINE, A. BEISER, R. AU, J. HIMALI, T.M. LAUDATE, K. STAVITSKY, S. SESHADRI, C. DE CARLI & P.A. WOLF. Relation of Stroke Risk to Brain Morphology in an Ethnic Minority Sample: The Framingham Omni Study.

Objective: Risk factors for stroke have been related to total brain volume (TCBV) and to white matter hyperintensity (WMH) volume in Caucasians but have not been examined in minority populations that typically exhibit a high incidence of cardiovascular disease.

Participants and Methods: Participants included people from the following ethnic groups: African-American (n=83), Hispanic (n=80), Asian/Pacific Islander (n=56) and Caucasian (n=2057). Stroke risk factors were obtained from health examinations. TCBV and WMH volumes were adjusted for head size and WMH volumes were additionally log-transformed to normalize their distribution. Additionally, we defined large WMH as 1 s.d. above age and sex-specific means. Analyses were adjusted for age and sex.

Results: As previously reported, TCBV was negatively associated with systolic blood pressure ($p < .01$), elevated blood pressure ($p < .01$), hypertension ($p < .01$), hypertensive medication use ($p < .01$), diabetes ($p < .01$), and smoking ($p < .01$) in Caucasians; the only significant association we observed in the minority groups was hypertensive medication use in Hispanics ($p < .05$). Analyzed as a continuous variable, WMH

volume was positively associated with smoking in Caucasians ($p < .01$) but not in any of the minority groups. Large WMH volume was associated with smoking in Caucasians ($p < .01$), and a similar trend was observed in minorities ($p = .09$). Interaction terms indicated varying effects of hypertension, hypertensive medication, and diabetes between the groups.

Conclusions: Despite higher incidence of cardiovascular disease, the present findings indicate that stroke risk factors have a different and perhaps weaker relation to TCBV and WMH volume in minority groups compared to Caucasians, although smaller groups may have reduced effect sizes.

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C.A. SMITH, J. HOOK, G.T. STEBBINS, D. HAN, E. MARTIN, R. BAMMER & M. MOSELEY. Risky Decision Making and Whole-Brain Radiologically-Defined Normal Appearing White Matter: A Diffusion Tensor Imaging Study.

Objective: Risky decision making is associated with lesions in the ventromedial prefrontal cortex, and regional decreases in neural activity within frontal, parietal, and limbic brain structures. To date, the relation between markers of white matter integrity and risky decision making has yet to be defined. With this, we sought to investigate the association between risky decision making and radiologically-defined, normal appearing white matter (NAWM) integrity.

Participants and Methods: Fifty-three right-handed participants underwent high resolution DTI scanning. Each subject completed the Iowa Gambling Task, and risky decisions (RD) was defined as the total cards selected from the “disadvantageous” decks (A+B’). Voxel-wise NAWM fractional anisotropy (FA) and mean diffusivity (MD) maps were created. Regression analyses were used to identify regional relationships between the DTI markers of interest and risky decision making.

Results: No significant correlations between the whole-brain FA or MD and RD were revealed. In contrast, increased RD was associated with regional alterations in MD and FA within the posterior cingulate, precuneus, pulvinar, and frontal lobe.

Conclusions: We demonstrate a relation between NAWM integrity and risky decision making, such that increased free mobility of water (indexed as MD) and decreased neural integrity (indexed as FA) was associated with increased risky decision making. These results are consistent with reports of altered neural function in frontal, parietal, and thalamic regions.

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K. WALTHER, B. BENDLIN, M. MCGILL, A. BIRDSILL, F. MARENCO, E. GLISKY & L. RYAN. White Matter Pathology in Older Adults Is Related to Frontal Function.

Objective: White matter hyperintensities (WMH) are evident in older adults on T2Flair images, but their significance for cognitive function has not been clearly identified. In addition, more recent work with diffusion weighted MRI has demonstrated changes in diffusion in white matter of older adults, but few studies have seen a relationship with cognitive function. In the present study, we focused on two questions. First, is the volume of WMH related to diffusion measures in normal looking white matter, and second, do these measures predict frontal and memory performance in older adults?

Participants and Methods: Fifty-two older adults between the ages of 57 and 92, independently living in the community without neurologic

or psychiatric disorder, underwent neuropsychological testing (frontal and memory functioning) and were scanned on a 3T MRI scanner using T2Flair and whole brain diffusion imaging. WMH was measured across the whole brain, and diffusion was measured in specific frontal and posterior regions.

Results: First, older adults with extensive WMH volumes had worse diffusion measures (higher ADC, lower FA) in both frontal and posterior regions. Second, frontal functioning was related to the amount of WMH, even when corrected for age. However, memory performance was related only to age, not WMH.

Conclusions: The diffusion measures suggest that white matter pathology in older adults extends beyond frank regions of hyperintensities. In addition, the presence of a large amount of WMH is related to frontal, but not memory decline in older adults.

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E.A. WILDE, R. YALLAMPALLI, Z. CHU, J.V. HUNTER, E.D. BIGLER, X. LI, D. MENEFEY, A. VASQUEZ & H.S. LEVIN. Longitudinal Changes in Moderate to Severe Pediatric Traumatic Brain Injury: Diffusion Tensor Imaging.

Objective: Diffusion Tensor Imaging (DTI) studies have previously revealed robust changes in patients with traumatic brain injury (TBI) as compared to uninjured subjects, presumably reflecting changes in white matter microstructure. However, few studies have utilized longitudinal imaging data to examine the impact of injury on subsequent development of white matter in children.

Participants and Methods: Nine children (3F, 6M) aged 7-17 years with TBI (GCS mean=9.22; range 3-15) and ten orthopedically-injured (OI) children (2F, 8M) of comparable age, ethnicity, post-injury interval, and socioeconomic composite index underwent DTI at 3 and 18 months post-injury on a 1.5T Philips scanner. Quantitative DTI analysis was performed in several regions including the frontal and temporal white matter, the anterior (AIC) and posterior limbs (PIC) of the internal capsule and subregions of the corpus callosum using Philips PRIDE Fiber Tracking v4.1 software. Fractional Anisotropy (FA), Apparent Diffusion Coefficient (ADC), and radial diffusivity (RD) were used as imaging variables.

Results: T-tests of difference scores revealed significant or near-significant within-group changes (between 3 and 18 month data) for the following regions for the OI group: genu (FA), body (FA, ADC, RD), splenium (FA), left frontal (FA), and right PIC (ADC, RD). Within the TBI group, changes were noted in the following: genu (ADC, RD), splenium (FA), and left temporal (FA). Between-group differences (for difference scores) were also apparent in the following regions: genu (FA, ADC, RD) and RPIC (RD).

Conclusions: Longitudinal studies utilizing advanced imaging techniques such as DTI may enhance understanding of late post-TBI changes in the context of development.

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R. YALLAMPALLI, E.A. WILDE, E.D. BIGLER, J.V. HUNTER, Z. CHU, X. LI, M. TROYANSKAYA, J.M. FLETCHER, J. CHIA & H.S. LEVIN. Diffusion Tensor Imaging of the Fornix in Moderate to Severe Pediatric Traumatic Brain Injury.

Objective: Traumatic Brain Injury (TBI) is a common cause of death and disability in children. Memory disturbances are common following TBI, and may result from changes in the hippocampi and fornices. Using diffusion tensor imaging (DTI), we examined deleterious changes in the fornix in children with and without TBI and the relation of injury severity to these changes.

Participants and Methods: Nine children (5F, 4M) aged 9-16 years with TBI (GCS mean=7.89) and six children (2F, 4M) of equivalent age with extracranial injury underwent DTI 3 months post-injury (± 24 days) on a 3T Philips scanner. The groups did not significantly differ in age, ethnicity, post-injury interval, or socioeconomic composite index, and all participants were right handed. A 3-D automated fiber tracking procedure was performed using Philips PRIDE v4.1 fiber tracking software.

Results: Wilcoxon one-tailed t-tests revealed a significant group difference in fractional anisotropy (FA) ($p=0.045$; Cohen's $d=0.90$), with the TBI group having lower FA. Marginal group differences were noted for Apparent Diffusion Coefficient (ADC) ($p=0.118$; Cohen's $d=0.76$), axial diffusivity (AD) ($p=0.118$; Cohen's $d=0.69$) and radial diffusivity (RD) ($p=0.098$; Cohen's $d=0.79$) with the TBI group demonstrating higher diffusivity. Spearman correlation demonstrated significant relations between GCS and ADC ($r=-0.817$, $p=0.007$), AD ($r=-0.676$, $p=0.045$), and RD ($r=-0.782$, $p=0.019$), such that greater injury severity (low GCS) was associated with greater measures of diffusivity.

Conclusions: The fornix appears vulnerable in TBI, and DTI may be a useful tool in examining post-traumatic change to white matter microstructure. Future studies with a larger cohort examining the relation of DTI to memory are underway.

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R. YALLAMPALLI, E.A. WILDE, J.V. HUNTER, Z. CHU, G.R. HANTEN, E.D. BIGLER, X. LI, M. TROYANSKAYA, J.M. FLETCHER, J. CHIA & H.S. LEVIN. Acute Changes in the Fornix Following Mild Traumatic Brain Injury Using Diffusion Tensor Imaging.

Objective: Mild Traumatic Brain Injury (MTBI) is common in adolescents, but the dissociation between cognitive complaints (e.g., memory disturbance and decreased processing speed) in the acute post-injury interval and the absence of findings on conventional imaging have been enigmatic for clinicians and investigators.

Participants and Methods: Nine right-handed children (3M, 6F) aged 14-19 years with MTBI and a GCS of 15 with negative CT findings were matched with nine right-handed uninjured controls of comparable age, gender, socioeconomic status and ethnicity. Both groups underwent diffusion tensor imaging (DTI) 1-6 days post-injury on a Philips 3T scanner. A 3-D automated fiber tracking procedure was performed on the fornix using Philips PRIDE v4.1 fiber tracking software.

Results: T-test revealed a significant group difference in fractional anisotropy (FA) ($t=-2.57$, $p=0.026$; Cohen's $d=1.04$), with the TBI group demonstrating increased FA compared to controls. A marginal group difference was found for apparent diffusion coefficient (ADC) ($t=1.82$, $p=0.087$; Cohen's $d=0.81$), with decreased diffusivity in the TBI group. General linear model analysis revealed a relation between fornix FA and processing speed on the Automated Neuropsychological Assessment Metrics ($F(2,15)=5.47$, $p=0.034$). There were marginal relations between the Verbal Selective Reminding Test 30 minute delay score and FA ($F(2,15)=2.68$, $p=0.112$) and ADC ($F(2,15)=2.89$, $p=0.110$).

Conclusions: Typically, decreased FA/increased ADC are considered markers for degenerative changes in white matter following TBI; however, in the acute post-injury interval, increased FA/ decreased ADC in regions including the fornix may signal other acute changes such as cytotoxic edema that are not visible on conventional imaging but may relate to cognitive disturbance.

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Language: Other (e.g., Naming, Fluency, Reading)

E.J. HELDER, M.E. BEHEN, E. PRIMEAU, J. PERRY, O. MUZIK & H. CHUGANI. Specific Language Impairment and Associated Language Activations in Children with Histories of Early Severe Deprivation.

Objective: Research in our lab has found a high incidence of specific language impairment in children with histories of early deprivation (ED) as well as differences in traditional language regions using 2-deoxy-2-[(18)F]fluoro-D-glucose (FDG) PET and MR Diffusion Tensor Imaging (DTI). The present study sought to replicate previous work by evaluating the incidence of specific language impairment in ED as well as examine language activations in children with language impairments compared to those without language deficit using fMRI.

Participants and Methods: Participants included adopted children ($n=21$, mean age=137 months \pm 34.4, 9 males) placed in orphanages at birth (mean duration=29.8 months \pm 20.8) and a normal control group ($n=13$ mean age=148 months \pm 32, 9 males). Participants completed a comprehensive neuropsychological evaluation and fMRI protocol involving passive story listening and word generation tasks.

Results: Eleven ED children had language impairment defined as expressive and/or receptive language scores >2 SDs below the normative mean. Comparisons on neuropsychological testing revealed significantly lower verbal reasoning ($p<.001$), verbal memory ($p<.001$), and academic skills ($p<.05$) in language impaired compared with non-language impaired ED children and normal controls. fMRI results indicated significant reduction in activation in traditional language areas (e.g., left superior temporal gyrus, $p<.05$) in ED children with language impairment children compared with non-language impaired ED and control children.

Conclusions: The current study replicated previous work assessing the incidence of language impairment in ED children as well as extended this work by describing the associated neurocognitive profile and language activation patterns in children with histories of ED and language impairment using fMRI.

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Memory

L.L. WULFF & K.A. NIELSON. Effects of a Two-Week Trial of Physiological Arousal on Memory and Other Cognitive Functions.

Objective: Arousing events are better remembered than mundane events. Indeed, manipulation of arousal, such as by muscle tension, can influence memory even when it occurs shortly after learning. This study investigated the effects of physical arousal on memory and other cognitive functions in healthy elders.

Participants and Methods: Fifty-two participants completed narrative (WMS LM) and visual memory tests (BVRT), followed alternately by no treatment and by squeezing a sand-filled latex ball for 1-minute (counterbalanced for order). Half of the participants then used the ball at home for two weeks with assigned memory tasks while the remaining participants only completed the assigned tasks without the intervention; both groups used a daily memory diary. Retention was tested for the lab and at-home tasks after the two-week interval. Pre- and post-tests were also completed on standard tasks of attention, working memory, language, and executive functioning.

Results: Delayed recall and recognition of the laboratory tasks showed that narrative memory was significantly enhanced by arousal ($p < .01$); visual memory was not affected ($p = .81$). Although none of the at-home tasks were significantly affected by arousal ($p > .05$), significant enhancement of attention (Trails-A) and working memory (Digit-span Backward) ($p < .05$) occurred in the 2-week intervention group.

Conclusions: The results are consistent with past findings that muscle-tension induced after learning modulates memory consolidation, though no significant findings resulted outside of the laboratory. However, improvements in working memory and attention were observed resulting from two weeks of the repetitive manipulation of physical arousal, suggesting that the intervention may have general cognitive benefits.

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M.M. MANDE, C.L. WESTON, L. YANG & L.L. SYMONDS. The Effect of Distraction on Human Performance in a Simulated Aviation Task.

Objective: During flight a pilot's concentration is challenged by information-processing tasks requiring use of working memory. This study investigated the effect of performing a working memory/speed processing task on performance during a simulated flight.

Participants and Methods: Fifty participants simulated a pilot solo flight (Microsoft Flight Simulator 2004). Twenty-five flew while performing the PASAT ("Experimental group"); the remaining 25 performed the same flight without interruptions/distractions ("Control group").

Results: Results indicated that almost twice as many in the Control group completed the flight without "crashing" (9 vs. 5), though the difference was not statistically significant ($p = .345$). When the Experimental group was subdivided based on the last flight segment completed (take-off, leg1, leg2, leg3, landing), participants followed the Yerkes-Dodson U-shaped model (stress initially increases performance, then causes a decline, and finally leads again to increased performance). Separate Mann-Whitney U tests for speed and altitude on the 5 legs indicated that both control and experimental groups flew similar speeds compared to the ideal flight. During only one leg did the Control group fly a speed statistically closer to the ideal flight than the Experimental group ($p = .003$). The Control group followed the ideal altitude more closely than the Experimental group on all three legs between take-off and landing ($p = .030, .028, .017$).

Conclusions: Stress from task memory overload, (in this study, the PASAT), has an effect on pilot performance. In particular, there was a decrease in performance in altitude and speed, highlighting the importance of first securing the aircraft's flight and only then responding to communication calls.

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Multiple Sclerosis/ALS/Demyelinating Diseases

P.A. ARNETT, M.M. SMITH, F.H. BARWICK, J.E. BEENEY & A.R. RABINOWITZ. Cognitive Factors Contribute to Grooved Pegboard Performance in Multiple Sclerosis Patients.

Objective: Motor tasks, such as the Grooved Pegboard Test (GPT) and Finger Tapping Test (FTT), have a long history of use in neuropsychological assessment. Poor performance on them is typically interpreted as reflecting a deficit in fine motor coordination (GPT) or fine motor

speed (FTT). However, performance on these tasks may require more complex cognitive processes, as well. If so, then interpretation of these measures as only reflecting motor processes may be misleading. To evaluate this issue, the present study examined the extent to which performance on commonly used neuropsychological measures predicted performance on the GPT and FTT in multiple sclerosis (MS) patients.

Participants and Methods: Fifty-one MS patients were administered the GPT and FTT, in addition to the following neuropsychological tests: BVMT-R, CVLT-II, Symbol Digit, PASAT, DKEFS Sorting Test, COWAT, and Animal Naming.

Results: Correlational analyses revealed that every neuropsychological test index was significantly correlated (p at least $< .05$, absolute correlation range = $.31$ to $.43$) with dominant and nondominant GPT performance. No neuropsychological test index was significantly correlated with FTT scores.

Conclusions: Although used to measure lateralized fine motor coordination, analysis of the GPT suggests that it is a complex task that may require higher level cognitive functions. Consistent with this conceptualization, our data show that the GPT is associated with performance on tasks of memory, speeded attentional processing, and executive skill in MS patients. In contrast, the FTT appears to be a relatively pure measure of motor skill in MS patients, uncorrelated with more complex cognitive tasks. Correlations with the GPT could not be attributed to the fine motor demands of the neuropsychological tasks, as only one task involved any motor writing component. These neuropsychological tasks may have predicted GPT performance because of the shared novelty involved with all tasks, a feature not characterizing the FTT.

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M.R. BASSO, I. SHIELDS, R. SHIELDS, V. TRACY, P. CANDILIS, D. COMBS & J. JOHNSON. Prospective Memory Deficits in Multiple Sclerosis.

Objective: Cognitive impairment occurs in 60% of patients with multiple sclerosis (MS). Forgetfulness is especially common, and deficits involving acquisition and retrieval are reported across studies. This research has addressed recall for retrospectively learned information, but little research has examined prospective memory in MS. Prospective memory is a form of episodic memory that involves recall of intended actions, and is presumed to reflect frontal-temporal lobe integrity. Rendell et al. (2007) compared prospective memory in unimpaired MS patients and a control group, and found worse prospective memory in the patients. The present study compared prospective memory in a control group and impaired and unimpaired MS patients.

Participants and Methods: Participants were administered a broad battery of neuropsychological tests and the Memory for Intentions Screening Test (MIST; Raskin, 2004). This instrument possesses acceptable reliability and validity (Woods et al. in press). Patients were classified according to impairment on the neuropsychological battery, excluding MIST performance. If 33% of scores was impaired, then the person was categorized as impaired. This yielded 22 unimpaired and 10 impaired MS patients, and 15 controls.

Results: MIST recall and recognition scores were analyzed using ANOVA. Impaired patients performed worse than the control group on the MIST overall recall score, but there were no differences on the recognition index. MS patients did not differ from controls on the CVLT-2. Executive function and working memory correlated with MIST recall, more so than did CVLT-2 scores.

Conclusions: Cognitively impaired MS patients show reduced prospective memory, whereas unimpaired patients do not. MIST scores correlated with executive function and working memory performance more than retrospective memory performance, implying a frontal substrate. This also suggests that prospective memory recruits planning and organizational skill more than retrospective memory.

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J.E. BEENEY & P.A. ARNETT. Depression Symptoms Mediate the Relationship Between Executive Function and Hostility in an MS sample.

Objective: Deficits on tests of executive function are related to various problems with self-regulation, as well as increases in hostility. In this study, we examined whether lower performance on tests of executive function would be related to increases in hostility among an MS sample. We hypothesized that in a patient group often characterized by executive functioning problems, the variables in question would be related. However, we further hypothesized that one mechanism explaining this relationship might be via the mediational influence of depression, as some research has suggested that depression in MS is often associated with anger and hostility.

Participants and Methods: Fifty-nine MS patients were administered the Tower of London and The Reading Span Task, along with the SCL-90 Hostility Scale and Chicago Multiscale Depression Inventory (CMDI).

Results: Hostility was negatively correlated with an executive function index ($r = -.26, p < .05$). However, this relationship was fully mediated by CMDI depression symptoms. Both executive function and depression ($r = .43, p < .001$) and hostility and depression ($r = .58, p < .001$) were moderately correlated. After controlling for depression symptoms, the relationship between the executive function index and hostility was non-significant ($R^2 \text{ Change} < .01, p > .6$).

Conclusions: As predicted, performance on tests of executive function was significantly related to hostility. However, in accord with predictions, data supported the idea that depression symptoms provided the link between these two variables. One possible interpretation of the findings is that executive functioning difficulties lead to depression, which leads to hostility. Another possibility is that all three of these variables are related to an underlying brain disturbance.

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L.N. BROWN, Y. ZHANG, R.K. ZABAD, R. MITCHELL & L.M. METZ. Corpus Callosum Volume and Interhemispheric Transfer of Somatosensory Information in Multiple Sclerosis.

Objective: A temporal threshold (TT) is the longest temporal interval that separates the onsets of two stimuli when they are judged by the observer as simultaneous. Judgments to bimanual stimulations (i.e., both index fingers) require interhemispheric transfer via the corpus callosum (CC). Bimanual TTs are increased in people with multiple sclerosis (MS), suggesting compromised conduction capacity across a portion of the CC. The objective of this study was to determine if CC volume correlates with bimanual TTs in patients with MS.

Participants and Methods: TTs were examined in MS patients and matched controls. Participants responded (YES/NO) whether pairs of tactile stimulation to the index fingers were delivered simultaneously. A set of 3-plane localizing MR images was acquired on a 3T MR system within 48 hours of clinical assessment and measurement of TTs. The CC volume was measured on a mid-sagittal slice using the liveWire program, an intelligent algorithm capable of finding the best-fit contour of structures measured.

Results: The CC volume was smaller (by 21% on average, $p < 0.01$) and TTs were higher (by 49% on average, $p < 0.03$) in MS patients when compared to controls. A significant correlation ($r = -0.66, p = 0.01$) between CC volume and TTs emerged for the MS patients.

Conclusions: This study revealed a significant relationship between CC volume and bimanual TTs in MS. It also confirmed the presence of CC atrophy and conduction impairment in MS patients when compared to controls. Further studies are needed to determine the relationship between cognitive function, CC volume, and TTs.

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J.A. DUQUIN, B. WEINSTOCK-GUTTMAN, J. FEICHTER, K. PATRICK, S. JURGENSEN, M. PANZARA & R. BENEDICT. Routine Monitoring of Neuropsychological Symptoms in Multiple Sclerosis.

Objective: Cognitive impairment occurs in approximately 50% of multiple sclerosis (MS) patients and routine screening for cognitive impairment has been suggested. The Multiple Sclerosis Neuropsychological Screening Questionnaire (MSNQ) has excellent test-retest reliability and may be sensitive to change in perceived cognitive status. We investigated the reliability and validity of the MSNQ when administered at monthly intervals.

Participants and Methods: Seventy-six MS patients (mean age = 47.5) and 25 healthy controls matched on demographic characteristics were examined with the Symbol Digit Modalities Test (SDMT), MSNQ, and Beck Depression Inventory Fast Screen (BDIFS) over six monthly sessions.

Results: MSNQ reliability coefficients ranged from 0.85 to 0.91. Mixed factor ANOVA showed main effects for group ($p < .001$) but not time. There were moderate correlations between MSNQ and BDIFS across all administrations ($r = 0.38$ to 0.58) and lesser but significant correlations with SDMT ($r = -0.23$ to -0.39). Multivariate regression analysis (controlling for age) revealed that BDI-FS explained most variance in MSNQ at each time point although SDMT was also retained as a significant predictor at months three ($R^2 = 0.317, p = 0.000$) and six ($R^2 = 0.166, p = 0.001$).

Conclusions: We conclude that the MSNQ is a reliable measure and that it is correlated with depression and cognitive dysfunction, more strongly with the former. Informant report MSNQ scores, which are more strongly correlated with NP testing than depression, may be more useful in future research.

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J.J. ENGLERT, L.B. STROBER, B. WEINSTOCK-GUTTMAN & R.H. BENEDICT. Understanding Personality Change in Multiple Sclerosis Using a Five-Factor Model Approach.

Objective: Personality traits, which are stable across the lifespan in healthy people, may change with the progression of cerebral disease. Little is known about the personality changes that may occur in multiple sclerosis (MS) patients. We used a retrospective rating approach to study perceptions of personality change in MS patients and their caregivers.

Participants and Methods: Forty-five MS patients underwent examination of cognitive functioning and personality, using the NEO Five-Factor Inventory (NEOFFI). In addition, patients completed the NEOFFI, focusing on the time before diagnosis. Informants known prior to MS diagnosis, and with whom patients had regular contact, also rated patients using both the present and retrospective forms of the NEOFFI. Twenty-six matched healthy controls with informants were also studied.

Results: Mixed factor, time x group ANOVAs were conducted on the NEOFPI factor T-scores. Informant ratings showed significant interaction effects for Neuroticism ($p < .01$), Extraversion ($p < .01$), and Conscientiousness ($p < .01$), with MS patients exhibiting increasing Neuroticism and decline in other facets of personality over time. Amongst patients, significant interaction effects were shown for Neuroticism ($p = .05$) and Extraversion ($p < .01$), with Neuroticism increasing and Extraversion decreasing over time. No significant effects were found amongst the other factors.

Conclusions: Findings indicate that MS patients undergo significant changes in personality as compared to healthy controls. These personality changes may be related to strategic areas of brain atrophy in MS and further study will focus on personality/MRI correlations.

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J.M. HILL, M. YOUNES, B. PENG, L. WOLANSKY, J. SKURNICK, S. KIM, S. COOK & D. CADAVID. The Impact of Disability Status and Combined Active Lesions as Evidenced on MRI on Mood Level in Multiple Sclerosis Patients.

Objective: To examine the impact of multiple sclerosis (MS) lesion count and pattern, and functional disability status on mood level. This work expands on work previously reported that demonstrated that the pattern of combined active lesions (CAL) on MRI in MS patients was predictive of lowered cognitive functioning.

Participants and Methods: Seventy-five patients (male = 23; female = 52) with either relapse-remitting MS (80%) or a clinically-isolated syndrome (20%) were randomized to receive either Betaseron or Copaxone as part of a clinical trial. They received a 3-T MRI with triple dose gadolinium once a month for one year with optional monthly scans for up to 24 months, and neuropsychological testing including an assessment of mood level (Beck Depression Inventory [BDI]), and disability level (Expanded Disability Status Scale [EDSS]) at baseline, six, twelve, and twenty-four months.

Results: A trend toward improvement in BDI scores over the course of the study for all patients was noted ($p=0.09$). There was no effect of treatment group ($p=0.76$) or CAL pattern ($p=0.56$) on mood level. Only EDSS was correlated with mood level ($r=+0.45$, $p=0.0001$), and when general linear models were used only EDSS was significantly predictive of mood level.

Conclusions: Level of functional disability not total lesion count or CAL pattern is predictive of mood level in MS, suggesting that depressed mood in MS is more a result of the impact of disease on level of functioning than extent of disease activity in the brain.

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R. HOLTZER, L. RIBER & F. FOLEY. Associations Between Fatigue and Working Memory in Multiple Sclerosis.

Objective: Associations between fatigue and cognitive performance are inconsistent in persons with Multiple Sclerosis (MS). Herein, we examined whether a relationship between fatigue and Working Memory (WM) could be demonstrated in MS.

Participants and Methods: Participants were 20 individuals diagnosed with MS (mean age=40ys) and 20 controls (mean age=39ys) case matched for age, sex, education and IQ. A computerized Delayed Item Recognition (DIR) paradigm (Holtzer et al., 2004; 2005) assessed WM in three experimental conditions that manipulated attention demands: a) alone b) Partial Interference (PI) c) Complete Interference (CI). Fatigue was assessed using the Fatigue Severity Scale (FSS).

Results: Repeated measures analysis revealed significant main effects for group and for task with slower WM performance (ms-sec reaction time) observed in the MS group and as a function of increased attention

demands, respectively. Individuals with MS reported higher levels of fatigue compared to the controls but the range of scores was similar in both groups. There was no association between reports of fatigue and WM in the control group. However, significant associations between fatigue and WM emerged in the MS sample in the PI and CI conditions of the DIR task. Linear regressions with fatigue serving as the predictor and WM performance serving as the outcome variables showed that the association between fatigue and WM remained significant only in the CI condition even after controlling for the effects of age and depression.

Conclusions: An association between fatigue and WM emerged as a function of increased attention demands in persons with MS but not in controls.

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L. MILES, M. INGLESE, J.S. BABB, J. HERBERT, H. JAGGI, L. DILLER, A.S. YI, D. CASCIO & R.I. GROSSMAN. Comparison of Neuropsychological Functioning in Four Subtypes of Multiple Sclerosis.

Objective: To examine differences in cognitive functioning among MS subtypes: relapse remitting, primary progressive, benign, and clinically isolated syndrome.

Participants and Methods: Twenty-five participants with benign MS, 11 participants with clinically isolated syndrome, 28 participants with relapse remitting MS, 16 participants with primary progressive MS, and 46 controls. Participants underwent neuropsychological testing. Pair-wise comparisons examined differences on test scores between groups.

Results: Cognitive impairment was present in all MS subtypes. Significant differences were found between MS groups.

Conclusions: Participants with primary progressive MS were the most cognitively impaired followed by participants with relapse remitting MS, clinically isolated syndrome, then benign MS.

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A.R. RABINOWITZ & P.A. ARNETT. MS Symptoms' Effects on General Contentment.

Objective: Common MS symptoms like problems with mood, fatigue, and ambulation may significantly impact quality of life. The current study was designed to assess the relative impact of 13 symptom domains on general contentment in patients with MS. An index of MS related attitudes was examined as a possible mediator of the relationship between key MS symptoms and general contentment.

Participants and Methods: Seventy-seven MS patients were administered the MS Symptom Severity Scale (MS-SSS), the Functional Assessment of MS (FAMS), and the MS Attitude Index (MSAI). The MS-SSS consists of 25 items pertaining to MS symptoms, summarized in 13 subscale domains. The FAMS is a 44-item self-report measure of quality of life across 6 domains. The General Contentment (GC) subscale score from the FAMS was used in analyses; high scores indicate low general contentment. The MSAI is a 5-item self-report questionnaire designed to assess feelings of learned-helplessness and lack of control related to MS.

Results: Five of the 13 symptom domains assessed by the MS-SSS were correlated with GC at the $p < .01$ level: mood ($r = .52$), weakness-paresthesias ($r = .52$), ambulation-motor ($r = .49$), bladder-bowel ($r = .47$), and fatigue ($r = .40$). The Sobel-test was used to test for mediation. MSAI total score partially mediated the relationship between the fol-

lowing symptoms and GC: mood ($z = 3.70$; $p < .001$), weakness-paresthesias ($z = 3.86$; $p < .001$), and ambulation-motor ($z = 3.56$; $p < .001$). MSAI total score fully mediated the relationship between the following symptoms and GC: bladder-bowel ($z = 3.80$; $p < .001$) and fatigue ($z = 4.00$; $p < .0001$).

Conclusions: Compared with other common symptoms of MS, mood, weakness-paresthesias, ambulation-motor, bladder-bowel, and fatigue related symptoms have the greatest impact on MS patients' general contentment. The results of this study suggest that these physical and mood symptoms may lead to poorer quality of life via their impact on feelings of learned helplessness and lack of control.

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L.I. REICKER, T.N. TOMBAUGH, L. WALKER & M.S. FREEDMAN. A Comparison of Methods for Improving the Detection of Slowed Processing Speed in Multiple Sclerosis.

Objective: Currently, the Paced Auditory Serial Addition Test (PASAT) is generally acknowledged to be the neuropsychological measure most sensitive to the reductions in processing speed associated with multiple sclerosis (MS). However, the effectiveness of the PASAT as a clinical measure may be restricted by several factors. The purpose of this study was to determine whether modifying the PASAT, in an attempt to better isolate the speed component of performance, or going in a different direction, by using reaction time tests, offers the best alternative for improving the detection of slowed processing speed in MS.

Participants and Methods: The Adjusting-PASAT incorporates a titration/stair-step procedure with traditional PASAT methodology, allowing the measurement of a temporal threshold representing the speed at which information is no longer consistently processed. The Computerized Tests of Information Processing (CTIP) is a newly developed series of reaction time tests that progressively increases the complexity of processing across three tasks. These tests, along with a traditional 3.0s version of the PASAT, were administered to 30 adults with relapsing-remitting MS and 30 healthy controls.

Results: A repeated measures ANOVA revealed patients with MS obtained significantly longer reaction times than controls on the CTIP tests. Furthermore, as task difficulty increased across the three tests, MS patients performed progressively worse than controls. One-way ANOVAs failed to yield any significant differences between the groups on either the Adjusting-PASAT or the traditional PASAT.

Conclusions: These results suggest reaction time tests are a better alternative than the Adjusting-PASAT or the traditional PASAT for detecting slowed processing speed in patients with MS.

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K.A. RYAN, L.J. RAPPORT, K. TELMET HARPER, L. BIELLI-AUSKAS & D. FUERST. Awareness of deficit, compensatory driving behaviors and driving outcomes in multiple sclerosis.

Objective: This study examined the influence of disease characteristics, cognitive functioning, awareness of deficit, compensatory driving behaviors, and social influences on driving outcomes among individuals with Multiple Sclerosis (MS).

Participants and Methods: Sixty MS patients who were currently driving and their caregivers participated. Disease-related indices were obtained from medical records, and cognitive functioning was assessed using a neuropsychological battery. Unawareness of deficit was measured as the discrepancy between self-report and caregiver report of patients'

functional abilities. External social influences to driving (e.g., directives from health professionals and caregivers) and compensatory driving behaviors were measured using a driving questionnaire. Driving outcomes included miles driven per week and driving incidents (including Department of Motor Vehicle records).

Results: Multivariate analysis indicated that patients' perceptions of social barriers to driving were the dominant predictor of how safely they drove (driving incidents). Self-report of compensatory driving behaviors was inversely related to miles driven and driving incidents. Awareness of deficit moderated the relationship between compensatory behaviors and miles driven and showed a similar and strong trend to driving incidents. Only among drivers with unawareness of deficit (26.7%) were miles driven and driving incidents positively related.

Conclusions: Awareness of deficit plays a special and important role in driving outcomes among patients who drive, because patients who are unaware of their deficits and do not compensate for them are at increased risk for driving incidents.

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L.B. STROBER, J.J. ENGLERT, M. ALT, F. MUNSCHAUER, B. WEINSTOCK-GUTTMAN & R.H. BENEDICT. Comparing the sensitivity of memory tests in multiple sclerosis (MS): The Rao Brief Repeatable Neuropsychological Battery (BRNB) and the Minimal Assessment of Cognitive Function in MS (MACFIMS).

Objective: Brief neuropsychological batteries such as the Brief Repeatable Neuropsychological Battery (BRNB) and the Minimal Assessment of Cognitive Function in Multiple Sclerosis (MACFIMS) have been proposed for MS patients. While there is considerable overlap between these batteries, they differ in the tests recommended for memory assessment. We compared the sensitivity and discriminative validity of these memory tests in MS patients.

Participants and Methods: Sixty-five MS patients and 46 healthy controls matched on age, education, estimated IQ, gender, and ethnicity, underwent neuropsychological testing, including all BRNB and MACFIMS tests. Four memory tests were administered: Selective Reminding Test (SRT) and 10/36 Spatial Recall Test (10/36), California Verbal Learning Test, second edition (CVLT2) and Brief Visuospatial Memory Test-Revised (BVMTR). The order of test administration was counter-balanced for all memory tests.

Results: Large effect sizes were found for the Symbol Digit Modalities Test (SDMT) ($d = 1.32$), SRT ($d = .96$), BVMTR ($d = .96$), CVLT2 ($d = .96$), and Controlled Order Word Association Test ($d = .91$). Utilizing stepwise logistic regression, the BRNB and MACFIMS battery accounted for approximately 41% and 38% of the variance, respectively with comparable accuracy (83%). Amongst the verbal memory tasks, Long Term Storage (LTS) of the SRT ($\beta = 1.10$) and total recall of the SRT ($\beta = .794$) and CVLT2 ($\beta = .938$) were all significant predictors, accounting for 28% of the variance. BVMTR2 Delay was the only significant predictor ($\beta = .647$) amongst visual memory tasks.

Conclusions: The BRNB and MACFIMS batteries have comparable discriminative validity. Of the memory tests comprising these batteries, the SRT and BVMTR are most sensitive.

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L.B. STROBER, J.J. ENGLERT, M. ALT, F. MUNSCHAUER, B. WEINSTOCK-GUTTMAN & R.H. BENEDICT. Effects of using same versus alternate form memory tests in multiple sclerosis.

Objective: A common assumption in clinical neuropsychology is that alternate forms are necessary when patients are evaluated repeatedly.

Previously, using a one-week test-retest interval, we found marked differences in practice effects between same- and alternate-form in multiple sclerosis (MS) patients. Only the latter was reliable and valid. In this study, our goal was to replicate this finding using a much longer test-retest interval.

Participants and Methods: Fifty MS patients underwent neuropsychological testing including the second edition of the California Verbal Learning Test (CVLT2) and the revised Brief Visuospatial Memory Test (BVMTR). Patients were randomly assigned to same or alternate-form condition. The groups were matched on demographics, test-retest interval, and disease course.

Results: Test-retest reliability coefficients for CVLT2 total recall and delayed recall were fair to good for both same- ($r = .74, p < .001, r = .68, p < .001$) and alternate-form ($r = .61, p = .001, r = .60, p = .001$) conditions. Similar results were obtained for the BVMTR: same-form (total recall $r = .74, p < .001$, delayed recall $r = .76, p < .001$), and alternate-form (total recall $r = .82, p < .001$, delayed recall $r = .68, p < .001$). Mixed ANOVA revealed no significant main effects for time, form type, or form \times type interaction for either test. Furthermore, form type did not compromise learning curves at time two on either measure.

Conclusions: Practice effects on the CVLT2 and BVMTR are minimal over a time span approximating two and a half years, and the degree of practice is not substantially different between same- and alternate-form conditions. The reliability of these measures appears adequate.

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K.D. SULLIVAN. Visual Dysfunction in Pediatric Multiple Sclerosis.

Objective: Multiple Sclerosis (MS) has historically been considered a disease with its onset exclusively in adulthood. It is now established that 2-5% of cases have their origin before age 18. Visual dysfunction occurs in 80% of adult-onset MS but no study to date has examined or characterized the incidence in a pediatric population. Low-contrast letter acuity has been identified as the most sensitive clinical measurement of binocular visual impairment in adult onset MS (Balcer, 2003).

Participants and Methods: Ten participants diagnosed with relapsing-remitting pediatric multiple sclerosis (mean age=16.3, mean duration since diagnosis=3.25 years) were tested on the Sloan low contrast acuity cards at 100%, 25%, 10%, 5%, 2.5% and 1.25% contrast levels binocularly. All participants had 20/20 Snellen near visual acuity.

Results: Results showed a significant loss of contrast sensitivity at all spatial frequencies as compared with healthy controls. When compared against adults diagnosed with MS, the pediatric MS group performed at a similar level of impairment at all levels of contrast except 100% in which they were significantly worse.

Conclusions: These data suggest that young individuals diagnosed with pediatric multiple sclerosis have impaired contrast sensitivity and that MS negatively impacts visual functioning early in the course of the disease. The pathogenic mechanisms of demyelination, axonal loss and retinal ganglion cell death likely play a role in the accumulation of visual deficits in this population. Sensitive vision measures are required to detect the impact of disease in pediatric patients with multiple sclerosis. The implications of contrast sensitivity loss on neuropsychological assessment and everyday functioning are discussed.

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G. WYLIE, M. HOPTMAN, D. CATALANO, J. LENGENFELDER, A. SMITH, A. LENT, N. CHIARAVOLLOTTI & J. DELUCA. An Investigation Into the Nature of White Matter Damage in Multiple Sclerosis Using Diffusion Tensor Imaging.

Objective: Multiple sclerosis (MS) is a neurodegenerative disease affecting white matter (axons) in the central nervous system. Imaging

methodologies such as diffusion tensor imaging (DTI), that can measure white matter integrity are particularly well suited to the study of MS. We used DTI to investigate both where in the brain white matter deficits occur in MS, and also where white matter integrity (WMI) is correlated with performance of a neuropsychological test of executive function (the Number-Letter Switching [NLS] condition of the Trial Making Test of the DKEFS).

Participants and Methods: A battery of neuropsychological tests, which included the NLS, were administered to five patients with MS and five healthy controls. A high resolution structural image was acquired from each subject, using magnetic resonance imaging (MRI), as was a DTI image (12 directions).

Results: We found that, compared to healthy controls (HCs), individuals with MS show deficits in white matter integrity in several areas, including frontal and parietal areas, as well as in thalamic and hippocampal areas. In addition, when a measure of WMI (fractional anisotropy, or FA) was correlated with the NLS, patients with MS showed correlations that were more extensive, yet more diffuse than HCs.

Conclusions: The more extensive correlations suggest that performance of the NLS depends on the white matter that remains intact in MS; the more diffuse correlations might provide a way to quantify the disruption of white matter tracts that is known to occur in MS.

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Other

M.T. ACOSTA. Neurofibromatosis type 1 (NF1) as a Model to Understand and Treat Learning Problems.

Objective: NF1, one of the most frequent genetic conditions, affects 1/3000 individuals. While the most worrisome problem for parents and patients is the incremented risk to develop tumors, up to 80% of patients have learning difficulties. Furthermore, symptoms compatible with the diagnosis of ADHD/ADD are present in up to 60% of patients. Learning problems are the most important source of morbidity.

Participants and Methods: An improved understanding is provided by: First, a combination of better descriptions and characterization of the cognitive and behavioral phenotype is available in recent studies in patients with NF1, which included a bigger number of patients and extensive psychological and neuropsychological assessments. In addition a better comprehension of the molecular and cellular mechanisms implicated in the cognitive deficits as well as the development of sophisticated molecular techniques have provided the perfect scenario to allow the integration of multiple scientific disciplines on the search of a better comprehension and a potential solution to the cognitive problems in this population. The pre-clinical studies have demonstrated a potential for pharmacological interventions.

Results: Second, a mice model Nf1 +/- has been developed to better understand the molecular and biological alterations present as a result of the genetic defect. This mice model has been very informative about the molecular mechanism, phenotypic expression and potential interventions in learning problems in this population

Conclusions: Multidisciplinary groups which include, biologists, pharmacologist, clinicians, neuropsychologist are developing a translational process to transfer those positive results in the treatment of cognitive deficits in a mice model of Nf1 to real patients with NF1.

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P. CHIU, M.E. KRAMER, S.L. WADE & N.C. WALZ. "Would You Do This?": Adult Gender Differences in the Neural Substrate of Social Information Processing.

Objective: Social information processing (SIP) refers broadly to the set of mental operations recruited during social interaction. This preliminary investigation examines if there are gender-related differences in the neural correlates of SIP in healthy adults.

Participants and Methods: While undergoing a functional magnetic resonance imaging (fMRI) scan, 12 healthy adults (mean age 20.9 years) viewed video vignettes of child actors portraying the experience and resolution of problematic social events. For each vignette, participants were prompted to make a judgment as to whether or not they would have responded to the situation in the same way as the protagonist (SIP task), or to monitor the number of children present in the video (control task).

Results: Robust activation across multiple brain regions was observed in both task conditions relative to a rest baseline. In addition, relative to the control task, the SIP task activated brain regions including a large extent of the medial frontal cortex (MFC), inferior and mid-portions of lateral prefrontal cortex (predominantly on the left), left anterior temporal regions, bilateral occipital cortex, posterior cingulate, left parietal cortex (BA 39), basal ganglia and thalamus. Of these regions, men showed more activation in the middle and ventral portions of MFC whereas women showed more activation in dorsal MFC. Men also showed more activation in anterior temporal and ventrolateral frontal regions, whereas women showed more activation in the basal ganglia, cerebellum, left occipital, left parietal, and dorsomedial frontal cortex.

Conclusions: Although both groups showed similar activation patterns during the SIP task, there are also subtle gender-related differences.

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P.A. TAYLOR-COOKE, J.G. CHACKO, K.C. CHELETTE & M.S. MENNEMEIER. Persistent Learning on Magnocellular and Parvocellular Processing Tasks but not on a Combined Task.

Objective: Persistent learning refers to sustained improvement on a task over time without further practice. We examined persistent learning on tasks sensitive to magnocellular (Motion Detection-MC) and parvocellular processing (Texture Detection-TD) and on a task involving the interplay of these two systems (Trolox Fading-TF) to determine whether learning would persist over an extended period.

Participants and Methods: Nine healthy subjects aged 22 to 27 participated. TF performance was assessed for stationary targets at 8 points in peripheral vision. PC and MC processing times were similarly assessed for TD and MD. Each session lasted 15 to 30 minutes and was separated by at least 48 hours. Whereas, one group (N=4) completed the eighth session after a 4-month delay, the other group (N=5) had no extended delay. Overall performance on tasks was regressed on sessions to assess change over time.

Results: Subjects demonstrated learning on both TF [$F(1, 56)=9.97, p<.01$] and TD tasks [$F(1, 56)=13.55, p<.001$] and a trend was demonstrated on the MD task, $F(1, 56)=3.17, p=.07$. Neither MD nor TD performance returned to baseline at the eighth session regardless of the length of delay. TF performance returned to Baseline, but only for those who had an extended delay before the eighth session ($p>.05$).

Conclusions: This study replicates findings of perceptual learning in both the magno and parvocellular pathways and extends them to show sustained improvement over a four-month period. While improvement was evident on the task involving both systems (TF) it was not sustained over time. These data suggest that persistent learning may depend more on structural changes within individual neural processing pathways rather than improved connections between systems.

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Symposium 4

1:15–2:45 p.m.

Cognitive and Neuroimaging Correlates of Fact Retrieval, Calculation, and Estimation in Children with Learning Difficulties

Chair: Linda Ewing-Cobbs

L. EWING-COBBS, J.M. FLETCHER, K. RAGHUBAR, P.T. CIRINO, N. DAVIS & P.G. SIMOS. Cognitive and Neuroimaging Correlates of Fact Retrieval, Calculation, and Estimation in Children with Learning Difficulties.

Symposium Description: Children with difficulties in mathematics are inefficient in representing and retrieving math facts, learning and implementing mathematical procedures, and estimating quantities. This symposium highlights the use of transdisciplinary techniques to examine individual differences in cognitive profiles and neuroimaging findings related to these core mathematical processes in community-based samples of third and fourth grade children with difficulties in math (MD), reading (RD), both math and reading (MD/RD), and in typically-developing comparison children. Core mathematical processes involving fact retrieval as well as exact and approximate calculation will be examined in relation to 1) supporting cognitive competencies, including processing speed, working memory, inhibitory control, and shifting between mental sets and strategies, and 2) supporting behavioral competencies, including ratings of inattention. The first two papers examine cognitive competencies supporting the accuracy and speed of calculation and problem solving and highlight the importance of attention as a predictor of math performance. The latter studies use diffusion tensor imaging (DTI), functional MRI (fMRI), and magnetoencephalography (MEG) to characterize the structural connectivity and spatial and temporal activation patterns associated with fact retrieval, exact calculation, and estimation. Speed and accuracy of calculation were associated with activation in superior parietal and superior and inferior frontal regions; these regions also correlated with integrity of white matter pathways assessed using DTI. Children with math difficulties showed an altered temporal and spatial sequence of regional hemispheric activation on MEG during single digit addition and dot estimation. These studies address fundamental components of numerical cognition as well as the development of normal and aberrant neural networks underlying competence in core mathematical processes (NIH P01 HD046261).

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K. RAGHUBAR, M. BARNES, P. CIRINO, L. EWING-COBBS, L. FUCHS & J.M. FLETCHER. Calculation Errors and Behavioral Inattention in Children with Math Difficulties.

Objective: Types of errors in multi-digit calculation were investigated in children with math and reading difficulties (MD/RD), math difficulties (MD), reading difficulties (RD), and no learning difficulties (NoLD). The relation between behavioral inattention and errors was also assessed.

Participants and Methods: Participants (N = 291) completed a 12-item multi-digit addition and subtraction task in both fall and spring terms of grade 3 or 4. Errors were coded as reflecting difficulties in: math fact retrieval; procedures such as regrouping; visual-spatial processing; and switching between operations. Teachers completed the SWAN, a measure of behavioral inattention.

Results: MD/RD and MD groups did not differ in accuracy, math fact errors, or procedural errors. Contrary to predictions from neuropsychological models, children with MD/RD and RD had higher rates of visual-spatial errors than the NoLD group. Switch errors did not differentiate the groups. All groups with learning difficulties had higher ratings of behavioral inattention than typically achieving peers and inattention was related to accuracy, math fact errors, and procedural bugs, but not switch errors or procedural slips. In contrast to the MD group, MD/RD and RD groups made significant gains in multi-digit calculation between fall and spring terms.

Conclusions: Findings are discussed with reference to: models of math disabilities; hypothesized differences in cognitive and mathematical processing in children with MD with and without co-existing RD; the nature of the relation between math performance and inattention; and the further investigation of operation switch errors from both developmental and individual difference perspectives.

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P.T. CIRINO, K.K. STUEBING, L. EWING-COBBS, M.A. BARNES, A.E. BARTH, L. FUCHS & J.M. FLETCHER. Latent Prediction of Computation and Problem Solving Skills via Cognitive Arithmetic Speed and Accuracy.

Objective: Several latent factors derived from predictors of computational skill and problem solving were examined. We specifically focused on the indirect effects of these predictors through cognitive arithmetic (single digit addend and minuend) speed and accuracy.

Participants and Methods: Participants were 291 students in Grades 3 and 4. Outcome latent factors were math computation and math problem solving, and mediating latent factors were cognitive arithmetic accuracy and cognitive arithmetic response speed. Latent predictors of reading, processing speed, working memory, inhibition (two factors), and behavioral inattention were also formed. Structural models allowing predictors to have both direct and indirect effects, or to have only indirect effects, were compared.

Results: Confirmatory measurement models of the 24 observed variables and 10 latent factors evidenced good fit (CFI = .923; RMSEA = .063). Outcome latent factors were highly related ($r = .77$). Cognitive arithmetic accuracy was more strongly related to problem solving ($r = .40$) than to computation ($r = .27$), whereas cognitive arithmetic response time showed the reverse pattern ($r = -.47$ problem solving; $r = -.62$ computation). Reading, working memory, and behavioral inattention were each strongly related to both outcomes (range $r = .48$ to $.59$), with other latent factors showing more modest relationships. All latent variables together predicted 66% computation and 62% problem solving. A model allowing only indirect effects of predictors via cognitive arithmetic skill fit less well, though only slightly.

Conclusions: These results demonstrate the predictive capacity of these latent variables for both computation and problem solving, as well as the hierarchical nature of these math skills and the importance of cognitive arithmetic skills. There was also some differential prediction of computation versus problem solving.

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N. DAVIS, C. CANNISTRACI, C. LORANG, L. FUCHS, B. ROGERS, W. SCHRADER, A. ANDERSON & J.C. GORE. Correlated Brain Tissue Structure and Function in Mathematical Processing.

Objective: The present study used functional magnetic resonance imaging (fMRI) and diffusion tensor imaging (DTI) to quantify the relationships between white matter integrity and neuronal activation and the accuracy and response time of subjects during exact and estimated calculations.

Participants and Methods: fMRI and DTI scans were obtained for twenty-seven third grade children. The participants represented a wide range in mathematical skill. Three ROIs were selected from the fMRI data: 1) a cluster of activation in the parietal lobe that correlated with accuracy on a double digit calculation task, 2) a cluster in the frontal lobe that correlated with accuracy on a single digit calculation task, and 3) a cluster in the frontal lobe that correlated with response time on the single digit calculation task. We calculated each participant's mean activation value for these ROIs and correlated them with participants' fractional anisotropy values across the brain.

Results: We identified several clusters in white matter pathways in which fractional anisotropy values were correlated significantly with functional activation. Fibertracking localized these pathways to superior parietal cortex, superior and inferior frontal lobe, and longitudinal fasciculi.

Conclusions: Our results identify specific regions in brain white matter that predict accuracy and response time in mathematical problem solving. Further, we show that variations in these fiber pathways are significantly correlated with synaptic activity during mathematical processing, as measured by fMRI. Detailed models of information flow during these tasks will be necessary to infer whether disrupted pathways are a cause or consequence of deficits in cortical function.

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P.G. SIMOS, J.M. FLETCHER, S. SARKARI, J. JURANEK & A.C. PAPANICOLAOU. Aberrant Spatiotemporal Activation Profiles Associated with Simple Arithmetic Operations in Developmental Math Disability.

Objective: The goal of the present study was to investigate the spatiotemporal profiles of brain activity during performance of simple math tasks in children who vary in math and reading ability.

Participants and Methods: Brain activity was measured using magnetoencephalography during addition of single digit numbers and estimation of the number of dots in a small array. Three groups of children were evaluated: children with below-average general math abilities and average or above average reading skills (MD group, $n=14$), students with below average scores on both math and basic reading tests (MD/RD group, $n=16$) and students with above average scores on standardized math tests (control group, $n=25$). Spatiotemporal brain activation profiles were reconstructed using a Minimum Norm Estimate procedure.

Results: Children with MD showed increased degree of activity in inferior (supramarginal, angular gyrus) and superior parietal regions in the right hemisphere. Moreover, there were notable differences in the temporal order of regional activity between groups. Controls showed early activity in the supramarginal gyri, with the right angular and superior parietal regions peaking last, and after a significant delay from supramarginal activity. In contrast, the activation profile characteristic of the MD group featured, first, activity in the right superior parietal lobule whereas activity in the left supramarginal gyrus peaked last, after a significant delay.

Conclusions: These findings are consistent with the notion that cortical patches in at least a portion of the parietal network of areas believed to be involved in number processing become active in an aberrant temporal sequence in children with math difficulties. This aberrant profile appears to be present during processing of numbers, symbolic or not, and characterizes children with specific math difficulties.

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Poster Session 5: Psychopathology, Drugs, Toxins

2:45–4:15 p.m.

Drug/Toxin-Related Disorders (Incl. Alcoholism)

S. BAVA, L.R. FRANK, T. MCQUEENY, A.D. SCHWEINSBURG & S.F. TAPERT. **White Matter Integrity in Adolescent Marijuana Users.**

Objective: Chronic heavy cannabis use during adolescence is associated with an array of CNS alterations and potential neurocognitive consequences, yet the impact of early cannabis use on microstructural white matter integrity (WMI) is poorly understood. Cannabinoid receptors are known to exist in myelin precursors and to affect glial cell processing. Building from this evidence, we used diffusion tensor imaging (DTI) to characterize WMI in heavy marijuana using teens and non-using controls after 28 days of verified abstinence. We predicted that fractional anisotropy (FA) would be lower in heavy marijuana users relative to non-using controls, whereas mean diffusivity (MD) was hypothesized to be elevated in marijuana-using relative to non-using controls.

Participants and Methods: Twenty-four marijuana-using adolescents (ages 16-19) and 30 demographically similar non-using controls were evaluated with DTI. Diffusion parameters including FA and MD were computed using AFNI and in-house tools (Frank et al., 2003). Whole-brain voxelwise group comparisons were conducted using tract-based spatial statistics (Smith et al., 2006).

Results: Marijuana-using teens demonstrated significantly reduced FA in the left superior longitudinal fasciculus ($p < .001$). The posterior portion of this region, along with numerous projection fibers including the inferior longitudinal fasciculus, corona radiata, and cerebral peduncle, also showed trends toward increased MD in marijuana-using teens compared to controls.

Conclusions: The superior longitudinal fasciculus may represent a particular area of vulnerability in marijuana-using teens, as previous research indicates that this fiber tract continues to myelinate relatively late into adolescence. Disruptions to white matter in this young group could indicate aberrant axonal and myelin maturation with resultant compromise of fiber integrity. Research supported by NIH grants R01 DA021182 (Tapert) and R01 MH64729 (Frank).

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S.R. CHEN, C. CHEN, I. LIU, H. WANG, L. KUO, V.J. WEDEEN, T.G. REESE & W. TSENG. **The Morphology of the Corpus Callosum in Alcoholics: A Diffusion Spectrum Imaging (DSI) Study.**

Objective: Current research indicates a relationship between alcoholism and the corpus callosum (CC). Diffusion spectrum imaging techniques were applied to investigate CC microstructure substrate using generalized fractional anisotropy (GFA) of water diffusion. We hypothesized that alcoholics' GFA would be lower than controls'.

Participants and Methods: We recruited 18 adult, right-handed males: 11 alcoholics, seven healthy individuals. The mid-sagittal CC area was manually selected using three red color thresholds: 0.2, 0.3, and 0.4. The threshold was the product of the x-axis value of the voxel's normalized maximum vector and the diffusivity anisotropy (DA) value. An automatic program segmented the CC into five regions (sequentially labeled, anterior to posterior) created by modified angles based on Witelson's partitioning. GFA was analyzed within each section and the whole corpus callosum; the mean GFA corresponded to the spatial area.

Results: The progression of thresholds subjected the corpus callosum to critical conservative evaluation. For all three thresholds, the poste-

rior GFA (regions four and five) was consistently significantly lower in alcoholics. Threshold 0.3 was chosen to eliminate extraneous noise found under 0.2 without risking incomplete CC selection under 0.4. With threshold 0.3 the GFA of the fourth and fifth posterior regions as well as the whole corpus callosum were significantly lower in the patient group than in the control group (region four $F=5.360$, $p < 0.05$; region five $F=6.171$, $p < 0.05$; whole CC $F=5.795$, $p < 0.05$).

Conclusions: This implies the morphology of the alcoholics' posterior CC and CC as a whole were significantly different compared to healthy subjects; there were no significant differences in other CC areas. Our results suggest a relationship between the posterior corpus callosum and the characteristics associated with alcoholism. In alcoholics the altered connectivity between the posterior hemispheres as seen by the lower GFA might result in below average perceptual and motor abilities.

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B. COLLINS & J. MACKENZIE. **Cognitive Effects of Hormonal Therapy in Breast Cancer Patients.**

Objective: The primary purpose of this study was to evaluate the cognitive effects of adjuvant hormonal therapy in breast cancer patients.

Participants and Methods: Post-menopausal breast cancer patients scheduled to receive adjuvant hormonal therapy ($n=28$) completed neuropsychological testing before treatment (T1), and following five months of hormonal therapy (T2). A sample of healthy female volunteers ($n=28$) was tested at comparable intervals. A standardized regression based approach was used to assess cognitive change. This method uses test/retest scores of the control group to generate an equation that predicts T2 scores from T1 scores. The difference between the predicted and obtained scores divided by the standard error of the estimate produces a deviation score that reflects the discrepancy from the T1-T2 difference scores that would be expected on the basis of practice alone.

Results: Analysis of individual deviation scores revealed that hormonal patients were 9 times more likely than healthy controls to show reliable cognitive decline from T1 to T2 (64% and 7% respectively). Executive function, processing speed, and verbal learning were most affected. Despite matching of subjects on age and education, and controlling for effects of anxiety and fatigue, the healthy controls scored higher than the hormonal patients on several cognitive measures even at baseline.

Conclusions: These data indicate that hormonal therapy exerts a subtle negative influence on cognition in breast cancer patients. The fact that patients scored lower than controls even prior to commencing hormonal therapy suggests that both treatment and non-treatment factors contribute to cognitive disturbances in this patient population.

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E. DOERING-SILVEIRA, E. LÓPEZ, M. DE RIOS, C.S. GROB & D.X. DA SILVEIRA. **Neuropsychological Status of Adolescents Using Hallucinogens in a Ritual Religious Context.**

Objective: To assess neuropsychological performance of adolescents who consume the hallucinogen ayahuasca within a religious ritual setting. Long term ayahuasca ritual use by adolescents may eventually result in impaired cognitive performance.

Participants and Methods: Forty ayahuasca consuming adolescents and forty adolescents who never used ayahuasca were compared on their performance on a battery of neuropsychological tests. Groups were matched by sex, age, and educational level.

Results: Both groups performed well on all neuropsychological tests. However, there were differences between the groups. Controls had higher scores on tests which required more cognitive functions working together

to perform a task. Subjects stemming from lower social classes did worse on robust tests than subjects from higher classes such as the WHO-UCLA Auditory Verbal Learning Test. However, social economic level did not show any influence in the quality of performance on more simple or “pure” tests. Male subjects who abstained longer periods from consuming ayahuasca performed better on complex tests than those who had shorter abstinence periods.

Conclusions: Adolescents who consume ayahuasca performed well on all the neuropsychological tests. However, cognitive functioning was influenced by sex and social economic status. There is reason to believe that good educational and cultural opportunities provided extra cognitive strength on highly demanding cognitive tasks, but did not interfere with the performance on simpler and more focused ones. It is possible that ayahuasca may have some subtle effect on cognitive functioning which can only be observed before highly cognitive demanding tasks.

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S. FERNÁNDEZ GUINEA, J. GRAÑA, E. GARCÍA & N. REDONDO. Executive Function Impairment Differences Between Two Typologies of Drug-Consumers: Cannabis and Cocaine Subgroups.

Objective: This study analyzes the differences in executive function tests performance between two typologies of drug-consumers, called Type A and Type B, with cocaine and cannabis as the main drug of consumption, respectively.

Participants and Methods: The sample was composed by 447 participants: a) 333 drug-addicts subjects who were receiving outpatient treatment for their problem of addiction, and b) 114 subjects in the control group. EuropASI, zoo subtest from BADS, arithmetic subtest from WAIS-III and Wisconsin Card Sorting Test were applied to the participants.

Results: A two-stage cluster analysis was performed with all drug-addicts subjects, revealing that participants classified as Type B showed cannabis as the main drug of consumption, various indicators of chronicity (higher mean age, higher unemployment rate), and more severity of their drug consumption problem in comparison with Type A. Participants from the latter group presented cocaine as the main drug of consumption and more severity associated with alcohol consumption.

The control group showed a significant better performance in all executive function measures compared with drug-addict group. Type B subgroup showed a significant poorer performance in comparison with Type A subgroup in zoo test (perfil score, planification and total time) and WCST (number of categories completed, correct responses, errors, perseverative responses, conceptual responses), and a significant better performance in arithmetic test.

Conclusions: In conclusion, cannabis consumer subgroup presented a more impaired cognitive functioning than cocaine subgroup, characterized by difficulties in self-regulation, impaired planification abilities, poor mental flexibility and slowness of information processing. Clinical and therapeutic applications will be discussed.

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K.L. HANSON, J.L. WINWARD, A. SCHWEINSBURG, K. LISDAHL MEDINA & S.F. TAPERT. Longitudinal Study of Cognition Among Adolescent Marijuana Users Over Three Weeks of Abstinence.

Objective: Previous research has shown subtle neuropsychological deficits among adolescent marijuana users following 28 days of abstinence (Medina et al., 2007). Less is known about recovery during the first month of abstinence. In this longitudinal study, we characterized changes in neurocognition among marijuana-using adolescents across the first three weeks of abstinence.

Participants and Methods: Participants were 16- to 19-year-old marijuana users (n=18) with limited alcohol and other drug use, and demographically similar, non-using controls (n=13). Participants completed a neuropsychological battery on days 1, 12, and 19 of a monitored abstinence period. Abstinence was ascertained by decreasing tetrahydrocannabinol (THC) values on consecutive urine drug screens. Tests assessed verbal list learning, verbal working memory, attention and vigilance, and time estimation.

Results: Marijuana users performed worse than controls on verbal list learning across all three test days (p<.01), although marijuana users tended to improve over time (p<.10). Groups had similar attention and vigilance processing speeds, but users were less accurate than controls across test days (p<.05). Marijuana users tended to be less accurate in time estimation (p<.10), and more frequent marijuana use and more lifetime use correlated with underestimation of time (p<.05). No group differences were found on working memory, and no other significant group x time interactions were observed.

Conclusions: Marijuana users maintained deficits in verbal memory and vigilance accuracy over the course of a three-week abstinence period, and poorer time estimation was associated with heavier marijuana use. Future studies will evaluate neurocognitive recovery with prolonged abstinence versus preexisting differences.

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D.A. KAREKEN, V. BRAGULAT, M. DZEMIDZIC, T. TALAVAGE, D. DAVIDSON & S.J. O'CONNOR. What if Proust's Teacup had had Cognac? Cerebral Networks of Alcohol Craving Elicited by Alcoholic Odors.

Objective: Chemosensory information (smell, taste) is invariably present when drinking. Such potent conditioned stimuli are cited as promoting relapse after treatment for alcoholism. We used fMRI to study cerebral regions that respond to the aromas of alcoholic beverages, and where this activation co-varied with craving.

Participants and Methods: A mixed sample of healthy social (n=8) and heavy drinkers (n=12) participated (age= 24.8, SD= 2.7). Subjects were familiarized with sets of non-appetitive odors (NApO; e.g., grass), appetitive control odors (ApCO; e.g., grape), and preferred alcoholic drink odors (AO) by pairing each with representative photographs. Craving was measured between odor/photo sets. Subjects then participated in an fMRI (Siemens 3T Trio) session in which they sniffed odors from each class. Data were analyzed with SPM5 (event model, random effects) using group membership as a covariate. The significance threshold was p < 0.05, FDR corrected.

Results: Craving was significantly positively correlated with the [AO > ApCO] BOLD signal difference in the right nucleus accumbens and dorsal putamen, bilateral dorsal/anterior insula, bilateral orbitofrontal cortex, and bilateral polar dorsolateral prefrontal cortex, as well as in the bilateral precuneus and both anterior and posterior cingulate. Similar areas, except nucleus accumbens, precuneus, and anterior cingulate, were observed when correlating [AO > NApO] with craving. Adjusting for craving, heavy drinkers showed trends for more activation in limbic areas, including the NAc.

Conclusions: The difference between fMRI BOLD signal activity elicited by preferred alcoholic drink and control odors is related to stimulus-provoked craving as measured outside the scanner. The brain areas identified here are similar to those shown (in both animals and humans) to code for the “incentive salience” of rewarding substances and their naturally conditioned stimuli. Responses in these brain areas may be useful in studying at-risk individuals. *Supported by R01 AA014605.*

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M. KRENGEL, C. COMTOIS, K. SULLIVAN & R.F. WHITE. The Cognitive Correlates of Chronic Multisymptom Illness in GWI Military Pesticide Applicators.

Objective: Exposure to acetylcholinesterase inhibiting pesticides has been advanced as an explanation for the persistent health complaints of the veterans of the Gulf War (GWI). The goal of this study was to evaluate the relationship among pesticide exposure, chronic multisystem illness (CMI) and cognitive functioning of GWI veterans with known exposures. We hypothesized that a high-pesticide exposed group with CMI would show significant cognitive deficits relative to a low-exposed individuals.

Participants and Methods: Participants included a unique group of 100 pesticide control personnel from the GW including pesticide applicators (high-exposed group) and preventive medicine specialists (low-exposed group). Each study participant completed a comprehensive battery of neuropsychological tests and health symptom/exposure assessment questionnaires. Each participant was then categorized as to whether or not they met CDC criteria for CMI based on their responses on the Health Symptom Checklist (HSC) questionnaire. Total health symptoms were also calculated based on the HSC responses.

Results: Chi-square analyses showed that the high-pesticide group was significantly more likely to meet criteria for CMI compared with the low-pesticide group ($p < .01$). Univariate analyses of the HSC scores showed a significant relationship between total health symptoms reported and pesticide exposure categories ($p < .01$). MANOVA analyses showed that total health symptoms were significantly associated with slower response time on CPT mean reaction time and on time to complete the Grooved Pegboard with the non-dominant hand ($p < .01$).

Conclusions: These preliminary findings suggest that GW veterans with high pesticide exposures were more likely to meet self-report criteria for CMI than their low-exposed counterparts. In addition, total number of self-reported health symptoms was also related to pesticide exposure. The higher exposed group reported more total current health symptoms which were correlated with reduced motor skill performance.

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S. KUMBHANI, T. JACOB, D. JIMENEZ, R. ROMERO & J. MOSES. Alcoholism and Familial Vulnerability to Neuropsychological Deficits: A Discordant Twin Study.

Objective: Extensive research has demonstrated cognitive impairments in individuals diagnosed with Alcohol Dependence (AD). However, Children of Alcoholics (COAs), display similar neuropsychological deficits without ever having consumed alcohol. This suggests that some neuropsychological impairment may, in fact, precede the onset of the AD. This study utilized a discordant twin design to address whether or not genetic influences predispose an individual to an AD diagnosis. The main hypothesis is that there would be evidence of familial vulnerability to cognitive deficits. A secondary hypothesis predicted that excessive drinking may have additive executive functioning consequences.

Participants and Methods: This study is based on a 111 twin pair (54 MZ, 57 DZ) sub-sample from the Vietnam Era Twin Registry. Paired-Sample T-Tests and Bivariate Correlations were used to examine the differences between the MZ and DZ groups' performances on the Wisconsin Card Sorting Test (WCST) and Judgment of Line Orientation (JOL). A bivariate linear regression equation was used to test if the more severe drinkers would have higher impairment rates on the WCST.

Results: Results found evidence for the operation of genetic influences on neuropsychological performance. Specifically, no significant difference was found in neuropsychological performance between the co-twins. Additional analyses showed that genetic influences were particularly strong for visuospatial abilities. The results of the linear regression indicated that the severity of AD could not predict the severity of executive function impairment.

Conclusions: Findings were congruent with the literature suggesting that preexisting neuropsychological deficits may predispose individuals to alcoholism vulnerability rather than the observed deficits being solely due to excessive alcohol consumption.

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M.E. MCCABE, P. CHIU & B.P. LANPHEAR. Low Level Lead Exposure and Attention Outcomes.

Objective: Lead is a neurotoxic agent with deleterious effects on developing cognitive function. Even low levels of lead exposure have been shown to negatively impact intelligence (e.g., Canfield et al., 2003). However, less is known about the impact of low levels of lead on neuropsychological domains, such as attention.

Participants and Methods: The present study assessed the impact of blood lead concentration (mean=5.41 $\mu\text{g}/\text{dl}$), measured at 60-months of age, on attention outcomes, assessed at 60- and 66-months, in 176 children, using MANOVA. Attention outcomes, which were nine scales from the Conner's Parent Rating Scale (CPRS; Conners, 1997) and scores from the Map Mission and Opposite World subtests of the Test of Everyday Attention in Children (TEA-Ch; Manly et al., 1999), were entered into a factor analysis using maximum likelihood and oblimin rotation.

Results: A three factor solution emerged as the best explanation for the data; factors were interpreted as: 1) externalizing symptoms (eigenvalue=23.88), 2) selective attention/set-shifting (eigenvalue=3.72), and 3) internalizing symptoms (eigenvalue=2.12). Only participants with blood lead concentrations in the upper and lower thirds of the sample were used for this analysis ($N=122$). A significant group difference was found on the second ($F=13.45$, $p=.0004$) factor, but not on the first nor third.

Conclusions: Children with greater blood lead concentrations had worse selective attention/set-shifting outcomes. These results suggest that even at low levels, lead can affect cognitive function, attention in particular. Correspondence: *Marie E. McCabe, Psychology, University of Cincinnati, 429 Dyer Hall, MLC 0376, Cincinnati, OH 45221. E-mail: memccabe@texaschildrenshospital.org*

T. MCQUEENY, A.D. SCHWEINSBURG, K.L. HANSON & S.F. TAPPERT. Behavioral and Cognitive Impulsivity During Inhibition in Abstinent Adolescent Marijuana Users: An fMRI Study.

Objective: Substance users have shown compromised inhibitory control, the neural substrates of which continue to develop in adolescence. We previously saw subtle neurocognitive decrements among adolescent marijuana (MJ) users, as well as differences in inhibitory processing after a month of abstinence. Here, we examined the relationships between behavioral and neural indicators of inhibitory control in MJ using teens after 28 days of abstinence.

Participants and Methods: Participants (ages 16-19) were 14 MJ teens and 14 demographically similar controls. Adolescents underwent 28 days of abstinence monitored through semiweekly urine toxicology. Participants then completed neuropsychological testing and performed a go/no-go task during functional magnetic resonance imaging (fMRI).

Results: MJ teens did not differ from controls in neuropsychological or go/no-go task performance. However, compared to controls, MJ teens showed more fMRI response in temporal, parietal, occipital, and cerebellar regions, and less response in the inferior anterior cingulate during no-go trials (clusters >1107 microliters, $p < .05$). For controls, better go/no-go accuracy was linked to less activation in left temporal and parietal areas ($p < .05$). However, for MJ teens, go/no-go task performance

did not relate to brain response, and better neuropsychological scores (complex attention, cognitive flexibility, planning, and impulsivity) related to less no-go-related activation in temporal areas and more activation in the anterior cingulate, after controlling for alcohol and other drug use ($p < .05$).

Conclusions: Consistent with current literature, MJ teens showed abnormal brain response after prolonged abstinence during response inhibition. Neuropsychological patterns suggestive of impulsivity were associated with greater medial temporal and reduced anterior cingulate response in MJ youths. Although not impaired, these cognitive properties may play a role in efficient use of neural resources during tasks with inhibition requirements.

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A.D. PEDERSEN, M.Y. MEHLSSEN, C.G. PEDERSEN, R. ZACHARIAE, H. MAASE & P. ROSSEN. Is Cognitive Function Affected in Men with Testicular Cancer Treated with Chemotherapy?

Objective: Cancer patients frequently express cognitive complaints associated with their chemotherapy. A small number of studies have shown minor cognitive dysfunction in adult cancer patients treated with chemotherapeutic agents compared to both patients not treated with chemotherapy and healthy controls. Most studies have included middle-aged women with breast cancer and possible cognitive side effects have never been examined in men with testicular cancer. The aim of the present study was to examine whether testicular cancer patients treated with surgery and chemotherapy show indications of cognitive impairment when compared to testicular cancer patients treated only with surgery.

Participants and Methods: Thirty-six patients treated with Bleomycin, Etoposid, Cisplatin (BEP) aged 27-70 years, and 37 surveillance patients aged 24-60 years were tested with a comprehensive clinical battery of standardized neuropsychological tests measuring intelligence and seven cognitive domains 2-7 years after successful treatment for testicular cancer.

Results: There were no differences between the two groups regarding age, education, intelligence or time since treatment. Patients treated with chemotherapy performed significantly lower in one of 20 comparisons (Rey AVLT first trial ($F=1.18$, $p < 0.05$)). But when adjusting the level of significance for multiple comparisons with a Bonferroni correction, no differences in any cognitive test were found.

Conclusions: Testicular cancer patients treated with surgery and chemotherapy displayed same performances on cognitive tests in comparison with similar patients treated only with surgery. Our results thus do not support previous indications of cognitive side effects of chemotherapy.

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J.S. PRICE, P.K. SHEAR & K.L. MEDINA. Ecstasy Consumption and Verbal Memory Functioning: Gender Effects.

Objective: Studies have demonstrated verbal memory deficits associated with past year ecstasy use (Medina et al., 2005), although the specific underlying cognitive mechanisms of such deficits are less understood. Further, although female ecstasy users have more impaired serotonergic functioning compared to males (Reneman et al., 2001), one study found poorer memory performance among male ecstasy users (Bolla et al., 1998). The current study investigated whether gender moderated the relationship between ecstasy exposure and verbal memory component processes after controlling for polydrug use and other confounding variables.

Participants and Methods: Data was collected from 65 polydrug users (ages 18-35; 48 ecstasy and 17 marijuana users; 0-2310 lifetime ecstasy tablets). Participants completed the California Verbal Learning Test-2nd Edition, psychological questionnaires, and a detailed drug use interview.

Results: After controlling for polydrug use, ethnicity, age, reading ability, and family history of substance use disorders, increased past year ecstasy consumption predicted increased susceptibility to interference ($p < .03$) and poorer total recall ($p < .05$), recall discriminability ($p < .02$), long delay free recall ($p < .004$), and retention ($p < .04$). Male ecstasy users were more susceptible to interference ($p < .05$) and had poorer long delay free recall ($p < .03$) and retention ($p < .005$) with increased ecstasy usage compared to females.

Conclusions: Ecstasy consumption was associated with verbal encoding and retrieval deficits, and increased susceptibility to interference. Male ecstasy users were at particular risk for verbal memory deficits. This pattern of dose-dependent deficits is consistent with hippocampal and prefrontal cortex dysfunction. Additional research examining whether gender moderates the effects of ecstasy on brain function is needed.

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A.D. SPADONI, L.M. SQUEGLIA, A.L. NORMAN & S.F. TAPERT. Utility of Neurocognitive Performance in Predicting Subsequent Heavy Drinking in Adolescence.

Objective: Poor executive and language functioning have been indicated as risk factors for alcohol use disorders (AUD) in youth. However, few studies of cognition in alcohol users have examined premeditated abilities, allowing the possibility that some impairments may predate heavy drinking. Further, few studies have examined risk factors of externalizing behaviors and alcohol expectancies in relation to neurocognition in predicting teen drinking.

Participants and Methods: Participants were 46 12-14-year-olds with <6 lifetime drinks. At baseline, executive, memory, visuospatial, verbal, and attentional abilities were assessed, and measures of psychopathology, alcohol expectancies, and mood were collected. Transition to heavy alcohol use was assessed at annual interviews. Twenty-three youth reported heavy drinking at a follow-up. Twenty-three continuous non-drinkers were matched to drinkers on gender, family history of AUD, parental education, and family income. Mean follow-up for both groups was 3.3 years. Covariates were baseline lifetime drinks and age.

Results: Drinkers performed similarly to non-drinkers on all baseline neurocognitive measures, but had poorer strategizing when learning verbal material ($p = .01$, partial $\eta^2 = .37$). Drinkers had higher externalizing, inattention, and delinquent behavior scores ($p < .05$, average partial $\eta^2 = .30$), and more positive alcohol expectancies ($p < .01$, partial $\eta^2 = .42$) at baseline than non-drinkers. After covarying for the greater rate of baseline conduct disorder in drinkers, learning strategies and alcohol expectancies became stronger predictors of subsequent drinking ($p < .01$, partial $\eta^2 = .49$).

Conclusions: In this preliminary longitudinal examination within a relatively high-functioning sample, few neuropsychological measures discriminated youth who would transition into heavy drinking from those who would not. Instead, externalizing behaviors and alcohol expectancies best distinguished subsequent heavy drinking by mid-adolescence.

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J. TAN & P. SHAMMI. Cognitive Sequelae of "Darkroom Disease": A Case Study.

Objective: The term "darkroom disease" refers to a cluster of symptoms resulting from exposure to chemicals used in film development, es-

pecially X-ray. Although it has been considered a form of multiple chemical sensitivities, controversies remained regarding its diagnostic validity, particularly whether it should be considered a physical or psychological condition. Neuropsychologists have therefore been involved in the differential diagnosis to partial out the various factors that contribute to patients' subjective complaints. Symptoms of respiratory disorders, severe fatigue, and painful joints have been well documented. The literature, however, lacked information on the cognitive sequelae of this condition despite anecdotal reports of cognitive problems. We present a case study of an individual diagnosed with "darkroom disease" following daily exposure to X-ray film processing chemical fumes over 5 years.

Participants and Methods: Our patient worked as an X-ray technician for over 20 years, but stated that, during the last 5 years, she worked long hours in a poorly ventilated darkroom before she began to experience a gradual increase in respiratory symptoms as well as cognitive difficulties. She underwent a standard neuropsychological assessment 2 years after she stopped work.

Results: Results of the assessment revealed mild to moderate deficits in speed of mental and psychomotor processing, verbal learning, visuospatial functioning, fine motor skills, and executive function.

Conclusions: The diffuse pattern of difficulties is indicative of toxic encephalopathy, and may suggest permanent functional damage to the central nervous system. Given the harmful nature of toxic exposure, case studies remain the best format from which neuropsychologists may gain understanding of the condition.

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N.P. VADHAN, C.L. HART, M. HANEY, W.G. VAN GORP & R.W. FOLTIN. Decision-making in Cocaine Abusers: Contingencies and Gambling Task Performance.

Objective: The Iowa Gambling task (Bechara et al., 1994) has been widely used to measure decision-making in substance abusers. Since the clinically-relevant decisions of substance abusers may involve real consequences to the individual, the extent to which Gambling task performance under hypothetical monetary contingencies models the naturalistic decision-making of substance abusers is unclear. In the current study, we examined the effects of a cash monetary contingency on Gambling task performance in cocaine abusers.

Participants and Methods: Twelve male long-term cocaine smokers who met DSM-IV criteria for cocaine dependence, and eight male non-cocaine using control participants who were similar to the cocaine users in terms of alcohol and marijuana use, education and IQ, have completed this study to date. All participants performed the Gambling task under two counterbalanced conditions: under one condition, earnings and losses were hypothetical, and under the other condition, earnings and losses were in actual cash.

Results: Cocaine abusers appeared to make more selections from disadvantageous decks than advantageous decks, relative to control participants, under the hypothetical monetary condition. However, the number of cards from advantageous decks selected by cocaine abusers' significantly increased under the cash monetary condition ($p < 0.05$), to within the observed range of the control participants' performance under the same condition.

Conclusions: The application of tangible consequences improved the decision-making of cocaine abusers on the Gambling task to a level similar to that of control participants. Thus, performance differences between cocaine abusers and healthy controls in previous studies may have been affected by motivational as well as decision-making processes. These data underscore the importance of considering population-specific factors (e.g., instructional vs. consequential control in substance abusers) when conducting transdisciplinary neuropsychological research. Correspondence: *Nehal P. Vadhan, PhD, Psychiatry, Columbia University/NYSPI, 1051 Riverside Drive #120, New York, NY 10032. E-mail: npv2101@columbia.edu*

W.A. VANVOORST, Y. GEDA, T. BERGQUIST & E. AHLKOG. New Onset Depression in a Patient with Manganese Neurotoxicity: Cognitive and Neuroimaging Findings.

Objective: Cognitive impairment following manganese toxicity is well established (e.g., Klos et al., 2006), but less is known about concomitant neuropsychiatric difficulties. This case study profiles the cognitive functioning, neuroimaging findings, and mood symptoms of a patient with manganese neurotoxicity over 7 years.

Participants and Methods: A 68-year-old male with eight years of education and 30 years of welding experience initially presented with myoclonus and memory difficulties. The patient, who did not have a psychiatric history, developed severe symptoms of depression within the context of his neurological condition. Three neuropsychological evaluations were performed at two year intervals. The patient stopped working three weeks prior to the first neuropsychological evaluation. MRI scans were obtained during the first and last year of follow-up.

Results: Serum manganese levels were elevated at 1.2 ng/mL (upper limit of normal = .85). Initial performances on neuropsychological tests showed impaired verbal fluency and verbal/visual memory with remaining scores consistent with age and education. Depressive symptoms were mild. Initial MRI of the head revealed increased T1 signal in the putamen and globus pallidus bilaterally. The second neuropsychological evaluation showed no interval changes and mild depressive symptoms.

The last MRI showed resolved T1 signal in the left basal ganglia and reduced signal in the right. Serum manganese levels were unchanged. Repeat neuropsychological evaluation (time 3) showed memory and attention had deteriorated. The patient's depressive symptoms became progressively worse even with the use of antidepressant medication.

Conclusions: Consistent with prior research, this case shows difficulty with tasks affecting frontal subcortical circuits. Manganese toxicity in the basal ganglia may have been a precipitating factor in the development of depressive symptoms. Additional studies on the neuropsychiatric sequelae following manganese toxicity are needed.

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Other

R.E. PROPPER, S. OLEJARZ & S.D. CHRISTMAN. The Thought of EEG: Anxiety and Right Hemisphere Activity.

Objective: Factors biasing electroencephalograph (EEG) recordings or line bisection (LB) performance may impact neuropsychological research. Because most undergraduate students have not encountered EEG previously, it was hypothesized that the prospect of EEG recording would increase anxiety. Previous findings of associations between right hemisphere and anxiety suggest that increased anxiety would lead to increased leftward LB bias.

Participants and Methods: Participants volunteered for an experiment in which electrodes might be applied. At Time 1 (T1), participants completed LB and the State-Anxiety Inventory Questionnaire (SAI). Following random assignment, Control Group (CG) participants (n=10) versus Experimental Group (EG) participants (n=11) were told they would not versus would wear electrodes, respectively. All again filled out LB and SAI (Time 2; T2). After debriefing, participants filled out LB and SAI (Time 3; T3). No electrodes were applied.

Results: ANOVAs revealed an effect of Time on SAI ($p = .043$), with increased anxiety at T1 compared to T2 ($p = .07$) and T3 ($p = .05$). Marginal significance of Group on SAI ($p = .068$) resulted from CG being more anxious compared to EG. Simple regressions revealed significant negative relationships between LB and SAI at each time in CG (p 's $< .05$), but not in EG.

Conclusions: Uncertainty regarding whether EEG would be recorded resulted in increased anxiety; anxiety decreased in both CG and EG following group assignment. It is unclear why Groups differed in SAI at each Time. Results suggest that higher levels of anxiety are associated with leftward LB bias and increased right hemisphere activity. In individuals anxious about participating in EEG studies, such findings could seriously impact data.

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Psychopathology/Neuropsychiatry/Other

M.T. ACOSTA, M. ARCOS-BURGOS, J.Z. BALOG, J.I. VELEZ & M. MUENKE. Pharmacological Response to Stimulant Medication in Patients with ADHD: Conditional Latent Class Clusters Transition as a Phenotype for Pharmacogenetic Trials.

Objective: Attention Deficit Hyperactivity Disorder (ADHD) is extensively treated with stimulant medication. Benefits of pharmacological treatment have been extensively demonstrated when compared to other therapeutic interventions. However, exploring and inferring the pharmacological treatment outcome based on subtypes as defined by DSM-IV is difficult. In fact, inclusion of either demographic covariates or pharmacokinetic indicators, did add very little information to discriminate between responders and non-responders among ADHD patients.

Participants and Methods: In order to disclose the presence of hidden classes of patients with ADHD that respond to stimulant treatment we used Latent Classes Cluster Analysis (LCCA) on the scale of ADHD symptoms as evaluated by the SWAN scale (Strengths and Weaknesses of ADHD-Symptoms and Normal-Behavior). This scale was administered while being either OFF or ON medication in 240 children with ADHD. While being OFF medication we found the presence of seven clusters transitioning to six clusters after being ON medication. By estimating conditional latent class clusters probabilities of transition, using 105 parametric simulations, and assuming a multinomial distribution, we were able to define the probabilities of responding to stimulant treatment.

Results: We did not find any significant correlation of the treatment response clustering neither to the ADHD subtypes, doses, gender or age.

Conclusions: Our findings indicate biological components intrinsic to the individual that will determine the pharmacological responses. Based in our data, we believe that this transition probability matrix will be useful for future pharmacogenetic trials of ADHD looking for genes that modify the treatment response

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A. BENITEZ & J. GUNSTAD. Sleep Quality is Associated With Psychological and Cognitive Impairments in Healthy Young Adults.

Objective: Research on various patient populations show that sleep disordered individuals manifest cognitive impairments and psychological difficulties. The current study examines the extent to which poor sleep quality is related to these impairments in healthy young adults without sleep disorders.

Participants and Methods: Participants (N=67) completed the Pittsburgh Sleep Questionnaire (PSQI), the MMPI-2, and measures of attention, executive functioning, and memory. Analyses determined whether individuals who had poor sleep quality (i.e., PSQI Global Score > 5; "PSQ") differed from those with good sleep quality ("GSQ") on the MMPI-2 Restructured Clinical (RC) Scales and neuropsychological measures.

Results: Groups did not differ on neuropsychological test performance, though the PSQ group had higher scale elevations on MMPI-2 RC Scale measures of emotional difficulties (RCd, $t=-4.35$, $p<.001$; RC1, $t=-4.34$, $p<.001$; RC2, $t=-3.15$, $p=.003$; RC7, $t=-3.48$, $p=.001$). To clarify this finding, subsequent analyses accounted for RC Demoralization (RCd; a measure of emotional distress) and found that (1) poor sleep quality was associated with poorer executive functioning and attention (r ranging from .21 to .27), (2) sleep medication use was associated with more perseverations ($r=.20$) and attentional errors ($r=.36$), and (3) poor sleep efficiency and latency were associated with poorer short ($r=.20$) and long-term memory ($r=.21$), respectively.

Conclusions: Poor sleep quality is related to neuropsychological test performance in healthy young adults, even when accounting for possible effects of subclinical psychiatric symptoms. Such findings require examination in other populations, though suggest that even subtle sleep disturbance may adversely impact cognitive function. Further studies are needed to examine mechanisms for these relationships.

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J. BURCIAGA, M.R. MADORE, J.L. HALL, D.E. FLECK, P.K. SHEAR & S.M. STRAKOWSKI. Psychomotor Deficits in Patients with Bipolar Disorder.

Objective: Research has shown that people with bipolar disorder display deficits across multiple cognitive domains, although psychomotor speed has been less well studied. The current study examined processing speed in participants with bipolar disorder during manic and euthymic mood states compared to the performance of healthy controls. It was hypothesized that participants with bipolar disorder would display significant psychomotor slowing when compared to healthy controls.

Participants and Methods: Participants were 71 manic or mixed patients with bipolar disorder I and 52 healthy controls (ages 15 to 45). As part of a larger battery, participants were administered the American National Adult Reading Test (ANART), Trail Making Test (TMT) Parts A and B, the Finger Tapping Test (FTT) and the Digit Symbol Coding subtest of the WAIS-III.

Results: ANART scores were significantly correlated with all of the psychomotor speed variables, and so premorbid IQ was covaried in the primary analyses. A series of ANCOVAs indicated significant group differences on TMT Part B and Digit Symbol Coding. Based on these findings, a post-hoc analysis was conducted to examine the performance of a separate group of 27 euthymic patients on the TMT (euthymic data were not available for the DS-C subtest) relative to the healthy control and bipolar manic groups.

Conclusions: The results suggest that manic (but not euthymic) patients demonstrated significant psychomotor slowing in the presence of normal simple motor speed.

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L. HARIK, A. PICA, S. WRIGHT, J. LEE & L. BIELIAUSKAS. Cognitive Deficits Associated with Anticholinergic Therapy and Drugs with Anticholinergic Properties in Community Dwelling Veterans.

Objective: Cognitive abilities such as learning, memory, and attention are dependent upon the integrity of the cholinergic system. The purpose of this study was to assess cognitive impairments associated with administration of Anticholinergic Therapy (ACT) and use of drugs with anticholinergic properties. Scores on several subtests of a standard neuropsychological assessment used at the Ann Arbor Veterans Affairs Health System were compared between two groups: patients currently taking drugs with anticholinergic properties (ACT), and patients of similar age, education and drug profiles, but not on ACT.

Participants and Methods: Participants included patients at the Ann Arbor Veterans Affairs Hospital in the Extended Care Center. All participants were matched for age and education; those with a history of neuropsychological insults, acute traumatic brain injury or delirious mental state were excluded. The subsets used to assess differences in cognitive impairment in the two groups included: Digit Span Forward and Backward, Rey 15 Item Task, Mini Mental State Examination (MMSE), Hopkins Verbal Learning Test (HVLT), Memorial Delirium Scale (MDS).

Results: The performance of subjects on ACT or taking anticholinergic drugs was significantly impaired on the Rey15 Item Task, MMSE (attention subtest), and HVLT (immediate recall) (all p -values <0.05) when compared to control subjects.

Conclusions: Test data show significantly lower performance on attention and memory-related cognitive tasks as well as apparent motivational measures in patients with ACT. The importance of accounting for ACT medication regimen in VA medical inpatients in interpreting neuropsychological test results, including tests of motivation, is emphasized, as well as their implications for effective patient care.

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T. HUH, R. MACKIN, P.A. AREAN, H. BORNFELD & J. KRAMER. The Relationship Between Cognitive Performance and Behavior in Alzheimer's Disease (AD) and Fronto-Temporal Dementia (FTD).

Objective: The need driven dementia behavior (NDB) model posits that neurocognitive decline affects dementia patients' abilities to communicate their needs, resulting in disruptive behaviors. Consistent with this theory, studies demonstrate that global scores of cognitive functioning (MMSE) predict behavior problems in AD patients. However, FTD patients have different cognitive and behavioral profiles compared to AD patients. This study was conducted to better determine the relative contributions of specific cognitive profiles to behavior problems in two subtypes of dementia.

Participants and Methods: Memory (30 second delayed recall on the California Verbal

Learning Test-short form), language (Boston Naming Test), visual spatial function (Rey Osterrieth Complex Figure Copy), and executive function (letter and category generation) scores from 68 AD and 61 FTD patients were regressed onto agitation, irritability, depression and anxiety scores from the Neuropsychiatric Inventory.

Results: Results indicated different profiles of cognitive deficits that contributed to behavior problems between groups. In AD patients, memory ($\beta = -.377, p = .007$), language ($\beta = -.396, p = .005$), and visual-spatial ($\beta = -.288, p = .044$) functions significantly accounted for irritability; and memory ($\beta = -.368, p = .007$) and visual-spatial ($\beta = -.491, p < .001$) functions significantly accounted for agitation. In FTD patients, memory ($\beta = -.408, p = .008$) accounted for depression only.

Conclusions: These results support findings that decline in memory, language and visual-spatial domains may result in greater behavior problems for AD. However, other processes should be considered to better understand behavior problems in FTD. These results provide additional support for the use of the NDB approach in managing behaviors in AD patients but the need for further modification for FTD patients.

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A.K. LAMARRE, S.C. JOHNSON & S.R. CARLSON. Psychopathic Personality Traits and Ability to Learn on the Iowa Gambling Task.

Objective: Learning advantageous decision making strategies, both in real life and experimental paradigms such as the Iowa Gambling Task (IGT) is negatively associated with impulsive traits and executive dys-

function. Psychopathic inmates have difficulty doing this on the IGT. However, psychopathic personality traits are heterogeneous and reflect two major dimensions. One (Fearless Dominance) underlies traits related to affective and interpersonal deficits, while the other (Self-Centered Impulsivity) contributes to impulsiveness and antisocial behavior. It is unclear to what extent each of these dimensions relates to decision making. Psychopathic traits extend throughout the range of normal personality and it is unknown how individual differences in them relate to decision making in non-forensic populations. The present study investigated the relationship between psychopathic personality dimensions and decision making in a sample of undergraduate students.

Participants and Methods: One hundred twenty undergraduates completed the Psychopathic Personality Inventory-Revised and the IGT (ABCD version). Ability to learn to make advantageous decisions on the IGT was indexed as the extent to which participants increased their selection of choices from advantageous decks relative to disadvantageous decks from the first block of 20 trials to the final block.

Results: Multiple regression analysis revealed that higher levels of Self-Centered Impulsivity predicted significantly poorer learning. However, poor learning was not significantly related to Fearless Dominance.

Conclusions: Our data suggest that decision making deficits seen in clinical psychopathy are continuous with impulsive/antisocial traits extending into normal range personality. The results underscore the importance of examining the relationship between subfactors of psychopathic personality and decision making.

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S. MACKIN, N. DUFFY, E. GILLUNG, T. HUH & P. AREAN. Impact of Cognitive Impairment on Cost of Medical Services for Individuals at a Community Mental Health Facility.

Objective: Cognitive impairments among older adults are commonly linked to poor medical and psychiatric treatment adherence, increased disability, and poor health outcomes. The objective of this study is to evaluate the impact of cognitive impairment on the cost of medical services for individuals receiving services at a community mental health center.

Participants and Methods: Data was collected from 48 ethnically diverse older adults attending day programming at a large community mental health center. Cognitive impairment was diagnosed by neuropsychologists utilizing the Mattis Dementia Rating scale (DRS) and the Clinical Dementia Rating scale (CDR). Measures of depression severity and substance abuse history were also obtained. An age and education corrected DRS total score falling below the 11th percentile ($SS=7$) and a CDR rating greater than 0.5 was used as the criteria for cognitive impairment. Cost of medical services was obtained through a review of records and included all medical, psychiatric, and emergency room treatments for participants in the preceding 24 months

Results: Cognitive impairment was demonstrated by 60% of the sample. After controlling for age and income, cognitively impaired individuals had significantly greater medical treatment costs over the 24 month interval than cognitively intact individuals $F(3,38) = 5.20, p = .034$. Type of mental health diagnosis, ratings of substance abuse, and depression severity were not significantly associated with medical treatment costs.

Conclusions: Preliminary data from an ongoing study suggests that cognitive impairment among community mental health patients is significantly associated with cost of medical services.

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M. PHILLIPS & M. HAINES. A Case of Transient Global Amnesia – Not!

Objective: To describe a 60-year-old woman claiming to have transient global amnesia (TGA) and provide a discussion of the actual phenomenon.

Participants and Methods: TGA refers to a loss of memory for recent events and impaired ability to retain new information; remote memory and immediate recall is preserved. Episodes generally last between 1 and 8 hours (mean 4.2 hours), rarely exceeding 24 hours. Patients are generally disoriented to time and place with 60-90% exhibiting repetitive questioning. Radiographic studies have been inconclusive and mixed.

Results: PB was referred by her physician for evaluation of her “global amnesia.” She relied on her daughter to provide historical information due to her “inability” to recall her past. PB described waking after a nap with no memory of her past. She denied any difficulty with retaining new information. PB has a 10 year history of depression; an exacerbation of depressed mood was noted prior to onset of “amnesia”. Performance on formal neuropsychological testing revealed low average to average intellectual functioning and average to superior memory functioning. MMPI-2 results suggested a high level of distress, depression, worry and somatic concerns. Subsequent brain MRI, MRA and PET/CA were all read as normal.

Conclusions: PB presented with complaints of complete amnesia for events prior to waking from a nap. Her reported symptoms, presentation and performance on neuropsychological testing were not consistent with a diagnosis of TGA. Despite the obvious inconsistencies inpatient treatment had been provided. Subsequent radiographic studies were unremarkable. Neuropsychological testing was able to redirect PB from neurological to psychiatric services.

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G. STAVRO-ETTENHOFER & J.T. NIGG. Executive Function Deficits in Psychopathology.

Objective: Deficits in executive functions (EF) have been linked to a wide range of psychiatric disorders. It is important to clarify to what extent these effects are overlapping or specific. The present study was an attempt to understand the degree of specificity of EF deficits in relation to several forms of psychopathology.

Participants and Methods: Two large, high-risk samples were combined (ages 18 to 66; total n=641). Participants completed diagnostic interviews and neuropsychological testing. Diagnoses included childhood externalizing disorders, attention-deficit/hyperactivity disorder (ADHD; persisting into adulthood), antisocial personality disorder (ASPD), alcoholism, drug dependence, depression, and anxiety disorders. EF tests were Stroop Test, Wisconsin Card Sorting Test, Trail Making Test, and Stop Signal Test. Speed-related portions of these tasks were also examined.

Results: Latent variables for internalizing disorders, externalizing disorders, EF, and speed were included in structural models. Presence of lifetime or current externalizing disorders predicted poorer performance on speed and EF tasks. Internalizing disorders were unrelated to EF or speed. When disorders were examined individually in regression analyses, only lifetime or current ADHD predicted poorer performance on an EF composite score. Current alcoholism and ASPD demonstrated some task-specific EF effects. Many EF effects disappeared after controlling for IQ; however, those specific to ADHD remained.

Conclusions: Findings suggest that shared underlying processes associated with externalizing disorders, particularly ADHD, contribute to EF weaknesses, but that internalizing associations may be related to their overlap with externalizing problems. Cognitive effects were not isolated to the EF domain. Thus, comorbidity amongst disorders and EF task impurity may have made the psychopathology-EF link appear more extensive in past research.

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V. TRACY, T. WARD, M.R. BASSO, E. HERNANDEZ & B. LUND. Executive function and working memory correspond with liver dysfunction in people with eating disorders.

Objective: Factors contributing to neuropsychological impairment in eating disorders (ED) are uncertain. In other populations, neurobehavioral impairment corresponds with hepatic disease, and may linger after resolution of liver damage. Owing to chronic malnutrition, ED patients tend to have liver dysfunction. However, the relationship between liver dysfunction and cognitive impairment has not been addressed in people with ED. Thus, the present study.

Participants and Methods: Participants included 44 females with eating disorders (Anorexia Nervosa = 28, Bulimia Nervosa = 9, Eating Disorder NOS = 7). Patients were seen during an inpatient admission in a long-term treatment unit. Upon admission, a variety of liver laboratory indices were collected. Patients' length of treatment varied, with patients being discharged as they neared their goal weight and their medical status had stabilized. Typically, length of stay exceeded 30 days. Within two weeks of discharge from the hospital, participants were individually administered a battery of neuropsychological tests which included measures of executive function, working memory, language and new learning.

Results: Values on admission liver panels were correlated with neuropsychological test scores. Results indicated meaningful correlations between liver enzymes and performance on measures of working memory and executive function. As admission liver enzymes increased, subsequent working memory and executive function scores decreased. There was no relationship between the liver panel and tests of language and new learning.

Conclusions: These results suggest that liver damage may correspond with long-term neuropsychological sequelae in people with ED. Specifically, liver damage at baseline correlated with worsening neurocognition several weeks later, and this occurred despite the patients having achieved medical and nutritional stability. Notably, the relationship was specific to executive function and working memory, implicating hepatic-related dysfunction in the frontal lobes.

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Psychopathology: Anxiety/Stress

S. ANDRES, L. LAZARO, M. SALAMERO & J. CASTRO-FORNIELES. VISUO-SPATIAL PERFORMANCE IN EARLY AND LATE ONSET OBSESSIVE-COMPULSIVE DISORDER IN CHILDREN AND ADOLESCENTS.

Objective: Early and late onset forms of obsessive-compulsive disorder (OCD) have showed different characteristics in gender predominance, kind of symptoms and response to treatment. Results of neuropsychological performance in adults with early and late onset OCD do not show clear results. None study has been done with children and adolescents. The main objective was to study the differences in visuo-spatial performance of early and late onset OCD in children and adolescents.

Participants and Methods: 35 patients with OCD and 35 age-matched healthy controls were assessed in this study (age between 7 and 18 years). Patients were separated in two groups: early-onset (before 10 years old, n=19) and late-onset (11 years or more, n=16). Neuropsychological performance were assessed by 4 tests with visual component: Block Design, Rey Complex Figure Test, Visual Reproduction and Coding. Results of this battery were compared between both groups and the matched control groups with a MANOVA.

Results: Differences in age, years of education and estimated intelligence level were not found between patients and controls. Early-onset group showed significant differences with its matched control group in comparison with late group in Block Design ($F=8.65$; $p=0.006$) and Coding ($F=4.76$; $p=0.037$). Differences in global MANOVA showed a tendency to significance ($F=2.03$; $p=0.083$).

Conclusions: Early onset OCD group showed worse visuo-constructive organization and slower speed in a repetitive and automatic task. Neuropsychological impairment in OCD patients (adults, children and adolescents) can be more marked in the early onset group. These results suggest that age of onset can be a potential marker for the subtyping of OCD.

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K. BLAIR, M. GERACI, J. DEVIDO, D. MCCAFFREY, M. VYTHILINGAM, P. NG, M. JONES, J.R. BLAIR & D.S. PINE. 10 Things I Hate About You: The Neural Response to Social Praise and Criticism in Generalized Social Phobia (GSP).

Objective: Generalized social phobia (GSP) is characterized by fear/avoidance of social situations. Previous studies have examined the neural response in GSP to one class of social stimuli, facial expressions. However, studies have not examined the response in GSP to another, equally important class of social stimuli, receiving praise or criticized. Here we examined the neural response to praise and criticism in GSP.

Participants and Methods: Seventeen unmedicated patients with GSP and seventeen age, IQ, and gender matched healthy individuals read positive (e.g., You are beautiful), negative (e.g., You are ugly), and neutral (e.g. You are human) statements that could be either about the self, or about somebody else (e.g. He is beautiful)

Results: There was an interaction between the valence of the statement, the person discussed, and group in the amygdala. Whereas patients with GSP showed increased amygdala activation to negative statements relative to the comparison individuals, there was no significant group difference for amygdala activation to positive and neutral statements. In addition, whereas patients with GSP showed increased amygdala activation to statements about themselves relative to the comparison individuals, there was no significant group difference for amygdala activation to statements about somebody else.

Conclusions: In line with neuroimaging studies that have examined the neural response in GSP to facial expressions, our data suggest that GSP is associated with amygdala pathology. However, our finding of valence/person specificity also suggest that the emotional response in GSP is highly context dependent even within social situations, and may help guide therapeutic formulations in the treatment of the disorder

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K. BLAIR, J. SHAYWITZ, B.W. SMITH, R. RHODES, M. GERACI, M. JONES, D. MCCAFFREY, M. VYTHILINGAM, E. FINGER, K. MONDILLO, M. JACOBS, D.S. CHARNEY, J.R. BLAIR, W.C. DREVETS & D.S. PINE. Response to Emotional Expressions in Generalized Social Phobia (GSP) and Generalized Anxiety Disorder (GAD): Evidence for Separate Disorders.

Objective: Generalized Social Phobia (GSP) involves the fear/avoidance of social situations while Generalized Anxiety Disorder (GAD) involves an intrusive worry about everyday life circumstances. GSP and GAD are highly co-morbid and it is unclear whether they are distinct disorders, or instead represent two levels of severity along an anxiety continuum with one underlying pathology. Using event-related functional magnetic resonance imaging (fMRI), we examined the neural response to facial expressions in GSP and GAD

Participants and Methods: Seventeen unmedicated patients with GSP, seventeen unmedicated patients with GAD and seventeen age, IQ, and gender matched healthy individuals viewed neutral, fearful, and angry expressions while making a gender judgment.

Results: The patients with GSP showed increased activation to fearful expression in several regions, including the amygdala relative to healthy individuals. This increased amygdala response related to self-reported anxiety in patients with GSP. In contrast, the patients with GAD did not show increased amygdala activation but instead showed significant less activation to fearful relative compared to the comparison individuals. Patients with GAD did show significantly increased responding to angry expressions relative to healthy comparison individuals in lateral regions of orbital/ inferior frontal cortex. This increased lateral frontal response related to self-reported anxiety in patients with GAD.

Conclusions: These results link both GSP and GAD with very different anomalies in amygdala responding and are more indicative of distinct pathologies rather than a continuum of severity.

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S.E. BRUCE, R.H. PAUL, R. BRYANT, L. WILLIAMS & E. GORDON. Time estimation, attention, and working memory in patients with PTSD.

Objective: The purpose of this study is to examine time estimation, attention, and working memory in a sample of patients diagnosed with post-traumatic stress disorder (PTSD). Based on attention allocation models, alterations in these cognitive domains would be expected to result in impaired time estimation among patients diagnosed with PTSD, but to our knowledge these relationships have not been examined in this patient population.

Participants and Methods: Participants consisted of 47 PTSD participants and 47 healthy controls matched for gender and age. All participants completed a computerized cognitive battery consisting of tests measuring memory, attention, and time estimation.

Results: Results indicate that PTSD participants did not significantly differ in time estimation compared to controls. However, PTSD participants did significantly worse on several measures of attention and working memory compared with the control sample. For example, participants with PTSD did significantly worse on visual memory ($F(1, 89) = 4.43$, $p < .05$), switching attention ($F(1, 92) = 7.78$, $p < .01$), response inhibition ($F(1, 91) = 13.96$, $p < .001$), and reaction time ($F(1, 90) = 14.99$, $p < .001$). Though PTSD was not found to alter time estimation, participants in this sample who reported higher scores of anxiety as reported from the Depression Anxiety Stress Scale (DASS-21) did significantly worse in estimating time than those participants with lower anxiety scores ($F(1, 74) = 5.31$, $p < .05$). Moreover, errors in time estimation were associated with working memory reaction time ($F(1, 88) = 5.58$, $p < .05$) and switching attention errors ($F(1, 90) = 4.41$, $p < .05$).

Conclusions: These results suggest that anxiety severity, rather than a diagnosis of PTSD, impact temporal errors. Clinical and nosologic implications will be discussed.

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L.M. KINOSHITA, T.T. LEE, K. UCAR, A. NODA, G.D. BIEN, K. KWAN, C. STEWART, E. DRANNIKOV, S.D. O'KENNON & J.A. YESAVAGE. Neuropsychological Profile of Older Veterans with Posttraumatic Stress Disorder and Sleep Disordered Breathing: Preliminary Findings.

Objective: Cognitive impairments are associated with posttraumatic stress disorder (PTSD) as well as sleep disordered breathing (SDB). Individuals with chronic PTSD exhibit impairments in attention, episodic memory and executive functioning. Although impairments in SDB are

mild, deficits include attention, vigilance and executive functioning. We found that the co-occurrence of PTSD and SDB in older veterans is high (83%). However, we do not know the neuropsychological profile of individuals who suffer from both PTSD and SDB and aim to clarify this important question.

Participants and Methods: Participants were 43 male PTSD veterans enrolled in a study at the VA Palo Alto. All participants met criteria for PTSD using the Clinician Administered PTSD Scale (CAPS). Mean lifetime CAPS was 78.6 (SD:21.2). Average duration of PTSD symptoms was 33 years. Most traumatic events were combat-related. Mean age was 58.7 (SD:3.0). Mean educational level was 14.6 (SD:2.4). Most participants were Caucasian (72%). Measures administered at baseline included RAVLT, TMT, Color-Word Interference Test from DKEFS, portions of WAIS-III, Logical Memory, BVRT, VFDT, BNT, COWAT and MMSE. Overnight polysomnography was used to assess SDB. Data was scored by a certified sleep technician. SDB was defined as apnea-hypopnea index, $AHI \geq 5$. Statistical analyses include descriptive statistics and linear regression.

Results: A significant association was found for RAVLT trial 5 ($p=0.02$), trial 1-5 ($p=0.05$) List B ($p=0.05$). A trend toward significance was found for the RAVLT delayed recall ($p=0.07$), RAVLT learning efficiency index score ($p=0.06$) and one contact score ($p=0.07$) for the Color Word Interference Test.

Conclusions: The results suggest that individuals who have both PTSD and SDB show a specific profile of neuropsychological deficits that is similar to the impairments seen in PTSD alone. Learning efficiency, effects of interference and delayed recall for auditory information may be impaired as well as executive functioning.

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S.K. MCCOY, B. COSLEY, L. SASLOW & E. EPEL. The Role of Social Rejection and Acceptance in Women's Cardiovascular, Neuroendocrine, and Psychological Response to Acute Stress.

Objective: We examined the role of social acceptance and rejection in women's parasympathetic nervous system (respiratory sinus arrhythmia, RSA), sympathetic nervous system (α -amylase, sAA), hypothalamic-pituitary-adrenal axis (cortisol) and psychological reactivity to an acute stressor. We hypothesized that social acceptance would ameliorate the malignant effects of an acute stress task.

Participants and Methods: Women ($N = 58$), recruited from the community, participated in a 20min version of the Trier Social Stress Task (TSST; Speech, Interview, Math) during which the evaluators of the task were either supportive (social acceptance) or unsupportive (social rejection). Cardiovascular (RSA via EKG, ICG) and neuroendocrine (salivary cortisol and α -amylase) reactivity were monitored. Following the task, women rated their perceived stress.

Results: Consistent with predictions, women rated the social rejection condition as significantly more stressful than the social acceptance condition. Women in the social rejection condition had significantly lower RSA (during speech), higher cortisol (20min post stressor) and lower amylase (20min post stressor onset) than women in the social acceptance condition. This pattern continued into recovery with women in the social rejection condition maintaining significantly higher cortisol (80min post stressor) than women in the social acceptance condition and failing to return to baseline levels of RSA (15min post stressor). No differences by stressor condition were found in amylase recovery (80min post stressor).

Conclusions: Consistent with hypotheses, given the same stressor, social acceptance led to less malignant stress reactivity than social rejection. Correlations among psychological, cardiovascular and neuroendocrine responses to acute social stress, as well as, implications for brain-behavior relationships are discussed.

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J.M. MONTIEL, A.G. CAPOVILLA, G. TORTELLA & N.M. DIAS. Neuropsychological Assessment of Attention, Language and Personal Adjustment in Panic Disorder.

Objective: Panic disorder (PD) is a kind of anxiety disorder characterized by episodes of recurring and unpredictable panic attacks, and has been attributed to a biochemical unbalance of dopamine and norepinephrine neurotransmitters in brain. Neuropsychological assessment may help identify the neuroanatomic substrate of some of psychological functions involved. In this study language, attention and personal adjustment of PD patients were assessed by means of a number of instruments. The study aimed at characterizing psychological functioning of PD patients.

Participants and Methods: The study compared 20 PD patients and 20 non-PD participants in a number of instruments: Anamnesis, Beck Anxiety Inventory, Panic and Agoraphobia Scales, Beck Depression Inventory, Social Adaptation Scale, Canceling Test, Computerized Stroop Test (neutral and emotional forms), Boston Naming Test, Computerized Naming Test, Verbal Fluency Test, Peabody Picture Vocabulary Test, and Non-Verbal Intelligence Test.

Results: Results showed significant differences between PD patients and non-PD participants in both personal adjustment and attention. PD patients presented greater interference effects in Computerized Stroop Test (emotional form only). Stroop Test performance of PD patients was significantly more disturbed by negative stimuli than that of non-PD participants. Results also showed evidence of convergent validity among tests aimed at assessing related constructs. Factorial analyses corroborated the hypothesis of three psychological dimensions: attention, language and personal adjustment.

Conclusions: This study offered corroborative evidence of the existence of deficits in attention and personal adjustment in PD patients, contributing to stress the importance of instruments devoted to assessing attention and personal adjustment in the clinical evaluation of panic disorder.

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S.D. SMITH, B. ABOU-KHALIL & D.H. ZALD. Post-Traumatic Stress Disorder in a Patient With No Left Amygdala.

Objective: Neuroimaging studies have shown that the right amygdala is more involved than the left amygdala in mediating many symptoms associated with post-traumatic stress disorder (PTSD). Consistent with this asymmetrical view of amygdalar activity, we present data from a unique patient who developed PTSD two years after the removal of her left amygdala.

Participants and Methods: Patient CD underwent a surgical resection of her left amygdala and anterior hippocampus to alleviate the symptoms of pharmacologically intractable epilepsy. Two years post-surgery, CD was seriously injured after being struck by a car; she soon developed PTSD symptoms including re-experiencing the trauma, avoidance of stimuli and situations related to the accident, and heightened arousal. CD, along with 9 matched control participants, completed two experimental tasks designed to test whether stimuli associated with her accident would modulate attention in a manner similar to that of traditional emotional stimuli. Participants completed (1) an emotional-Stroop task, which measures the degree of interference caused by emotional words, and (2) an emotional-attentional-blink (AB) task, which assesses whether an emotional distractor stimulus can impair detection of a neutral target.

Results: CD showed substantial emotional modulation of attention in both tasks. Her reaction times in the emotional-Stroop task were 2.5 standard deviations above the norm. In the AB task, her accuracy was 2 standard deviations lower than that of controls.

Conclusions: The current case study supports this asymmetrical view of amygdalar functioning, and suggests that the asymmetry may be great enough that PTSD can occur in the absence of the left amygdala.

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F. WOON & D.W. HEDGES. Premorbid Brain Volume Estimates and Reduced Total Brain Volume in Adults with Posttraumatic Stress Disorder: A Meta-Analysis.

Objective: Total intracranial volume (TICV) reaches maximum growth by early adolescence and provides an estimate of premorbid brain size. Little work has directly examined total brain volume (TBV) in post-traumatic stress disorder (PTSD), although limited evidence suggests that brain volume deficits may occur. The primary objective of this study was to meta-analytically determine whether TBV and TICV differ between adult PTSD subjects and controls.

Participants and Methods: Using the electronic databases, we systematically identified articles containing TBV and TICV data for adult PTSD subjects. MRI volumetric studies containing the following data were obtained: TBV or TICV measurements in adults with PTSD and one trauma-exposed or trauma-unexposed control group, or both. Data were extracted independently by two researchers and effect sizes were calculated.

Results: We identified 11 studies with TBV data (149 PTSD subjects and 162 trauma-unexposed controls) and 4 studies with TICV data (49 PTSD subjects and 72 trauma-unexposed controls). TBV was significantly smaller in PTSD subjects compared to trauma-unexposed controls (11 effect sizes; Hedges' $g = -0.313$; $p = 0.005$). In contrast, TICV did not differ between these groups (4 effect sizes; Hedges' $g = -0.292$; $p > 0.05$). There were no significant differences in TBV between PTSD and healthy but trauma-exposed controls (7 effect sizes; Hedges' $g = -0.208$; $p > 0.05$).

Conclusions: TBV is significantly smaller in adult PTSD subjects compared to healthy, trauma-unexposed controls. TICV did not differ significantly between these groups, suggesting a deficit in TBV occurred at some point after the attainment of maximum brain volume in the PTSD group.

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Psychopathology: Depression

M.R. BASSO, T. WARD, C. GHORMLEY, N. LOWERY, D. COMBS, R. PURDIE & R.A. BORNSTEIN. Depressive Dimensions and Neuropsychological Impairment.

Objective: Major depression appears to be a heterogeneous construct, and homogenous subgroups of patients may be clustered according to depressive, anxious, and activation symptoms (Biondi et al., 2005; Goldberg, 2000). Although these dimensions appear robust, their correspondence with cerebral dysfunction is uncertain. Accordingly, the present study examined the relationship between the symptom dimensions and neuropsychological performance among depressed inpatients.

Participants and Methods: Inpatients with no history of neurological illness participated. 96 were diagnosed with major depression and 32 were diagnosed with major depression with psychotic features. Diagnoses were made by boarded psychiatrists at a teaching hospital.

Patients were administered digit span, California Verbal Learning Test (CVLT), COWAT, Trailmaking Tests A & B, and the grooved pegboard test (dexterity). Additionally, to assess severity of psychiatric symptomatology, the MMPI-2 was administered. All tests were administered according to standardization instructions.

Results: MMPI-2 clinical scales were factor analyzed, and depression, anxiety, and activation factors emerged similar to Biondi et al. (2005). Factor scores for the three symptom dimensions served as independent variables in multiple regression analyses, as did age, education, and sex. Depression and anxiety accounted for impaired scores across the battery, but activation did not. Semi-partial correlations ranged from .2 to .3, implying a modest relationship between self-reported distress and neuropsychological function.

Conclusions: Depressive and anxious symptoms are morbidity risks for neuropsychological impairment, whereas activation is not. The neural substrates of depression and anxiety are weakly understood, but involvement of frontal lobes, basal ganglia, and temporal-limbic structures has been hypothesized (Shelline, 2003). These data appear consistent with this assertion.

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J. BEDNARK & S.A. ROGERS. The Relationship between Subgroups of Geriatric Depression and Executive Functions.

Objective: Researchers have found that geriatric depression is linked to deficits in attention, processing speed, and executive functions. However, research has not looked at the way attention and executive functioning relates to particular symptoms of geriatric depression. This study breaks down geriatric depression into three subgroups (emotional, physical, and cognitive symptoms) to better understand how they relate to attention, processing speed, and executive functions.

Participants and Methods: 37 non-neurological older adults, ages 56-94, voluntarily completed a comprehensive neuropsychological battery. Domain scores were calculated by averaging z-scores for individual subtests within each domain. The Geriatric Depression scale was coded into cognitive, physical, and emotional subgroups by three raters (ICC = 0; all Cronbach's alphas > .61).

Results: Attention, executive functioning, and processing speed were all negatively correlated with overall depression (all $ps < .05$). Attention and processing speed were both correlated with each of the three subscales of depression ($ps < .05$); executive function was negatively correlated with emotional and physical symptoms of depression ($ps < .05$), but not the cognitive symptoms. Post-hoc analyses of individual executive subtests showed that each subscale of depression had the strongest relationship with Stroop C and Letter-Number Sequencing, but not WAIS-III Similarities or Trails B.

Conclusions: Overall, there are significant depression-related declines in executive function, attention, and processing speed. Each type of depression is related to attention and processing speed, but executive functioning seems especially tied to emotional and physical features. This may be particularly related to reduced scores on tests of inhibition and working memory. These results will allow for a more accurate representation of cognitive decline in geriatric depression and help improve the detection and discrimination of cognitive decline in depressed geriatric patients.

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R.K. BHALLA, M.A. BUTTERS, H. AIZENSTEIN, C.F. REYNOLDS & J.T. BECKER. Reduced Volume of the Middle Cingulate Gyrus Predicts Cognitive Dysfunction in Late Life Depression.

Objective: Late-life depression (LLD) is associated with structural brain abnormalities and cognitive impairment. The purpose of this study was to identify brain regions that predicted cognitive diagnosis (normal or impaired) in elderly depressed subjects following treatment response.

Participants and Methods: Thirty-eight subjects, age 65 and older, with a history of non-psychotic unipolar major depression underwent comprehensive neuropsychological testing and structural MRI following treatment response. Subjects were diagnosed as cognitively normal or impaired (MCI or dementia). High-resolution T1-weighted brain MRIs were processed using an automatic labeling pathway technique. We first examined bivariate correlations to identify candidate regions that were highly related to cognitive diagnosis. We then selected 6 regions – inferior frontal, cingulate, and hippocampus (right and left sides) – and used logistic regression to predict presence or absence of cognitive impairment.

Results: After controlling for age, gender, and race, only the volume of the left middle cingulate gyrus (CG) was associated with impaired cognitive functioning. When the volume of the CG was dichotomized based on the 95% CI, the risk of impairment was 2.72 times more likely among depressed subjects with atrophic left middle CG. The volume of the CG was not related to total lifetime duration of depression, but there appears to be a complex relationship among age, duration of depression, cardiovascular disease and cingulate volume.

Conclusions: The left middle sub-region of the cingulate gyrus best predicts cognitive impairment following treatment response in LLD. Other studies have found lower CG volumes in LLD, particularly for subjects with later lifetime onset of depression. To our knowledge, this is the first study to examine which sub-region of the CG may be responsible for cognitive impairment in LLD.

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L.T. FIKKE, M.I. FIKKE, N.I. LANDRØ & E. WALDERHAUG. Cognitive Vulnerability as a Predictor of the Mood-Lowering Effect of Rapid Tryptophan Depletion (RTD).

Objective: Alterations in the serotonin (5-HT) system are implicated in the pathophysiology of depression. However, its interaction with dysfunctional cognitions in the development of depression remains unstudied. Females are found to have higher prevalence rates of depression, slower rates of serotonin synthesis and higher degrees of dysfunctional cognitions than men. The main objective of this study was to investigate whether there is an interaction between an experimentally induced lowering of serotonin neurotransmission and dysfunctional cognitions in the prediction of depressed mood. Also, a potential influence of sex on this interaction was investigated.

Participants and Methods: A between-subjects, double blind experimental design was used. Eighty-four healthy students (mean 24.5 years) without a recent psychological disorder were randomized to sham depletion or rapid tryptophan depletion (RTD), the method used to induce decreased serotonin neurotransmission. Prior to the manipulation, dysfunctional cognitions were measured by the Automatic Thoughts Questionnaire-30 (ATQ-30). Depressed mood was assessed with the depression subscale of the Profile of Mood States (POMS) after the experimental intervention.

Results: An interaction between decreased serotonin neurotransmission and dysfunctional cognitions in the prediction of depressed mood was found at trend-level. There was no significant interaction effect involving sex. However, when analysing the interaction in subsamples of males and females, a significant effect was found for males only.

Conclusions: The results indicate an interaction between decreased serotonin neurotransmission and dysfunctional cognitions in the prediction of depressed mood. As this study was intended to serve as a model for depression, the mechanisms may apply to clinical depression.

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E.I. FRANCHOW, Y. SUCHY & M. KRAYBILL. Motor Programming Deficits in Depressed Elderly: the Effects of Novelty and Complexity.

Objective: Conflicting evidence exists regarding the relationship between depressive affect and motor programming (MP) performance in elderly populations. While some recent studies have failed to find a relationship between negative emotional states and motor performance in elderly populations, others have demonstrated that depressive affect leads to prolonged initiation and slower movement speeds. The current study investigates whether the effects of task novelty and complexity may explain these inconsistencies in the literature.

Participants and Methods: Fifty community-dwelling adult participants ages 60 and older (mean = 75.36 years) completed the 30-item Geriatric Depression Scale (GDS) and the Push-Turn-Taptap (PTT) task from the Behavioral Dyscontrol Scale- Electronic Version (BDS-EV). We compared depressed (GDS score >9) and non-depressed elderly on three aspects of performance on the PTT task (i.e., initiation/planning, learning/accuracy, and motor speed), examining novel, complex, and intermediate trials separately.

Results: Results showed significant interactions between depression and both task novelty and task complexity. In particular, as compared to non-depressed participants, those with GDS scores of 10 or greater exhibited longer initiation times, but only on trials that were either novel or complex [$F(1,48)=5.90, P=.019$]; and a trend toward lower accuracy, but only on complex trials [$F(1,48)=3.88, P=.055$]. Depressed participants also showed slower motor speed overall, which was unaffected by task novelty or complexity [$F(1,48)=7.03, P=.011$].

Conclusions: The current research provides support for the effects of novelty and complexity on the relationship between psychomotor retardation and depression.

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M. GORLYN, J.G. KEILP, M.F. GRUNEBaum, M.E. RUSSELL, A.K. BURKE, M.A. OQUENDO & J.J. MANN. Working Memory Performance Predicts Short-Term Antidepressant Treatment Response in High Suicide Risk Patients with MDD.

Objective: Recent studies suggest that cognitive impairments in patients with Major Depressive Disorder (MDD) are associated with a less favorable treatment outcome using modern antidepressant medications. In an SSRI-treated pilot sample, we previously demonstrated that poorer global cognitive functioning and specific working-memory deficits predicted depression non-remission. Here, we conducted a preliminary analysis of an ongoing controlled treatment study (blind unbroken) to examine whether the same neurocognitive markers are exhibited by non-remitting suicidal MDD patients.

Participants and Methods: Patients met DSM-IV criteria for MDD with histories of suicide attempt and/or current ideation. Prior to treatment, eight cognitive domains were assessed and scores adjusted for age and education. Mean of the domains was used as an index of global cognitive functioning. Treatment remission was evaluated (≤ 10 on 24-item HDRS) after 2-months double-blinded treatment with paroxetine or bupropion.

Results: Remitters (N=12) and non-remitters (N=12) were similarly depressed at baseline. Groups did not differ in degree of overall cognitive functioning. Across domains, only working-memory approached significance even when controlling for depression severity ($F(1,21)=3.79, p=.065$). Non-remitters had significantly lower scores on the same timed reasoning task that distinguished non-remitters in our prior study ($F(1,21)=9.99, p=.005$).

Conclusions: Performance on working-memory tests that demand speeded mental manipulation can predict the short-term trajectory for mood symptoms in suicidal depressed patients receiving newer psy-

chopharmacological agents. Poor working-memory may relate to neurobiological differences of the presenting illness and guide treatment planning for this high-risk group. Neuropsychological testing can be a useful tool to evaluate the neurocircuitry of MDD and inform exploration for pharmacogenetic endophenotypes.

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G.L. IVERSON, B.L. BROOKS & A.H. YOUNG. A Short Form of CNS Vital Signs for Use in Depression.

Objective: The purpose of this study is to illustrate a methodology for identifying neurocognitive impairment using a short form of a computerized testing battery.

Participants and Methods: Participants were 100 adult patients with depression who were not on antidepressants. They were individually and carefully matched on age, education, gender, and ethnicity to 100 healthy adult control subjects. All participants completed CNS Vital Signs, a computerized assessment battery that takes approximately 30-35 minutes to administer. A short form of the battery, that takes approximately 10 minutes to complete, was derived utilizing only three of the seven tests: Finger Tapping, Stroop, and Shifting Attention. The Stroop Test and the Shifting Attention Test yield scores that are combined into two domain scores: Reaction Time and Cognitive Flexibility.

Results: Patients with depression performed significantly more poorly than controls on the two domain scores (Cohen's d were $d=.37$ and $.54$, respectively). When using one or more scores below the 5th percentile as the cutoff for neurocognitive impairment, 37% of the depressed sample and 12% of the control sample scored in this range [$\chi^2(1)=16.89$, $p<.001$; Odds Ratio=4.3, 95% CI=2.1-8.8]. When using one or more scores below 2SDs as the cutoff for impairment, 28% of the depressed sample and 8% of the control sample scored in this range [$\chi^2(1)=13.55$, $p<.001$; OR=4.5, 95% CI=2.0-10.2].

Conclusions: This abbreviated computerized battery measures aspects of attention, speed of processing, and cognitive flexibility. A subset of patients with depression perform in the impaired range on this rapidly-administered short form.

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S. MACKIN, E. GILLUNG, N. DUFFY & P. AREAN. Cognitive and Psychiatric Predictors of Financial Capacity in Older Adults.

Objective: The objective of this study is to delineate the relative contribution of specific cognitive impairments and depression on a commonly utilized measure of financial capacity.

Participants and Methods: Data was collected from 58 ethnically diverse older adults. Cognitive functioning was evaluated utilizing a comprehensive neuropsychological battery and 5 cognitive domain index scores (memory, information processing speed, abstract reasoning, visuospatial, language) were calculated using age and education matched normative data. Cognitive impairment was defined as performance falling below the 10th percentile. Financial capacity was assessed utilizing the Independent Living Scales (ILS) Managing Money scale and age corrected scaled scores were calculated for each participant. Depression status was assessed by licensed psychologists utilizing the Structured Clinical Interview for the Statistical Manual of Mental Disorders (SCID).

Results: Impairment in at least one cognitive domain was demonstrated by 62% of the sample and deficits were well distributed among cognitive domains. Fifty-two percent of the sample met criteria for depression and 33% of the sample demonstrated impaired performance on the

ILS. Depressed individuals scored significantly lower on the ILS than non-depressed individuals, $F(5,43) = 4.87$, $p = .002$, however a logistic regression utilizing five cognitive domain scores and depression status demonstrated that only impairment of abstract reasoning was a significant predictor of performance on the ILS ($6,43) = 3.93$, $p = .006$.

Conclusions: Preliminary data from an ongoing study suggests that impaired financial capacity in older depressed adults is likely due to impairments in abstract reasoning more so than other cognitive impairments or depressed mood.

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S.M. MCCLINTOCK, C.M. CULLUM, M.M. HUSAIN, B. LUBER & S.H. LISANBY. Rapid Recovery of Orientation Following Magnetic Seizure therapy.

Objective: Magnetic Seizure Therapy (MST) is a novel neurostimulation technique to treat severe, major depressive disorder (MDD). Preliminary animal and human research indicate that individual MST treatments result in limited cognitive effects. This is the first study to examine time to orientation and its relation to cognitive effects of a complete, acute MST course.

Participants and Methods: Twenty patients meeting DSM-IV-TR criteria for MDD received acute course MST in this two-center, double-masked, randomized, trial. Clinical diagnostics and neuropsychological measures of orientation, memory, and global cognitive function were obtained at baseline and follow-up. Correlational and regression analyses were computed to explore associations between demographic and clinical characteristics, time to orientation, and cognitive function. Repeated measure ANOVAs and post hoc paired-sample t-tests were computed to compare pre- and post- treatment functioning.

Results: Following 9.0 ~ 2.8 MST treatments, mean time to orientation was 3.9 minutes (SD=2.5). The MMSE showed no change pre-versus post-treatment ($\Lambda=.94$, $F(2, 16)=.51$, $p=.61$). No relationship was found between time to orientation and number of treatments ($r=-.35$, $p=.14$), depression severity ($r=.163$, $p=.49$), or age ($r=.27$, $p=.25$). Also, time to orientation did not predict performance on the MMSE ($R^2=.079$, $F(1,18)=.114$, $p=.74$) or the Autobiographical Memory Interview-Short Form (AMI-S; $R^2=.008$, $F(1, 18)=.148$, $p=.71$). Regarding retrograde amnesia, performance minimally improved on the Goldberg Remote Memory Questionnaire ($\Lambda=.60$, $F(2, 16)=5.3$, $p=.02$); however, performance on the AMI-S decreased ($\Lambda=.19$, $F(2, 16)=34.8$, $p<.0001$).

Conclusions: Overall, MST was unrelated to time to orientation and had no effect on global cognitive function. Time to orientation was unrelated to the number of MST treatments, demographic characteristics, and neurocognitive performance. The MST associated neurocognitive effects warrant further investigation with different MST parameters.

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A. ZAKEM, J. LEE & L.A. BIELIAUSKAS. Lack of Memory Impairment in Depressed VA Medical Inpatients.

Objective: Research has shown that individuals with psychiatric depression demonstrate decreased performance on learning and memory tests. However, mediating factors need to be considered, including age and age of onset of depression, premorbid level of cognitive function, and effort and motivation. The present study examined memory performance in VA medical inpatients, using a commonly used memory measure, the Hopkins Verbal Learning Test-Revised (HVLT), taking into account effort, general mental status, age, and estimated IQ.

Participants and Methods: Fifty-seven adult inpatients who met the DSM-IV criteria for Major Depressive Disorder and one hundred eighty-six medical control inpatients were included in the study. All included

patients scored greater than 8 on the Rey Fifteen Item Memory Test and greater than 23 on the Mini Mental State Examination. The groups were equivalent in mean age (Depressed Group Mean Age = 60.46; Control Group Mean Age = 63.47) and estimated IQ (Depressed Group Mean IQ = 94.12; Control Group Mean IQ = 96.80). All parts of the HVLT were administered as part of a neuropsychological battery.

Results: Results indicated no significant difference between the two groups on all measures of HVLT whether or not age was used as a covariate.

Conclusions: Despite documentation of decreased memory performance in depressed patients, the findings of the present study show no demonstrable memory decline in depressed VA medical inpatients compared to non-depressed VA medical patients when confounding factors such as effort, general mental status, and age are taken into account.

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V. ZIZAK, R.G. GOMEZ, J. KELLER, C. BULLOCK, C.H. COHEN, J. HEITZMANN, D. MARSHALL, A. CHE, O. ROSITO & A. SCHATZBERG. The Relationship of Depression Severity on Executive Function Using the D-KEFS Design Fluency Task.

Objective: Previous studies have shown that patients with Major Depressive Disorder (MDD) display neuropsychological impairments such as deficits in executive functioning (Gomez et al., 2006, Merriam et al., 1999, & Schatzberg et al., 2000). However, sparse research has administered the D-KEFS to investigate executive function in MDD patients. To elucidate previous research findings we examined the relationship between depression severity and executive function performance on the D-KEFS Design Fluency Task in patients diagnosed with MDD. We hypothesized that depressed patients would perform poorer on all three conditions (Filled Dots, Empty Dots, and Switching) of Design Fluency. The Switching condition was predicted to have the largest relationship due to its high involvement of executive functioning processes (fluency plus switching).

Participants and Methods: This study included 36 MDD patients. All patients were administered the Design Fluency task and the 24-Item Hamilton Depression Rating Scale (HAM-D).

Results: As expected, inverse correlations were found between the HAM-D Total Score and Filled Dots and Empty Dots on Design Fluency ($r = -.408$, $p = .013$; $r = -.461$, $p = .005$, respectively). However, no significant correlations were found between depression severity and Switching performance. This latter non significant finding may be explained by restriction of range. The Switching task may be difficult for everyone, thus resulting in a possible floor effect.

Conclusions: Overall, the results suggest that executive function may be disrupted in MDD patients especially as depression severity increases. However, with a very difficult executive functioning task, there may be no additive decrements due to depression severity.

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Psychopathology: Schizophrenia

B.A. BEENKEN, I. TORRES, S. KEEDY, M. MARLOW-O'CONNOR, R. ERWIN & M. GOLDMAN. Reductions in measures of learning and organizational ability in schizophrenia patients with polydipsia and hyponatremia.

Objective: It is thought that schizophrenia patients with polydipsia and hyponatremia (PHS) have worse cognitive functioning than normonatremic schizophrenia (NS) patients (Emsley et al., 1993). Volumetric

reductions have also been found in the anterior hippocampus (Goldman et al., 2007), a region richly connected with the frontal lobe (O'Donnell & Grace, 1998). Since the frontal lobe is also responsible for learning, organization, and susceptibility to interference, we hypothesized that measures reflecting these abilities would be reduced in PHS patients compared to polydipsic normonatremic (PNS) and nonpolydipsic normonatremic (NS) patients and controls.

Participants and Methods: It was hypothesized that PHS patients would show the greatest reductions in the following CVLT-II measures: Learning Over Trials, Retroactive Interference, Subjective Clustering, Semantic Clustering, and Serial Clustering. These measures were obtained for 8 polydipsic hyponatremic (PHS) patients, 10 nonpolydipsic (NS) patients, 10 polydipsic normonatremic (PNS) patients, and 14 healthy controls (HC), with predicted performance from least to greatest in that order. Correlations between hippocampal volumes and cognitive measures were performed for subjects with MRI scans.

Results: The hypotheses were partially supported in that PHS patients performed worse than the remaining groups at trend or significance level for the following measures: CVLT-II Learning Over Trials, Subjective Clustering, and Semantic Clustering. There were significant differences between healthy controls and PNS patients on all measures except Serial Clustering. Contrary to expectation, PNS patients had generally lower scores than NS patients, who typically performed more poorly than controls.

Conclusions: This study provides further evidence of cognitive difficulties in schizophrenia patients, particularly those with polydipsia and hyponatremia.

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R. CARLSSON, H. NYMAN, G. GANSE & J. CULLBERG. Neuropsychological Aspects on First-Episode Psychosis in Predicting Long-term Outcome.

Objective: To examine neuropsychological performance as a possible predictor of long-term outcome in first-episode psychotic patients, and to test the validity of a composite measure of clinical, social and functional variables, The Comprehensive Outcome Level in Psychosis (COLP).

Participants and Methods: In the Swedish Parachute-project, a group of consecutive patients with first-episode psychosis ($n=97$), diagnosed according to DSM IV at baseline as having either a schizophrenia syndrome or a non-schizophrenia psychosis syndrome, were examined by the neuropsychological version of WAIS-R at admission. The test-results were studied in relation to data from the five year follow-up, by means of ratings of psychopathology (BPRS) and Global Assessment of Functioning (GAF) and scoring of social networks, and were compared to outcome by means of COLP.

Results: Patients with schizophrenia syndromes performed one SD below normative data on Full Scale IQ and on Performance IQ (PIQ), but there were no significant differences between the both patients groups.

At year five a general improvement on GAF and decrease in symptoms was seen in most patients. Higher ratings on GAF, showed significant better results for Verbal IQ (VIQ) ($p = .005$) and PIQ ($p = .001$); and in relation to somewhat older age ($p = .036$).

Patients divided into the four levels of COLP showed significantly different results at the baseline testing with VIQ ($p > .001$) and PIQ ($p > .001$). For all analyses post hoc revealed a significant better result on Level 1, in relation to Level 2, 3 and 4.

The neuropsychological results will be discussed in relation to premorbid functioning, duration of untreated psychosis and the effect of medication status, gender, age and education, as well as the relevance for various outcomes.

Conclusions: Low level of cognitive functioning at admission in first-episode psychosis was found to predict long-term non-favourable outcome by means of COLP. COLP may also be useful to better describe patients in remission.

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C. DEFREITAS, R.J. MEAR & I.J. TORRES. Self-Monitoring, Proprioception, and Symptoms of Schizophrenia.

Objective: Frith and others have presented evidence suggesting that auditory hallucinations, delusions of thought insertion, and delusions of control are the result of a self-monitoring deficit. However, past studies supporting this link have not adequately isolated self-monitoring and proprioceptive abilities. The current study employed novel tests of self-monitoring and proprioception in order to tease apart their unique contributions to the production of the above-mentioned symptoms.

Participants and Methods: Twenty-four patients with schizophrenia or schizoaffective disorder (14 with the above-mentioned symptoms and 10 without) and 12 healthy controls matched on age, gender, and parental education, completed a self-monitoring task shown to be independent of proprioceptive ability (Grip Force Matching), as well as tests of proprioception.

Results: Between groups ANOVAs were conducted in order to test for significant differences in performance between patients with the symptoms of interest, patients without the symptoms of interest, and healthy control participants. Analysis revealed that patients with auditory hallucinations, delusions of thought insertion, and delusions of control performed at the same level as other patients with schizophrenia and healthy controls on tests of proprioception and self-monitoring.

Conclusions: The lack of association between Grip Force Matching and symptoms of interest in the current study appears inconsistent with the self-monitoring theory of schizophrenia. Moreover, these data suggest that previously reported associations between self-monitoring ability and symptoms of schizophrenia do not result from a proprioceptive deficit. An information processing bias in patients with the symptoms of interest may better account for current and past findings.

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V.G. DEFREITAS, H. KRISTINSSON, G. MOLINA & A.E. THORNTON. Language Lateralization and the Symptoms of Schizophrenia.

Objective: Language lateralization is often attenuated in schizophrenia, and various symptomatologies may predict differential patterns of aberrant laterality. Past research has primarily focused on the role of positive symptoms in abnormal lateralization. Given recent suggestions of the utility of a three-symptom approach (psychomotor poverty, reality distortion, and disorganization), we aimed to clarify the unique contribution of each symptom dimension to laterality patterns.

Participants and Methods: Thirty-three inpatients with schizophrenia spectrum disorder completed a conventional verbal dichotic listening task with consonant-vowel syllables. Symptom ratings were assessed using the Signs and Symptoms of Psychotic Illness (SSPI). Participants were further screened for right-handedness, phoneme discrimination, hearing acuity, and mood symptoms.

Results: Pearson Product Moment Partial Correlations were computed between symptoms and the laterality index, right ear accuracy, left ear accuracy score, and total accuracy, while controlling for the effects of other symptoms. Results revealed no significant relationships between laterality and symptom dimensions. There was, however, a significant association between higher disorganization and lower total accuracy

($r=-0.42, p=.017$), which appeared driven by a significant relationship between greater thought disorder and lower total accuracy ($r=-.41, p=.021$). Findings also revealed a trend for a relationship between lower total accuracy and greater flat affect, a symptom of psychomotor poverty ($r=-.32, p=.075$).

Conclusions: In our sample, language laterality did not differ with varying symptoms. Overall task accuracy, however, decreased with greater levels of flat affect and symptoms of disorganization, notably thought disorder. This is consistent with findings of distractibility and impaired attention seen in schizophrenia patients with psychomotor poverty and disorganization.

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L.A. DUKE, D.N. ALLEN, S.A. ROSS, G.P. STRAUSS & S.J. BARNEY. The Neurocognitive Impairment Associated With Comorbid Schizophrenia and PTSD.

Objective: This is the first study to utilize a comprehensive neuropsychological battery to examine the influence of PTSD on schizophrenia. It was hypothesized that comorbid PTSD would be associated with greater neurocognitive impairment.

Participants and Methods: The current study examined this issue using a four-group design: controls ($n=26$), a PTSD group ($n=21$), a SZ group ($n=26$), and a SZ+PTSD group ($n=21$). Extensive interviews were conducted to assess psychiatric symptoms (SCID, SANS, SAPS, BPRS, CDS, and PCL-C). Next, a comprehensive battery of neuropsychological tests evaluating all major neurocognitive domains (motor function, attention, executive function, working memory, verbal memory, visual memory, emotional memory, and general intelligence) was administered.

Results: Results of neurocognitive tests indicated that the schizophrenia groups performed significantly worse than the Control and PTSD groups in all neurocognitive domains. While the differences were not significant between the comorbid group (SZP) and the schizophrenia only group (SZ), the SZP group performed approximately one standard deviation poorer than the SZ group on the Attention Domain, while the SZP group scored approximately one half of a standard deviation better than the SZ group on executive function and visual memory domain.

Conclusions: Results of this study do not support the idea that the presence of comorbid PTSD results in increased cognitive impairment in schizophrenia. In fact, the presence of PTSD in individuals with schizophrenia may be associated with slightly better performance in many neurocognitive domains. Results of this study do, however, suggest some areas of neurocognitive function to further investigate, including attention, executive function, and visual memory. In conclusion, while the presence of PTSD in individuals with schizophrenia is associated with a different pattern of psychiatric symptoms, PTSD may not significantly impact neurocognitive function in a consistent manner, if at all.

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M.J. EULER, R.A. YEO, D.A. HAMILTON, L.K. PARKS, M.A. MONNIC & R.J. THOMA. Neural Correlates of Developmental Instability in Healthy Adults and Patients with Schizophrenia.

Objective: Developmental Instability (DI), the imprecise expression of the species-typical developmental plan, negatively correlates with global cognitive functioning and is thought to represent a vulnerability factor in the etiology of schizophrenia. We hypothesized that increased markers of DI would predict abnormal patterns of brain structure and cognition.

Participants and Methods: Markers of DI (skeletal fluctuating asymmetry [FA], and minor physical anomalies [MPAs]) and intelligence were assessed in groups of 23 controls and 19 schizophrenia patients. Relationships with brain structure were investigated using voxel-based morphometry (VBM). General intelligence was derived from 11 neuropsychological tests.

Results: The schizophrenia group had increased FA and MPAs ($p < .05$). MPAs and FA were positively correlated in patients ($r(17) = .743, p < .001$), though not in controls. MPAs and FA were inversely related to intelligence in both patients and controls. Controlling for age, positive associations between both FA and MPAs and overall gray matter were detected, though this only reached significance in patients ($p < .05$). VBM analyses revealed regions of increased frontal gray matter volume associated with FA in controls ($p < .001$), though not in patients. Conversely, VBM detected several gray matter regions positively correlated with MPAs in patients but not in controls, the most significant of which was in right middle temporal gyrus ($p < .001$).

Conclusions: DI markers were evident in controls, elevated in schizophrenia, and inversely correlated with intelligence. Group differences in the relationship between FA and MPAs suggest that DI underlies different types of disruption in each group, resulting in different neurodevelopmental trajectories.

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L. FLASHMAN, R.M. ROTH, M. GARLINGHOUSE, J. PENDERGRASS, N. KOVEN, C. KRUCK & T. MCALLISTER. **Relationship between Unawareness of Illness and IQ Measures and Estimates in Individuals with Schizophrenia.**

Objective: Many patients with schizophrenia demonstrate unawareness of their illness, including difficulty identifying their symptoms and recognizing that they have a mental disorder. There have been several theories pertaining to the etiology of impaired awareness of illness in schizophrenia; recently increasing attention has been paid to a possible neurobiological basis. Several studies have found a modest inverse correlation between unawareness of illness and overall intellectual ability, although this finding has not been reported consistently.

Participants and Methods: We examined the relationship between several aspects of awareness and measures and baseline estimates of intellectual ability (VIQ, PIQ, FSIQ, Vocabulary, Block Design [BD], and WRAT Reading) in 74 patients with diagnoses of schizophrenia spectrum disorder. Awareness was assessed using the Schedule of Unawareness of Mental Disorders, a semi-structured interview which assesses several dimensions of awareness including awareness of illness, awareness of medication effects, awareness of social consequences, awareness of symptoms, and attribution of symptoms. Items are rated on a five-point likert scale, with 1 indicating full awareness and 5 indicating complete unawareness of a symptom.

Results: Results indicated that WRAT Reading significantly correlated with all aspects of awareness, while FSIQ correlated with awareness of illness, awareness of consequence of having an illness, and misattribution. Awareness of the social consequences of having a mental illness was also correlated with vocabulary, BD, VIQ and education level.

Conclusions: The data suggests that intellectual ability and baseline estimates of intellectual ability are related to the type of awareness being assessed, adding further support to the multidimensional nature of unawareness in mental illness.

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M.A. GARLINGHOUSE, L. FLASHMAN, R.M. ROTH, J. PENDERGRASS, N.S. KOVEN, C.L. KRUCK, A.J. SAYKIN & T.W. MCALLISTER. **Evidence for Neural Involvement consistent with Anosognosia in Unawareness of Illness in Individuals with Schizophrenia.**

Objective: Many patients with schizophrenia demonstrate unawareness of their illness (i.e., difficulty identifying their symptoms or recognizing that they have a psychiatric illness). It has been noted that unawareness of symptoms in neurological disorders (i.e., anosognosia) is similar in nature to unawareness in schizophrenia. Anosognosia has often been associated with lesions in the right parietal lobe and bilateral frontal lobes. Consistent with this model, there is evidence to suggest a relationship between unawareness of illness in schizophrenia and neuropsychological deficits of the frontal and parietal lobes.

Participants and Methods: We examined the relationship between unawareness of illness, and structural and cognitive measures of frontal and parietal lobe in 70 patients with schizophrenia spectrum disorder. Awareness was assessed using the Schedule of Unawareness of Mental Disorders, a semi-structured interview/scale which assesses several dimensions of awareness.

Results: Greater unawareness of illness was associated with smaller right parietal lobe volume (after adjusting for total intracranial volume). In addition, we found significant correlations between awareness and several measures of frontal/executive function (e.g., DKEFS Trails, Cognitive Estimation Test) for the subgroup of patients where data was available ($N=39$), which were also correlated with frontal lobe volumes.

Conclusions: The data provide further evidence for a neural basis for unawareness of illness in schizophrenia consistent with a model of anosognosia.

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K. GODDARD, S. PURDON & P. TIBBO. **The Assessment of Obsessive-Compulsive Symptoms in First Episode Psychosis: A Comparison of Self-Report versus Clinician-Rated Instruments.**

Objective: Obsessive and compulsive symptoms (OCS) are frequently reported in psychotic disorders. The Yale-Brown Obsessive Compulsive Scale (YBOCS) is a clinician-rated measure widely used in the assessment of OCS; it has high interrater reliability, and good convergent validity and sensitivity to treatment effects in obsessive compulsive disorder samples. It is unclear whether these psychometric properties extend to psychosis populations, as applications of the YBOCS in psychosis samples yields a large range of scores across studies. We compared the YBOCS to a self-report measure of OCS (Clark Beck Obsessive Compulsive Inventory (CBOCI)), and examined the concurrent validity between the two instruments for the level of severity and the presence/absence of OCS symptoms.

Participants and Methods: 39 patients with first episode psychosis completed the YBOCS and the CBOCI as part of a comprehensive diagnostic and neuropsychological unmedicated baseline evaluation.

Results: 13% of the sample met DSM-IV criteria for OCD. The average YBOCS score of the sample was 4.4 while the average CBOCI score was 22.9 suggesting minimal and mild levels of OCS, respectively. The CBOCI identified 94.9% of the sample as having some OCS compared with 54.1% on the YBOCS, with 50.6% total agreement for the presence/absence of any OCS. Across levels of severity, the CBOCI identified more cases at higher levels of severity relative to the YBOCS, with only 12/39 (30.7%) cases in agreement.

Conclusions: The YBOCS consistently underestimated the presence and severity of OCS symptoms compared to the CBOCI. Self-report measures may more accurately capture OCS in first episode psychosis.

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K. GODDARD, S. PURDON & P. TIBBO. Low and Stable CPT D-prime Scores Differentiate First Episode Schizophrenia from Substance Induced Psychosis.

Objective: Attentional dysfunction indexed by CPT d-prime scores is well documented in premorbid, acute, and chronic schizophrenia, and among family members at high risk for the illness. CPT d-prime scores may offer a sensitive endophenotypic marker for schizophrenia-spectrum disorders, but the specificity of the deficit relative to non-schizophrenia spectrum psychotic disorders has not been confirmed. This study compared d-prime scores in a group of first-episode schizophrenia (FES) and substance-induced psychosis (SIP) patients, and examined changes in performance across time.

Participants and Methods: Within a comprehensive clinical and neuropsychological unmedicated baseline examination, 51 FES patients and 31 SIP patients completed three CPT tasks (CPT-AX, CPT-IP (2 digits), and CPT-IP (4-digits)). Follow up assessments were undertaken 9 and 27 weeks after random assignment to treatment with risperidone, quetiapine, or olanzapine.

Results: The FES group had significantly lower d-prime scores on all tasks across evaluations relative to the SIP group. D-prime scores were significantly better for the SIP group at the 27 week evaluation compared to baseline, while scores did not differ across assessments for the FES group, despite significant symptomatic improvement by 9 weeks of treatment for both groups.

Conclusions: Consistent with the contention that poor sustained attention may represent a valid endophenotype for schizophrenia, low and stable CPT d-prime scores differentiated first episode schizophrenia from substance-induced psychosis

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J. HORWITZ, K.H. KARLSGODT, C.E. BEARDEN, T.G. VAN ERP, K.H. NUECHTERLEIN & T.D. CANNON. Regional Brain Physiology of Working Memory and Clinical Presentation in Recent Onset Patients with Schizophrenia.

Objective: Patients with schizophrenia demonstrate dysregulation of functional activation during working memory processing. Specifically, we have previously shown that high-performing patients may hyper-activate and low-performing patients hypo-activate when compared to controls. However, although it is hypothesized that this dysregulation may be implicated in symptomatology, it remains unclear how these activation differences relate to the clinical presentation of the disease.

Participants and Methods: The relationship between these changes in working memory processing and the severity of clinical presentation is examined in thirteen recent-onset patients with schizophrenia using partial least squares, a multivariate statistical technique that selects underlying latent variables based on the covariance between two blocks of variables. In this case, we examined clinical variables and fMRI activation during a verbal working memory task.

Results: Increased activation across the working memory network was found to covary with role functioning, social functioning, negative and disorganized symptoms. Specifically, greater activation in left frontal and parietal regions was associated with fewer symptoms and better role functioning, while less activation in right frontal areas was associated with better social functioning.

Conclusions: These results are consistent with prior neuropsychological research, but extend these findings to suggest that the severity of negative and disorganized symptoms and level of social and role functioning are related to the severity of physiological disruption during working memory processing in schizophrenia.

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A.R. KAUP, B.W. PALMER, E.R. SAKS & L.B. DUNN. Decisional Capacity to Consent to Research in Psychosis: An Analysis of Errors.

Objective: Despite available literature on decision-making capacity (DMC) in psychosis, the rates and types of errors committed by individuals are unknown. We examined responses of individuals with schizophrenia and related psychoses on a semi-structured interview of DMC. We hypothesized participants would manifest a variety of error types, reflecting the heterogeneous pattern of cognitive impairment in schizophrenia.

Participants and Methods: 163 persons with schizophrenia or related psychotic disorders (age ≥ 40 years) were administered the MacArthur Competence Assessment Tool for Clinical Research (MacCAT-CR) in reference to either of two research protocols. We examined the content of responses and grouped errant responses into categories reflecting the apparent type or source of error.

Results: On the Understanding scale, the most common error (53% of sample) reflected memory difficulties. Of those demonstrating errors on Understanding, 78% improved with repeated trials. On Appreciation, 25% incorrectly endorsed the study being aimed at their personal benefit, and 22% failed to recognize that procedures differed from clinical care. The most common errors on Reasoning were responses that were too brief (14%) or vague (10%) [despite probes for additional information] to permit full credit.

Conclusions: An error analysis of MacCAT-CR performance provides richer data than merely examining quantitative scores. Our results highlight areas to target during the informed consent process. Repeated presentation of relevant study information and increased emphasis on the differences between research and clinical care are warranted. DMC assessment should be altered to encourage participants to provide detailed rationales for their decisions.

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M. KIM, H. JANG & H. PARK. The effect of visuospatial training on cognitive functions in patients with schizophrenia.

Objective: It is well documented that schizophrenic patients have an impairment of visuospatial function, and this impairment may result in impairments of higher cognitive functions such as attention and working memory in schizophrenics. This study investigated the effect of visuospatial training on the cognitive functions in schizophrenic patients.

Participants and Methods: Twenty-four schizophrenic patients residing in Institute for Social Return participated. Twelve patients received the visuospatial training (treatment group) and 12 did not receive (control group). The two groups did not differ in terms of age, educational level, duration of illness, age of onset and intelligence.

Ten hierarchically arranged subprograms (CogRehab software) were administered to the experimental group. The program was developed to train visuomotor, visual perception, visual imagery/rotation, spatial perception and visual integration. Training was administered for 16 sessions, and 1 session lasted for 40 minutes.

A comprehensive neuropsychological tests (ROCF, TMT, Stroop, CVLT, WCST) and PANSS were administered to all participants at pre and post-training periods.

Results: There were no significant differences on any of neuropsychological performances administered at pre-treatment period between the two groups. Significant differences on the performances of TMT, part B ($F_{1,20}=3.56, p<.05$), Stroop color-word interference ($F_{1,20}=6.08, p<.05$) and ROCF copy ($F_{1,20}=4.05, p<.05$) between the two groups at post-treatment period. The treatment group showed better performances than control group. In addition, treatment group showed improvement of negative symptoms compared to control group ($F_{1,20}=12.18, p<.01$).

Conclusions: The results showed that visuospatial training seems to be effective for the improvement of visuospatial function, attention and negative symptoms in schizophrenic patients. These improvements of visuospatial function and attention would be due to the environmental stimulation

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V.M. LEAVITT, S. YEAP, J. THAKORE, S. MOLHOLM & J.J. FOXE. Developing Endophenotypic Markers for Schizophrenia: Testing a Brief Monocular Deprivation Paradigm.

Objective: Visual sensory processing deficits in patients with schizophrenia have been well established in the literature. A recent electroencephalographic (EEG) study from our group found the visual P1 to be an endophenotypic marker for schizophrenia (Yeap et al., 2006), with first-degree relatives showing significant attenuation of the component with an effect size of 0.9. However, in this study there was a great degree of inter-individual variance. The result of this variance was substantial overlap in P1 amplitudes between healthy controls and patients. We therefore sought to increase the sensitivity of our measure. Our goal here was to tap into a second order effect that would “tax” the system further, thereby enabling us to separate the distributions of patients from controls. We created a paradigm that would effectively challenge the visual system such that patients would show much greater relative decrements in their visual evoked potentials (VEPs) than healthy controls.

Participants and Methods: 20 chronic schizophrenia patients and 10 age-matched controls served. We recorded VEPs as participants viewed visual stimuli with both eyes for 9 minutes, then we administered an eye patch and recorded VEPs from each single eye as participants viewed visual stimuli monocularly for 9 minutes with each eye, respectively.

Results: Brief monocular deprivation in healthy controls resulted in robust VEPs from the non-occluded eye. For the visual P1 in controls, a paired t-test comparing the sum of each of the two eyes alone to binocular viewing yielded significance ($p=0.002$). However, this did not hold true for patients with schizophrenia. An ANOVA found a significant interaction for group (patient vs. controls) \times condition (both eyes vs. sum of eyes), $p=0.029$.

Conclusions: The compensatory mechanism that allows healthy individuals to generate robust VEPs monocularly does not appear to be effectively activated in patients with schizophrenia. This VEP challenge test may provide us with an endophenotypic marker for the disease.

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J.R. MATHEWS & D.M. BARCH. Emotional Processing, Social Cognition, and Social Functioning Deficits in Schizophrenia.

Objective: Social functioning deficits have long been a defining feature in schizophrenia, but relatively little research has examined how emotional processes affect social functioning. Studies have shown that perception of emotion in others and understanding and acting on social cues are impaired in schizophrenia, and these impairments are associated with worse social functioning. Research on emotional processing in schizophrenia has been mixed. This study aimed to expand upon our current knowledge of the relationship between social cognition, emotional processing, and social functioning in schizophrenia.

Participants and Methods: Participants were 41 outpatients with DSM-IV schizophrenia and 32 healthy controls. Participants were administered measures of emotional processing (self-reports of valence to affective, high arousal stimuli while brain function is measured using fMRI), social cognition (affect discrimination and social inference), and social function (self-reports of social, educational, and occupational function).

Results: Results indicated both social cognition and emotional processing were significantly correlated with social functioning, and that emotional processing contributed significantly more variance to social

functioning than did social cognition in individuals with schizophrenia. In addition, social cognition did not mediate the influence of emotional processing on social functioning in individuals with schizophrenia. However, in the entire group, emotional processing was a significant mediator in the relationship between social cognition and social functioning.

Conclusions: This finding suggests that emotional processing is an important factor that is closely related to social functioning outcomes in schizophrenia. Further studies are needed to examine the exact nature and direction of the relationship between emotional processing components and social functioning components, as well as the interaction between these components and social cognition.

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M. MATSUI, T. SUMIYOSHI, H. ARAI, Y. HIGUCHI & M. KURACHI. Cognitive functioning related to quality of life in patients with schizophrenia.

Objective: The present study attempted to examine cognitive function of patients with schizophrenia as compared to healthy subjects in the domains of executive function and memory. Second, we attempted to examine the relationships between cognitive function and quality of life in Japanese patients with schizophrenia.

Participants and Methods: Participants consisted of 53 patients meeting DSM-IV criteria for schizophrenia and 31 normal controls. All participants completed a neuropsychological test battery assessing executive function, verbal memory, and social knowledge. QOL was rated using the Schizophrenia Quality of Life Scale. Multiple regression analyses were used to evaluate the neuropsychological measures and clinical symptoms to predict QOL.

Results: Patients with schizophrenia showed lower performance across various cognitive measures of memory, including the Sentence Memory Test, the Verbal Learning Test, and the Script Test, as well as the Rule Shift Cards Test of executive function. The QOL total score, the social initiative score or the empathy score were significantly predicted by the Script or/and the Sentence Memory. Neuropsychological functioning was unrelated to most QOL scores in the presence of clinical symptoms, while ability of empathy in the QOL was predicted by performance of the Sentence Memory Test.

Conclusions: These results demonstrated patients with schizophrenia have deficits in executive function, memory and learning, and social knowledge, and that social knowledge and memory are related to QOL. Thus, in patients with schizophrenia, deficits in social knowledge appear to be associated with current QOL in general, and specifically with the capacity for empathy and social initiative.

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M.A. MONNIC, R.J. THOMA, F.M. HANLON, H. PETROPOULOS, R.A. YEO, P.A. LYSNE & M. EULER. Hippocampal Subregion Volume and Memory in Schizophrenia.

Objective: This study investigated the interaction between hippocampal subregion volumes and memory scores in healthy control subjects and people with schizophrenia. Based on prior research, we expected that (1) memory would be impaired and (2) hippocampal volume would be reduced in the schizophrenia group. We also predicted that (3) positive correlations between hippocampal volumes and memory scores would emerge in the control group and (4) the pattern of correlations would differ between groups.

Participants and Methods: Participants were 24 patients with chronic schizophrenia and 24 controls matched for age, sex, and education. Anterior (AH) and posterior (PH) hippocampal volumes were computed from magnetic resonance images (MRI). Verbal and visual memory was assessed using WMS-R Logical Memory (LM) and Visual Reproduction (VR) subtests and evaluated with respect to volumetric measures.

Results: The patient group demonstrated memory impairment across tests and reduction in AH [$t(46) = 2.701, p = .010$], but not PH, volume. The array of correlations between memory scores and hippocampal volumes differed markedly according to group. For example, in controls, LM scores significantly correlated with left PH and right AH volumes (r -values ranged from .41 to .49). In the schizophrenia group, positive correlations were constrained to PH, whereas significant negative correlations were found between right AH and both LM and VR (r -values ranged from -.47 to -.53).

Conclusions: Differential patterns of correlations for the control and schizophrenia groups suggest a loss of normal structure-function relationships, possibly arising from atypical neurodevelopment.

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H.A. NEILSON, A.E. THORNTON, E.H. CHEN, R.K. CHAN, R. PRO-CYSHYN, G.W. MACEWAN & W.G. HONER. Cognitive Effects of Clozapine and Risperidone in Chronic Schizophrenia Spectrum Disorder.

Objective: The effects of atypical antipsychotic medications on cognition are still debated with little known regarding the impact of administering multiple compounds. This study reports the results of an international collaboration that investigated the cognitive effects of clozapine alone and in combination with risperidone, using a randomized controlled design.

Participants and Methods: Fifty-four participants with schizophrenia or schizoaffective disorder taking a stable dose of clozapine (mean 484 mg/day, 100 – 800 mg/day) were given a cognitive assessment battery. Treatment was then supplemented with a fixed dose of 3 mg/day risperidone or placebo, and cognition was re-assessed eight weeks later. The cognitive tests evaluated included selected subtests from the Cambridge Neuropsychological Testing Automated Battery (CANTAB) and the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS). Linear regression was used to assess the relationships between medications and cognition.

Results: There were no differential effects over time between risperidone versus placebo on non-verbal cognitive measures. However, higher doses of clozapine were associated with less improvement over time in spatial recognition memory. Additionally, interactional trends suggested that the combination of high clozapine dosage and risperidone supplementation negatively impacted cognition. In particular, spatial recognition memory ($p = .07$) and visual-spatial functioning ($p = .05$) progressively worsened at higher doses of clozapine in subjects randomized to risperidone treatment but not in those randomized to placebo.

Conclusions: High doses of clozapine appear to negatively mitigate some practice effects in schizophrenia spectrum disorder. Furthermore, when clozapine dose is high, risperidone supplementation appears to impair select aspects of cognition.

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S.E. PURDON, A. VALIAKALAYIL, C.C. HANSTOCK, P. SERES & P.G. TIBBO. Sustained Attention (CPT) Deficits Associated with Risk of Schizophrenia and Proton MRS Glutamate Levels.

Objective: Delineation of a genotype for schizophrenia has been impeded by the absence of a reliable endophenotype to address the heterogeneity of the clinical presentation of the illness. An endophenotype is an intermediate heritable state-independent component of a phenotype associated with the illness that co-segregates within families and occurs at higher rates among unaffected family members compared to the general population. Several state-independent measures have sensitivity to the diagnosis of schizophrenia,

but specificity is often poor and the familial criteria are rarely met. This may be improved by co-registration of measures that depict a more reliable endophenotype than any measure alone, particularly if the components were on a common gene-modulated pathogenic pathway.

Participants and Methods: Glutamate was quantified by proton magnetic resonance spectroscopy (1H-MRS) in the medial frontal lobes of 15 adult siblings of individuals with schizophrenia (HR) and 14 healthy volunteers (HV), all of whom also completed a Continuous Performance Test (CPT).

Results: Subjects were free of psychopathology but the HR group showed greater variability in glutamate levels. After median stratification, the high glutamate group contained a larger proportion of HR than HV subjects and scored lower on the CPT.

Conclusions: Elevated glutamate may relate to poor sustained attention and elevated risk of schizophrenia. Along a common pathogenic pathway, the glutamate elevation is presumed more proximal to the genotype, whereas the attention deficit is presumed more proximal to the phenotype. Thus, a strong test of the validity of glutamate elevations within a schizophrenia endophenotype could be accomplished by co-registration with a third component presumed to lie between the glutamate increase and the attention deficit in this pathway. Abnormalities in frontal lobe structure and function reported in high risk samples offer feasible methods for such an assessment.

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S. RÉMILLARD, E. POURCHER & H. COHEN. Cognition and Neuroleptics in Chronic Schizophrenia.

Objective: The differential effects of risperidone and haloperidol on cognitive function and psychiatric symptoms in schizophrenia (SC) were assessed over 12 months in this double-blind study.

Participants and Methods: The performance of 28 SC participants, randomly assigned to receive atypical (risperidone; 2-6 mg/day) or typical (haloperidol; 2-20 mg/day) treatment, was compared to that of healthy controls. Tests of attention (d2 Cancellation Test), verbal memory (California Verbal Learning Test), procedural learning (Mirror reading task), executive function (Wisconsin Card Sorting Test), and a psychiatric scale (Positive and Negative Symptoms Scale) were administered at baseline, 3, 6, and 12 months.

Results: Relative to controls, all SC participants showed markedly impaired processing speed, verbal memory, procedural learning, and executive function at each assessment period. There was no differential effect between the two NLPs on most cognitive measures. However, an exception was observed for procedural learning: patients under risperidone showed better learning profiles in the mirror reading task than those under haloperidol. Moreover, in contrast to haloperidol treatment, there was an improvement of negative symptoms under risperidone.

Conclusions: Haloperidol has higher D2 dopamine receptors blockade in the striatum, while risperidone administered at therapeutic doses is possibly associated with less striatal dysfunction. Also, risperidone possesses serotonergic antagonist properties that may contribute to its more effective reduction of SC negative symptoms. Our findings clearly indicate that these two types of NLPs do not significantly impact on global cognitive functioning, even in the long term — except for processes requiring subcortical involvement (as in procedural learning). The performance of the SC patients remained markedly inferior to that of controls throughout the duration of the study.

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D.A. RUHL, R.J. THOMA, J. BOCKHOLT, M.A. MONNIC, R. JUNG, J. LAURIELLO & J. BUSTILLO. Cerebellar Cortical Volume and Executive Functioning in Schizophrenia.

Objective: Abnormal cerebellar development is characteristic of schizophrenia and recent evidence implicates a role for the cerebellum in higher cognitive functions. This study reports relationships between cerebellar volume and measures of executive functioning in normal and schizophrenic subjects.

Participants and Methods: Twenty-four people with chronic schizophrenia and twenty-three controls were assessed for intracranial volume (ICV), left and right hemisphere whole cerebellum (CV), cerebellar gray (CGM) and white matter (CWM). Volumes were computed using 3D MRI and voxel-based morphometry. A neuropsychological battery included WAIS-III subtests, Tower of London (ToL) and the Trail-Making Test.

Results: Left-lateralized cerebellar asymmetry was evident in control ($p=.04$), but not schizophrenia subjects. Schizophrenia subjects performed more poorly on the ToL ($p<.05$), and Trails B ($p<.05$). Controlling for ICV, sex, and age, there were no group differences in cerebellar volumes, and no relationship existed between WAIS-III scores and cerebellar volume. Larger left CGM predicted poorer ToL performance in controls ($p<.05$). In schizophrenia, larger left CGM predicted better performance in the most complex, 5 ring level of the task ($r=.874$, $p=.001$), while larger right CV predicted poorer performance on the simpler 3 ring portion ($r=-.658$, $p=.038$). Overall, CGM had a stronger relationship to executive functioning in normal subjects than in schizophrenia.

Conclusions: These correlations between executive functioning (typically associated with prefrontal cortices) and cerebellum are thought to be mediated by a prefrontal-thalamic-cerebellar network with extensive connections between cerebellum and areas of the frontal cortex. Similar reported correlations between executive function and thalamic volumes also support this assertion.

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J. THYSEN, P. HUGHETT, P. GRANT, C.G. KOHLER, R.E. GUR & R.C. GUR. The Relationship Between Computerized Measures of Attention and Executive Domains and Quality of Life in Schizophrenia.

Objective: Research suggests that measures of attention and executive functioning are associated with functional outcome in patients with schizophrenia. This investigation sought to determine if two new computerized neuropsychological measures, the Penn Conditional Exclusion Test (PCET), a test of abstract reasoning and mental flexibility, and the Penn Continuous Performance Test (PCPT-nl), a test of attention (vigilance), were correlated with the 21-item Quality of Life Scale (QLS), a commonly used measure of functioning in schizophrenia.

Participants and Methods: Forty-seven patients diagnosed with schizophrenia or schizoaffective disorder were drawn from on-going longitudinal investigations of behavior and brain functioning and were administered the PCET, PCPT-nl and the QLS at an initial evaluation. The PCET is a measure of executive functioning that utilizes the "odd-man out" paradigm and is based on three sorting principles. The PCPT-nl is a measure of visual attention that does not require working memory.

Results: Accuracy on the PCET was correlated with higher functioning ability on the QLS (Spearman $\rho=0.55$, $p<0.0001$). The PCPT-nl was not related to functionality. A linear regression model indicated that a significant amount of variance on the QLS is accounted for by accuracy on the PCET. Gender was a significant covariate.

Conclusions: Attention, in the absence of a working memory component, is not predictive of functioning. Impairment in performance on a measure of executive functioning, however, was related to poorer social and vocational functioning as well as engagement in patients with schizophrenia. These findings suggest that problem solving and abstract reasoning abilities, rather than attentional abilities, are key predictors of quality of life in schizophrenia.

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L. VELLA, D.V. JESTE, R.K. HEATON & E.W. TWAMLEY. Neuropsychological Functioning and Work Rehabilitation Outcomes in Schizophrenia.

Objective: Older individuals with schizophrenia seeking work face multiple obstacles, including neuropsychological and work skills deficits. These deficits may predict how clients respond to work rehabilitation. In a treatment study comparing two different work rehabilitation programs, we expected baseline neuropsychological functioning and work skills to predict work outcomes.

Participants and Methods: The participants were 58 unemployed outpatients with schizophrenia or schizoaffective disorder who were aged 45 or older, 79% of whom were taking atypical antipsychotics. They were randomized to receive Individualized Placement and Support (IPS), a supported employment program, or conventional vocational rehabilitation (CVR) for one year. Assessments at baseline included the COMPASS work skills assessment and a comprehensive neuropsychological battery including measures of attention, processing speed, working memory, learning, memory, and executive functioning. Outcome measurements, collected weekly during the year, included achievement of competitive work, hours worked, weeks worked, and wages earned.

Results: Compared with CVR participants, IPS clients were more likely to obtain competitive work (60 vs. 29%), worked more weeks and hours, and earned more money (all $ps<0.024$). Across and within groups, COMPASS work skills scores and neuropsychological domain scores were not significantly associated with any work outcomes (all $ps>0.13$). Across groups, memory and executive functioning had small effects on the number of hours worked (Cohen's $d=.34$), whereas effect sizes for the other neuropsychological domains ranged from .02-.24.

Conclusions: Among older schizophrenia patients returning to the workforce, IPS produced significantly better work outcomes than CVR. Effect sizes suggested that the number of hours worked may be linked to better memory and executive functioning.

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Psychopharmacology

N. FANI, N. KITAYAMA, A. ASHRAF, L. REED, N. AFZAL, F. JAWED & J.D. BREMNER. Neuropsychological Functioning in Patients with Posttraumatic Stress Disorder Following Paroxetine Treatment.

Objective: Selective serotonin reuptake inhibitor (SSRI) medications have been found to promote neurogenesis in the hippocampus, a brain area sensitive to stress that plays a critical role in memory. Increases in verbal declarative memory function were previously found following one year of open label paroxetine treatment in participants with PTSD. The purpose of the present study was to assess the effects of paroxetine versus placebo on cognitive functioning in patients with PTSD.

Participants and Methods: Eighteen men and women with PTSD underwent assessment of neuropsychological function following which they were randomized to 12.5-62.5 mg paroxetine CR or placebo given in a variable dose in a double blind manner for three months. Following double blind treatment neuropsychological testing was repeated and subjects who had received placebo were treated for an additional three months with open label paroxetine CR following which neuropsychological testing was repeated.

Results: Paroxetine treatment resulted in a 24% increase in verbal delayed memory recall as measured by the Wechsler Memory Scale-Revised (WMS-R) versus 13% for placebo, a difference that was not statistically significant. Open label paroxetine resulted in a further 15% improvement in memory function. When baseline versus post paroxetine treatment was assessed in all subjects combined, there was a statistically significant improvement in verbal memory function as measured by the WMS-R, the Selective Reminding Test (SRT), a stem completion task, and recall of a novel paragraph.

Conclusions: These findings suggest that paroxetine CR is associated with an improvement in verbal declarative memory function, although a practice effect cannot be excluded as an explanation of the findings. Correspondence: *Negar Fani, M.S., Neuropsychology and Behavioral Neuroscience, Georgia State University, 1330S Jefferson Sq. Ct., Decatur, GA 30030. E-mail: nfani1@student.gsu.edu*

P. MARSHALL. Sensitivity of Neuropsychological Tests To Sedating Effects of Psychotropic Medications.

Objective: Many psychiatric patients are currently treated with combinations of anti-psychotic, anti-depressant, mood stabilizing, and anti-Parkinsonian medications at the same time. Many of these drugs have sedating properties that could adversely affect performance on neuropsychological tests.

Participants and Methods: This study examined the sedating quality of these combinations of drugs on an extensive neuropsychological battery consisting of 37 tests of verbal and visuo-spatial intelligence, memory for verbal and figural material, working memory, executive functions, attention for visual and verbal stimuli, cognitive processing speed, and motor abilities. Fifty schizophrenic patients with a diagnosis confirmed by SCID-IV interview were given the test battery. ANOVA was used to compare the third of the patients with the highest drug sedation ratings to the third with the lowest sedation ratings.

Results: Psychiatric patients having high drug sedation rating levels exhibited only slowing of response time as testing progressed on one test of sustained attention, the Conners CPT test. Somewhat surprisingly, drug sedation had no clear adverse effects on any other cognitive abilities, including speed of cognitive processing.

Conclusions: Even in combination with several other drugs, commonly used psychiatric medications do not appear to have an adverse effect on most all neuropsychological test measures. Thus, one can conclude that, in most all instances, medication effects are not causing impaired performances on testing.

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S.C. MUELLER, D.S. PINE, E. LEIBENLUFT & M. ERNST. Saccadic incentive task reveals differences in cognitive control as a function of medication status in pediatric bipolar disorder.

Objective: The exact mechanisms of atypical antipsychotic medication are unknown and the impact of antipsychotic medication on cognitive abilities is not well understood. For instance, atypical antipsychotics have been shown to reduce saccadic peak velocity in healthy individuals as well as saccadic latency in patients with schizophrenia.

Participants and Methods: Here we tested forty patients with pediatric bipolar disorder on or off antipsychotic medication using a reward-based saccadic eye movement task. Participants were required to exert cognitive control by switching between making eye movements towards (pro-saccade) or away (anti-saccade) from a stimulus. In addition, subjects received, or lost, a monetary reward depending on accuracy of performance. A neutral condition with no incentives was also included.

Results: Patients off medication (N=19) showed a paradoxical anti-saccade switch benefit: antisaccades preceded by a prosaccade exhibited faster latencies than repeated antisaccades in all three conditions

(reward, punishment and neutral). Patients on medication (N=21) showed this effect during the punishment and neutral conditions, but they exhibited a switch cost during the reward condition. Prosaccades were not affected by the type of preceding saccade. Moreover, general costs in peak velocity (motor control) were observed for patients on medication when changing saccade types during the incentive trials, and they were observed during neutral trials for patients off medication.

Conclusions: The results indicated that cognitive, motivational and motor aspects of behavior were perturbed by antipsychotic medication. The design may provide a promising tool to examine how medication affects the neural networks underlying these aspects of behaviour. The saccadic incentive task used in the present study may be a good neuropsychological test to examine basic cognitive performance in pediatric psychiatric populations.

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S.E. PURDON, L. WANG & G. LIU. Memory Enhancement After Two Weeks' Exposure to American Ginseng Extract HT1001 in Young and Middle Aged Healthy Adults.

Objective: A staple of traditional Chinese medicine for thousands of years, the ginseng root has a wide spectrum of presumed health-related benefits rarely subjected to contemporary scientific methods of validation. The longstanding presumption that ginseng may improve cognitive skills has become particularly relevant with recent in vitro and in vivo demonstrations of Rb1 and Rg1 ginsenoside-induced neural growth enhancement and inhibition of neural degeneration, and animal learning studies suggesting some protection against neurotoxic agents that impair memory. Prior investigations of sustained ginseng effects on human memory have produced ambiguous results, but they did not directly examine Rg1 or Rb1 ginsenoside exposure with standard neuropsychological instruments.

Participants and Methods: To assess potential memory benefits in healthy Beijing volunteers of a standardized proprietary extract of Panax quinquefolius containing Rg1 and Rb1 ginsenosides (HT1001), a young adult sample (YAS, n=10) and a middle aged sample (MAS, n=10) completed the Clinical Memory Scale (CMS) at baseline and an alternate form after 14 days' exposure to HT1001 in oral capsule form at a dose of 100 mg twice daily.

Results: Significant differences were obtained between the age groups, with the YAS exhibiting higher CMS Memory Quotients (CMS-MQ) than the MAS, and over time, with higher CMS-MQ on the second assessment. There was no interaction between age and time. Secondary analyses indicated benefits for both groups on free recall of word lists, cued recall of word pairs, and recognition of figures, and benefits in the YAS but not the MAS on free recall of pictures.

Conclusions: Open-label HT1001 had positive effects on memory measured with the CMS. Prior investigations with alternate forms of the CMS reported no benefits from repeated testing, but practice effects cannot be entirely ruled out. The results are sufficient to justify a prospective placebo-controlled examination of the apparent learning and memory benefits from HT1001.

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Other

A. MIDORIKAWA, M. KAWAMURA & K. NAKAMURA. A novel disconnection syndrome: Unilateral motor dyssynchronization to periodical visual stimuli.

Objective: In our previous study of patient with agenesis of the corpus callosum (ACC), it was presented that processes of motor synchronization to periodic visual depend on right hemisphere; instead, synchronization to auditory stimuli depend on both hemisphere. However, there

is a possibility that this result might be a singular phenomenon for ACC and there is a no consequence about particular region necessary for visual-motor synchronization. To investigate the commonality among callosum damaged subject and the particular region crucial for visual-motor synchronization, we performed the similar paradigm for the patient with partial callosal disconnection syndrome due to infarction of the anterior and middle corpus callosum.

Participants and Methods: Subject: The subject was 28 years-old, right handed male. MRI showed the lesion in the anterior and middle corpus callosum after brain hemorrhage. Procedure: Experiment I: The subject was asked to synchronize finger tapping with two types of external stimuli, namely periodical flash (Visual Condition) and periodical click (Auditory Condition) for a minute. Experiment II: The subject was asked to keep the tempo of the click internally for half a minute. After that he was asked to reproduce the same tempo without external signals.

Results: Experiment I: He could synchronize the finger tapping with external auditory stimuli very well, however, he could not synchronize the tapping with visual stimuli in case of using the right hand. Experiment II: In the visual condition, his right hand's tapping speed hastened and was gradually converged on the tempo of Experiment I.

Conclusions: Our result suggest that unilateral dyssynchronization to visual stimuli is common to callosal damaged patients and that this function is depend on anterior portion of corpus callosum.

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Paper Session 5

3:00–4:30 p.m.

Assessment/Cross Cultural Issues/Forensics

G.J. LARRABEE. Evaluation of New MMPI-2 Validity Scales in Malingering Civil Litigants and Non-Malingering Clinical Patients.

Objective: To compare new and traditional MMPI-2 validity scales in definite/probable malingerers and clinical patients. Scales include F, Fp, the FBS, Fptsd, the Response Bias Scale (RBS), the Henry-Heilbronner Index (HHI), and two scales from the MMPI-2RF: FBS-RF and a measure of somatic symptom overendorment, Fs.

Participants and Methods: Forty-one malingering civil litigants (24 performing significantly below chance on the PDRT, and 17 failing empirical PDRT cutoff plus at least one other free-standing symptom validity test [SVT]), were compared to 54 non-malingering patients (40 neurologic cases, primarily moderate and severe tbi, and 14 psychiatric cases, primarily major depressive disorder). Groups did not differ in age, or sex, but did differ in education, which was only associated with Fp and Fptsd in the malingering group.

Results: MANOVA was significant, $p < .001$, and univariate F values, with the exception of those for Fptsd and Fp, were all significant, $p < .001$. Cohen's d values were 1.99 (FBS), 1.91 (RBS), 1.85 (FBS-RF), 1.77 (HHI), 1.07 (FS), .58 (F), -.21 (Fptsd), and -.30 (Fp). R squared values, predicting each MMPI-2 scale by four derived SVTs (Visual Form Discrimination, Finger Tapping, Reliable Digit Span, and WCST Failure-to-Maintain Set) were .436 (RBS), .363 (FBS-RF), .270 (HHI; Fs), .258 (FBS), .094 (F), and .019 (Fp; Fptsd). Logistic regression showed that the combination of FBS and RBS accounted for the maximum variance in group membership, optimally classifying 85.26% of subjects.

Conclusions: The present data support the diagnostic validity of FBS, RBS and FBS-RF. RBS and FBS-RF also show the strongest external correlates with derived SVTs. The HHI also showed good validity, although did not add to the diagnostic discrimination provided by FBS and RBS.

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M.D. ALLEN, E.D. BIGLER, J. LARSEN, N.J. GOODRICH-HUNSAKER & R.O. HOPKINS. Functional Neuroimaging Evidence for High Cognitive Effort on the Word Memory Test.

Objective: Empirical data on the neural systems that underlie symptom validity tests (SVT), such as Green's Word Memory Test (WMT), are virtually non-existent. This is unfortunate, given the vital role that neurophysiological evidence might play in evaluating claims about the interpretation of such tests. We present data from a functional MRI (fMRI) experiment which examines the neurological substrates of successful performance on the WMT. The basic assumption underlying SVT tasks is that they place trivial demands on cognitive networks. This has never been tested by functional neuroimaging methods. If fMRI activation demonstrates a complex neural network necessary to perform the WMT this would strongly challenge the assumption that the WMT requires minimal cognitive effort.

Participants and Methods: fMRI data were acquired from 8 participants without brain injury who engaged in the delayed recognition portion of Green's WMT protocol.

Results: Compared to a simple perceptual identification control task, we found a highly reliable activation pattern across all participants, restricted almost exclusively to cortical areas most commonly associated with task difficulty, memory load, concentration, and other forms of cognitive effort. These areas include dorsolateral prefrontal cortex, anterior insula, superior parietal cortex and the dorsal anterior cingulate.

Conclusions: The WMT activates numerous cortical regions critical for cognitive effort. Given the extensive neural network necessary to perform the WMT, this study raises important questions about what WMT 'failure' truly means in patients with traumatic brain injury and other neurological and neuropsychiatric disorders, who have increased likelihood of disruption within this neural network of vision, language, attention, effort and working memory.

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B.D. HILL, E. ELLIOTT, J. SHELTON, J.R. O'JILE & D. GOUVIER. Validity of the WAIS-III Working Memory Index: Comparison to a Working Memory Criterion Construct.

Objective: This study sought to determine whether the WAIS-III Working Memory Index (WMI) validly measures the construct of working memory (WM). This study additionally assessed whether the inclusion of other WAIS-III subtests could increase the validity of WM assessment.

Participants and Methods: 173 participants with a mean age of 20.6 years ($SD=3.7$). Females composed 75% of the sample. Participants completed the following measures: WAIS-III, Listening Span task, Operation Span task, and N-back task. The last three tasks are experimental cognitive task that assess WM. These tasks were combined into a WM criterion score. Multiple regression was used to determine the amount of variance the WAIS-III WMI accounted for in the WM criterion score. This was then compared to a model of the best predictor WAIS-III subtests of the WM criterion score.

Results: The model entering only the WMI as a predictor variable was significant, $F(1, 172)=135.06, p<.001$. This model explained 44% of the variance in the WM criterion score (Adjusted $R^2=.438$). Using the backward method and entering all of the WAIS-III subtests, a model

emerged that was also significant, $F(5, 168) = 135.06, p < .001$. This model explained 49% of the variance in the WM criterion score (Adjusted $R^2 = .488$). Significant WAIS-III subtest predictors in this model were: Vocabulary, Block Design, Matrix Reasoning, Digit Span, and Letter-Number Sequencing.

Conclusions: Validity of the WAIS-III WMI as a WM measure was only partially supported as it explained less than half of the variance in the criterion. Also, the addition of other subtests does not substantially improve WM assessment.

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H.M. GONZÁLEZ & M. CEBALLOS. Acculturation and the cognitive and functional status of older Mexican Americans, a paradox?

Objective: Objective: Acculturation has been negatively associated with several health indicators among Mexican American adults; however, little is known about acculturation and the health and functioning among older adults. The purpose of this study was to examine the negative acculturation hypothesis in older Mexican Americans. We sought to determine if the cognitive and independent functioning levels of immigrant Mexican Americans was negatively associated with acculturation (i.e., years of U.S. residency).

Participants and Methods: Participants and Methods: Cross-sectional, multistage probability sample of 3,050 Mexican Americans (65+ years) living in the southwestern states of Arizona, California, Colorado, New Mexico and Texas.

Results: Results: Multiple regression models were used to evaluate the association between acculturation and health functioning while accounting for demographic, socioeconomic (SES) variables. Acculturation was associated with significantly higher mental status scores (MMS; $p = 0.002$) and fewer problems with Instrumental Activities of Daily Living (IADLs; $p = 0.004$). The association between acculturation and MMS was partially explained by SES; whereas the association between acculturation and IADLs was fully explained by SES.

Conclusions: Conclusion: The results indicate that the negative acculturation hypothesis may not apply to older Mexican Americans. Indeed, we found that more acculturation was associated with better functional status. The associations were largely explained by SES suggesting that economic resources may provide advantages to the health and function of Mexican Americans.

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D.S. TULSKY, S. WEINTRAUB, S. DIKMEN, R. HAVLIK, D. BLITZ, R. HEATON, B. BOROSH, N. CHIARAVALLOTI, A. O'BRIEN, J. MACHAMER, R. GERSHON & M.V. WAGSTER. The NIH Toolbox: An Instrument for Assessment of Neurological and Behavioral Function.

Objective: The lack of uniformity among measures used in longitudinal and epidemiologic studies make comparisons among studies difficult. Furthermore, the lack of inclusion of cognitive variables in large-scale studies across the lifespan limits early identification of children at risk for future compromised neuropsychological functioning which is likely to have long ranging treatment implications. For these reasons, a new NIH initiative has been launched to develop an assessment tool to bring uniformity to a large variety of studies through the inclusion of cognition and neuropsychological functioning as a standard variable. The NIH Toolbox will provide researchers a reliable and valid evaluation of several aspects of neural function (cognition, sensation, movement, emotion).

Participants and Methods: To date, the NIH toolbox project has conducted thorough literature reviews, met with experts in neuropsychology and experimental psychology, obtained survey data from over 100 professionals, and has conducted one-on-one interviews with experts in cognition.

Results: From these activities, the NIH toolbox has identified 6 domains of cognitive functioning, including: Executive Functioning, Memory, Processing Speed, Working Memory, Attention, and Language/Verbal Functioning for further development.

Conclusions: The NIH hopes to foster the inclusion of standardized, "state-of-the-art" measures to assess these important aspects of health that currently are not measured consistently across studies. Researchers will be able to assess cognitive and neurologic functioning over the life span and to compare findings across studies with otherwise different purposes. The goal is not to replace what the investigators are planning to use in their studies but rather an additional ones to improve communication, and to use them in large scale epidemiological studies and clinical trials that currently are not using any such measures. This poster describes the goals and current status of the NIH Toolbox project.

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Symposium 5

3:00–4:30 p.m.

Computerized Testing and Assessment II: Detection and Diagnosis of Mild Cognitive Impairment (MCI), Dementia and Cognitive Impairments in Older Adults. An Update for Clinical Neuropsychologists

Chair: Monique Cherrier

M. CHERRIER, M.M. SALING, E. DAVID, E. SIMON, R. KANE & P. MARUFF. Computerized Testing and Assessment II: Detection and diagnosis of mild cognitive impairment (MCI), dementia and cognitive impairments in older adults. An update for clinical Neuropsychologists.

Symposium Description: Computerized assessment in Neuropsychology has grown in popularity over the past 30 years. Today there are several well recognized computerized assessment batteries available to Neuropsychologists and other health professionals and the demand for computerized assessment is expected to increase in the future. While computerized assessment batteries may not replace paper and pencil tests, increasing numbers of psychologists are using select computerized tests and batteries to complement their existing test batteries. In addition, many health care and research settings are requesting that Neuropsychologists implement and/or supervise the use of computerized assessment. Thus, it is important for all Neuropsychologists to have sufficient and current knowledge to make informed decisions and to act as a resource for colleagues. This symposium will highlight five unique computerized assessment batteries that are suitable for use with older adults and neurological and psychiatric patients. Presentations will include performance of patients with moderate traumatic brain injury (mTBI), HIV dementia complex and schizophrenia on the Cogstate battery; a comparison of amnesic MCI and Parkinsons Disease (PD) patients on the Mindstreams ® battery, early detection of dementia using

the HeadMinder™ Cognitive Screening Test (CST), accurate detection of cognitive impairments in PD compared to non-impaired PD and controls using the ANAM battery and differentiation of Alzheimer's dementia from Lewy Body dementia syndromes using the CANTAB battery. Validation information comparing computerized test results with traditional paper and pencil tests and longitudinal follow up will be presented. Attendees will benefit from presentation of remarkable work that has been done in this area.

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D. ERLANGER & T. KAUSHIK. Validation the HeadMinder™ Cognitive Screening Test (CST) – A 12-minute, Computerized Dementia Screening Tool for Primary Care.

Objective: Early detection of dementia relies heavily on primary care physicians. The HeadMinder™ CST is a 12-minute computerized screening of reaction time, memory, and executive functions. Standardized results are available immediately upon test completion. The purpose of this study is to evaluate the construct validity of the CST.

Participants and Methods: Primary care patients (n=102) over the age of 65 from a geriatric specialty clinic ranged in age from 57 – 97. In this double-blind study, treatment team diagnosed patients based on patient and family interview, MMSE, 1 hour neuropsychological testing, and lab tests. HeadMinder diagnosed based solely on CST results.

Results: Significant agreement between HeadMinder and the treatment team was obtained (chi-square=45.84, p<.001). Sensitivity rate of the CST was 80%, specificity was 87%, Positive Predictive value was 88%, and Negative Predictive value was 79%. An ROC curve analysis was performed with AUC = .86, which compared well with the MMSE AUC of .76. The CST identified impairment, as measured by the MMSE, in a strictly linear manner for the entire population and for impaired persons as well. CST accurately identified persons as cognitively impaired whose mean MMSE scores were approximately 26, well above traditional MMSE cutoff scores associated with dementia.

Conclusions: The CST holds considerable promise for detection of dementia in primary care. In addition HIPAA-compliant testing on an Internet-based platform is useful for telemedicine applications. Future studies will incorporate and validate auditory instructions.

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R. KANE. Use of the Automated Neuropsychological Assessment Metrics (ANAM) Test System in the Assessment of Neurodegenerative Disorders.

Objective: The Automated Neuropsychological Assessment Metrics (ANAM) test system represents two decades of DoD-sponsored computer-based test development for assessing human performance and neuropsychological function. DoD interest in computerized neurocognitive assessment grew out of the need to have procedures that were repeatable and that could be used to monitor changes in human performance that might occur from extreme conditions, fatigue, chemical attacks and from drugs used as countermeasures against such attacks. With the ANAM test system this effort to develop time efficient repeatable neurocognitive measures transitioned into the clinical arena. With respect to clinical populations, ANAM has been used with diverse disorders including head injury and concussion, SLE, MS, PD, and AD as well as with a range of patients referred for neuropsychological assessment. In this presentation, we will review data from studies where ANAM was used for specific clinical conditions emphasizing its use with patients with neurodegenerative disorders.

Participants and Methods: We will review data from single and longitudinal assessments of patients with MS. In single assessment studies

ANAM results were compared with those obtained from the Minimal Assessment of Cognitive Functioning in MS (MACFIMS) battery. In the longitudinal study, patients were tracked over a two year period and assessed at 6 month intervals. At each interval they took ANAM along with an extended neuropsychological test battery.

Results: In both types of studies ANAM demonstrated good sensitivity and specificity using traditional tests as gold standards. In PD, ANAM was highly accurate in identifying impaired PD patients compared to non-impaired PD patients and controls.

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P. MARUFF. Validity of the CogState battery in central nervous system (CNS) disease.

Objective: The CogState test battery has been designed to detect change in psychomotor function, visual attention, visual memory and working memory. It has been used widely in the management of head injury, HIV dementia complex and schizophrenia. Aim: The aim of the current study was to compare the nature and magnitude of impairment in cognitive function in these different patient groups.

Participants and Methods: First, fMRI was used to determine the pattern of cerebral blood flow associated with each CogState test in 20 young adults. Second, the performance on the CogState battery was measured in 312 patients with moderate traumatic brain injury (mTBI), 213 patients with chronic stable schizophrenia and 125 patients with HIV dementia complex. Each group was compared to a controls matched on age, education and gender and for HIV group; sexual preference. The magnitude of impairment on each measure was expressed as Cohen's d.

Results: The Attention task activated the prefrontal cortex and basal ganglia. The One Back Memory Task activated the prefrontal cortex bilaterally and anterior cingulate gyrus. The Visual Memory task activated the medial temporal lobes. Patients with TBI showed the greatest impairment in psychomotor and attentional function. Patients with schizophrenia showed the greatest impairment in visual memory the HIV dementia group impairment showed the greatest impairment in working memory.

Conclusions: These data suggest that although the CogState battery was designed to detect change in cognitive function it also has some utility in characterizing cognitive impairment in CNS disease.

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M. SALING. Computerized assessment in neuropsychology: diagnostic and professional issues.

Objective: This talk focuses on hitherto unexplored issues of specifically tailored applications, and the relationship of computerised forms of assessment to the overall clinical process.

Computerised assessment provides a technologically sophisticated framework for the delivery of theory- and research-driven paradigms that can be tailored to neurocognitive mechanisms that are specific to particular neurological disorders, as opposed to the more generic paradigms that have been available in paper and pencil format as well as some computerised packages. In this talk I will present data from three previous studies to address the hypothesis that neurocognitively tailored paradigms are more effective in the detection of early cognitive change, and in the differential diagnosis of different dementia syndromes. The first dataset is derived from two longitudinal CANTAB studies of mild cognitive impairment, spanning two and three years respectively, and involving 118 participants. The second dataset, involving 59 participants,

was generated by a purpose-designed computerized assessment technique, used to differentiate Alzheimer from Lewy Body dementia syndromes. These data will be used to illustrate the concept of progressive cognitive loading to accentuate subtle differences in the interests of early differential diagnosis.

The availability of computerised assessment, together with the prospect of delivery over the Internet, has raised the prospect of self-assessment, assessment by clinicians other than neuropsychologists, and assessment devoid of a more comprehensive neuroclinical framework. These issues will be discussed in relation to the question of neuropsychological diagnosis.

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E. SIMON & G. DONIGER. Idiopathic Elderly Fallers Have a Distinct Cognitive Profile from Amnesic MCI, Early Alzheimer's Disease, and Parkinson's Disease: A Review of Studies using Mindstreams Computerized Cognitive Assessment.

Objective: To compare cognitive profiles in amnesic mild cognitive impairment (aMCI), Parkinson's disease (PD) without dementia, and idiopathic elderly fallers using a standardized battery of co-normed computerized tests.

Participants and Methods: The profile of cognitive impairment was evaluated for 381 patients with (pre-dementia) aMCI (Petersen criteria), 78 patients with early dementia (presumed AD; DSM-4), 67 PD

patients, and 42 idiopathic fallers. Median performance was computed for age- and education-normalized tests for memory, executive function, visual spatial, attention, information processing speed, and motor cognitive skills (scale: mean 100, SD=15) from Mindstreams® (Neuro-Trax Corp., NJ). Between-group comparison was by Mann-Whitney U test; comparison of prevalence of impairment was by chi-square (mean=100; SD=15; impaired: <85).

Results: In aMCI, and to a greater degree, early AD, poorest performance was for memory (median: aMCI 81.45, AD 72.3), executive function (aMCI 88.5, AD 77.2), and visual spatial processing (aMCI 88.8, AD 84.4). Poorest performance in PD was for executive function (89.20), while memory, attention, and information processing speed were mildly impaired (92.5, 92.6, 92.8). In contrast, idiopathic fallers had low executive function (88.8) and memory (90.7), mildly impaired information processing speed (92.6), but had higher attention (96.1), motor skills (95.5), and visual spatial (102.1) scores. Memory was poorer in aMCI than in PD ($p=0.017$) and fallers ($p=0.007$), and impairment in aMCI was more prevalent ($p<0.005$). Visual spatial was better ($p<0.001$) and impairment less prevalent ($p=0.01$) in PD than in aMCI.

Conclusions: Elderly who fall but do not have clinical aMCI or PD have a distinct cognitive profile. This review illustrates the strength of this versatile computerized cognitive system using co-normed tests across multiple cognitive domains.

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FRIDAY MORNING, FEBRUARY 8, 2008

Paper Session 6

9:00–10:30 a.m.

Tramatic Brain Injury

N. FITZPATRICK, K.S. CHIOU, E.C. HILLS, J. WANG, J. VESEK, D. GOOD & F.G. HILLARY. Evolution of Prefrontal Involvement in Working Memory Following TBI: Evidence against Brain Reorganization Hypotheses.

Objective: Functional imaging studies of traumatic brain injury have consistently demonstrated increased involvement of prefrontal cortex (PFC) in working memory functioning. The literature has differed, however, on whether this increased activation represents permanent reorganization or a transient recruitment of auxiliary resources in response to greater task demand. The purpose of this study is to better understand the nature of altered prefrontal activation by examining working memory functioning during the first six months of recovery from traumatic brain injury (TBI).

Participants and Methods: Participants included TBI patients ages 20-63 with 24-hour Glasgow Coma Scales from 5-13. All participants signed an IRB-approved consent form and underwent scanning using a Phillips 3.0T scanner, acquiring a T1 axial MPRAGE sequence, as well as EPI for functional activation. Resulting activations were processed using SPM2 software. Participants were scanned with functional imaging at about 3-months and 6-months post-injury.

Results: Early results indicate that participants exhibited a decrease in total frontal and parietal activation on the working memory task from their 3-month to their 6-month scan. Their average reaction time on the task also decreased over time.

Conclusions: These early results indicate that, during recovery from TBI, the extent of frontal-parietal networks involved in working memory functioning decreases over time. Accompanying the reduced demand on PFC resources was greater task efficiency (i.e., reduced reaction time). The current data lend support to the hypothesis that increased activation in PFC is a transient mechanism that comes "on-line" during periods of cerebral challenge and is unlikely to represent true brain reorganization.

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G.R. TURNER & B. LEVINE. Compensatory neural recruitment during verbal working memory performance after TBI: evidence for an altered functional engagement hypothesis.

Objective: Traumatic brain injury (TBI) has been associated with altered patterns of neural recruitment during performance of working memory tasks. Typically, this is observed as increased brain response in homologous prefrontal cortical (PFC) regions (e.g. right lateral PFC activity observed during verbal working memory; vWM). However, the behavioural correlates of these functional changes are poorly understood. Here we asked two questions: (i) is recruitment of right lateral prefrontal cortex (PFC) during verbal working memory following TBI compensatory and (ii) do these changes represent functional reorganization (i.e. recruitment of brain regions not engaged by healthy controls) or altered functional engagement (i.e. differential recruitment of similar brain regions in TBI and controls)?

Participants and Methods: 8 moderate/severe, chronic phase TBI participants with diffuse axonal injury but without focal lesions and 12 age/education matched controls performed a vWM task during fMRI scanning. Multivariate analyses were used to examine brain and behaviour correlations and functional connectivity within PFC.

Results: Activity in a network of right lateral PFC regions was positively and uniquely correlated with TBI performance during vWM, thus demonstrating compensatory recruitment of this region. Functional connectivity analyses provided strong support for the altered functional engagement hypothesis.

Conclusions: We observed altered functional engagement of right PFC during vWM in a sample of chronic-phase TBI participants, despite normal task performance. These compensatory brain changes may be a neural marker of capacity or efficiency limits, potentially hindering functional outcomes in this population.

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G. VOELBEL, W. GLENN, J. LENGENFELDER, R. BARBOUR, Y. PEI, A. SMITH, A. LENT & J. DELUCA. Functional Near Infrared Spectroscopy (fNIRS) Reveals Cortical Recruitment of the Prefrontal Lobe in Traumatic Brain Injury During Working Memory.

Objective: The objective of this study was to investigate whether persons with a severe traumatic brain injury (TBI) recruited additional cortical resources in prefrontal lobes during working memory compared to healthy adults.

Participants and Methods: Seven right-handed adults with TBI and 7 healthy adults without any history of neurological disease or psychiatric disorders were included (HC). All participants were between the ages of 21 and 55 years old. A 30 fNIRS source/detector optode array was placed on the foreheads. The fNIRS scan started with a 5 minute baseline period, followed by the auditory presentation of the N-Back test. The N-Back consisted of three randomly presented trials of the 0-, 1-, 2-, and 3- back tests. In the N-Back test, the 0-back condition was a baseline condition, and the 1-, 2-, and 3- Back conditions place increasing demands on working memory systems. The participants tapped the table with their right hand to respond to the target letters.

Results: Compared to the HC group, the TBI group revealed significantly greater levels of oxygenated hemoglobin in the right ventral lateral prefrontal cortex when 0-Back (baseline) was subtracted from the 1-, 2-, and 3-Back tests. In addition, the TBI group revealed increased activation of the contralateral prefrontal cortex compared to the HC group when the 1-Back was subtracted from the 2-Back.

Conclusions: This provides preliminary evidence that persons with TBI recruit additional cortical resources of the prefrontal lobe during a working memory task compared to healthy adults. These results replicate prior fMRI research, but are the first to be demonstrated in fNIRS TBI research.

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M.J. LARSON, D.A. KAUFMAN, I.L. KELLISON, R. STECKLEY, A. SIRIZI, M. MCINTYRE & W.M. PERLSTEIN. Double Jeopardy! The Additive Consequences of Negative Affect on Performance Monitoring Decrements Following Severe TBI.

Objective: Emotional sequelae are among the most frequent and debilitating effects of severe traumatic brain injury (TBI); however, the consequences of negative affect on higher-level cognitive functioning following TBI remain understudied. The current study utilized the error-related negativity (ERN) component of the scalp-recorded event-related potential (ERP) to test the hypothesis that negative affect disproportionately impairs performance monitoring processes in survivors of severe TBI relative to healthy control participants.

Participants and Methods: High-density ERPs were acquired while 20 survivors of severe TBI and 20 demographically-matched controls

performed a single-trial version of the Stroop task with 70% congruent and 30% incongruent randomly presented trials. Response-locked ERPs were separately averaged for correct and error trials. Negative affect was measured as the single latent factor of measures of depression and anxiety. Groups did not differ on level of negative affect.

Results: Negative affect did not relate to measures of injury severity in survivors of TBI. Control and TBI participants did not differ in error rates as a function of negative affect, but did differ in response times (RT), with greater Stroop RT interference as negative affect increased in participants with TBI relative to healthy controls. TBI survivors showed disproportionately smaller ERN amplitudes as a function of negative affect relative to controls. Negative affect inversely correlated with ERN amplitude in TBI, but not control participants.

Conclusions: Results support a double jeopardy hypothesis of impairment in electrophysiological reflections of performance monitoring when negative affect is overlaid on severe TBI. Thus, increased negative affect constitutes an increased risk for performance monitoring difficulties following severe TBI.

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S. HAN, H. SUZUKI, A.I. DRAKE, L.M. CESSANTE, A.J. JAK, W.S. HOUSTON, D.C. DELIS, J. FILOTEO & M.W. BONDI. Predictors of Job Status Change Following TBI Among Active Military Personnel.

Objective: To determine what neuropsychological factors may contribute to a change in job status among active duty military personnel following a mild to moderate traumatic brain injury (TBI). Since possession of an apolipoprotein E epsilon-4 allele has been associated with worse outcome following TBI, apolipoprotein E genotype was also considered as a factor.

Participants and Methods: Optimal Data Analysis (ODA) was used to construct a hierarchical classification tree model to determine factors that may predict a change in job status among 46 active duty military personnel who underwent apolipoprotein E genotyping and extensive neuropsychological testing after sustaining a mild to moderate TBI. Participants were examined within 6 weeks of their TBI event. Job change was defined as any reduction in duties following TBI.

Results: Prediction of job change occurred with 93.33% accuracy when (1) epsilon-4 carriers showed a relatively lower percentage change increase in CVLT-II long delay free recall versus short delay free recall ($< \text{or} = 3.55\%$), (2) non-epsilon 4 carriers showed a relatively lower score on the Kennedy-Johnson post concussive symptom scales ($< \text{or} = 18.5$) and a relatively higher score for WASI FSIQ (> 111), or (3) non-epsilon-4 carriers showed a higher score on Kennedy-Johnson post concussive symptoms scales (> 18.5) but a relatively lower z-score on CVLT-II total recognition hits ($< \text{or} = 0.25$). Overall, the model predicted the soldiers' future job status with 91.30% accuracy ($p < 0.01$).

Conclusions: Results suggest both genetic factors and neuropsychological differences post-injury may contribute to a change in job status among active duty military personnel who sustain a mild to moderate head injury.

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C. WILLMOTT, J. PONSFORD & C. HOCKING. Rehabilitation of Attention Following Traumatic Brain Injury: A Model for Methylphenidate.

Objective: Traumatic brain injury (TBI) results in disabling impairments of attention and speed of information processing. Methylphenidate (MP) primarily acts upon dopaminergic and noradrenergic neuro-

transmitter systems which mediate attentional processes, and are disrupted by TBI. Previous treatment study findings with MP (Ritalin®) in this population have been mixed. This study investigated the efficacy of MP in the amelioration of attention deficits during the acute rehabilitation phase.

Participants and Methods: Forty participants with moderate-severe TBI sustained on average 68 days previously, were recruited into a randomised, crossover, repeated measures, double-blind, placebo controlled drug trial. MP was administered at a dose of 0.3mg/kg bd over two weeks. Neuropsychological measures included standardized clinical tests and experimental reaction time (RT) measures. The Rating Scale of Attentional Behaviour was completed by therapists.

Results: The drug was well tolerated in this population. MP significantly increased speed of information processing on the Symbol Digit Modalities Task, Ruff 2 & 7 Selective Attention Test, Sustained Attention to Response Task, selected conditions of a four choice visuo-spatial RT task, and a selective attention RT task. There were no effects on executive control over attention. Whilst therapist ratings of attentional behaviour indicated some improvement with MP, findings were not significant.

Conclusions: Consistent with previous studies, the pharmacological augmentation of attention following recent TBI with MP appears to act primarily on speed of information processing.

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Symposium 6

9:00–10:30 a.m.

Early Risk and Protective Factors for Cognitive Decline

Chair: Sherry Willis

Discussant: Alfred W. Kaszniak

D.J. SCHRETLEN, C. PEARLSON & B. GORDON. Structural Neuroimaging and the Contribution of Brain Reserve to Cognitive Aging.

Objective: Brain reserve is an influential yet elusive concept that has been construed and tested in different ways. Some writers refer to cognitive reserve and brain reserve interchangeably, glossing over the fundamental discontinuity between mind and brain. In this study we explore relationships among key components of the reserve hypothesis in relation to the processing speed model of cognitive aging.

Participants and Methods: We administered tests of “premorbid” IQ, personality, and processing speed to a community sample of 301 adults aged 20–92 years. In addition, 268 subjects completed a brain MRI scan from which we estimated gray matter, intracranial, and cerebral ischemic volumes, and cerebral atrophy (brain-to-intracranial volume ratio).

Results: Pearson correlation (*r*) analyses showed that processing speed depends more heavily on age (-0.634) than years of education (0.303), premorbid IQ (0.308), or trait openness (0.361) (all *ps* < 0.0001). Subgroups defined by median splits of these proxies of reserve differed in their processing speed performances. However, participants with high reserve showed the same rate of age-related decline in processing speed as those with low reserve. Both gray matter (0.305) and cerebral is-

chemic (-0.373) volumes also correlated with processing speed. Total intracranial volume, arguably the best measure of passive brain reserve, did not correlate (-0.038) with processing speed, whereas cerebral atrophy correlated (0.573) strongly. Finally, after processing speed was age-residualized, it correlated more strongly with premorbid IQ (0.506) than with any other proxy, including measures of brain volume.

Conclusions: These findings raise fundamental questions about the reserve hypothesis, especially in relation to cognitive aging.

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J.L. TAYLOR, Q. KENNEDY, M.M. ADAMSON, G.M. MURPHY & J.A. YESAVAGE. Expert Knowledge, APOE epsilon4, and Risk for Decline in Aviation Performance.

Objective: The APOE epsilon4 allele is a well-established risk factor for cognitive decline; however, greater cognitive reserve may reduce its impact. We tested the hypothesis that aviation expertise moderates the impact of APOE e4 on longitudinal flight simulator performance. Aviation expertise may be a specific instance of cognitive reserve, to the extent that aviation knowledge and procedural skills are crystallized abilities, which are less vulnerable to decline than fluid abilities and episodic memory.

Participants and Methods: The Stanford/VA Aviation study is a longitudinal study of medically monitored non-airline pilots who are followed annually using genetic, flight simulator, cognitive, and neuroimaging assessments. The aviator cohort is homogenous with respect to being well educated and medical healthy; yet participants vary in their level of aviation training and experience (as defined by FAA proficiency ratings).

Results: Across 3 annual assessments (*n* = 139), more expert pilots had a higher baseline level of flight simulator performance and showed less decline over time. There was no significant main effect of APOE status (that is, e4 carriers as a group did not perform worse at baseline or over time). As expected, expertise interacted with APOE such that the deleterious impact of APOE e4 on decline in simulator performance decreased as expertise increased. Preliminary cross-sectional analyses revealed lower episodic memory performance for carriers than non-carriers but no e4-related difference in hippocampal volume.

Conclusions: These findings may indicate a potential protective effect of specialized knowledge and past experience on the flight performance of pilots who are APOE e4 carriers

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S.L. WILLIS, J.L. TAYLOR, A.W. KASZNIK, D.J. SCHRETLEN, J.L. TAYLOR, S.L. WILLIS & M.A. SAGER. Early Risk and Protective Factors for Cognitive Decline.

Symposium Description: There is increasing evidence for a long pre-clinical phase in cognitive impairment and dementia in many adults, beginning prior to old age. This symposium examines early risk and protective factors from an interdisciplinary perspective including genetics, neuroimaging, cognitive and neuropsychological assessment. Findings are reported from four large-scale studies of cognitive risk and decline, which include subjects in midlife and early old age. Schretlen, Pearlson and Gordon (Johns Hopkins, Hartford Hospital) discuss possible dissociations between the concepts of brain reserve and cognitive reserve. Taylor, Adamson, and colleagues (VA Palo Alto, Stanford) report findings on expert knowledge, APOE, and risk for performance decline among aviators. Willis, Aylward, Mahurin and Schaie (Penn State University, University of Washington) present findings on brain volume in old age for Seattle Longitudinal Study subjects who declined cognitively in midlife. Sager, Hermann and LaRue (University of Wisconsin) report

findings from the study of middle-aged children of persons with AD in the Wisconsin Registry for Alzheimers Prevention. Kazniak (University of Arizona) will serve as discussant. Symposium presenters seek to integrate findings across studies to advance a transdisciplinary understanding of early risk and protective factors.

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J. JONES, B. HERMANN, A. LA RUE & M.A. SAGER. Wisconsin Registry for Alzheimer's Prevention (WRAP): Biomarkers of Pre-clinical AD.

Objective: The Wisconsin Registry for Alzheimer's Prevention (WRAP) is a longitudinal cohort study of adult children aged 40-65 of persons with Alzheimer's disease (AD). Our objective is to identify neurobiological and lifestyle factors that are associated with abnormal cognitive aging and the eventual development of AD.

Participants and Methods: 820 adult children of persons with AD and 285 age-matched controls without a family history undergo baseline MRI, neuropsychological and laboratory testing, APOE genotyping and characterization of demographic, health and lifestyle variables.

Results: On fMRI memory testing, WRAP $\epsilon 4$ carriers (mean age of 53) exhibit significantly less hippocampal activation than $\epsilon 4$ carriers without a family history, suggesting that an unknown factor embodied in family history is influencing the expression of $\epsilon 4$ on brain activation. Although we find no significant mean differences between WRAP and control cohorts or between APOE $\epsilon 4$ carriers or non-carriers in baseline cognitive measures, analyses show significant main effects for family history groups on serial position measures on the Rey auditory verbal learning test. After controlling for age, education, APOE genotype and gender, the WRAP cohort recalled fewer items of the first presented items (primacy) and a greater percentage of the last presented items (recency) compared to controls. Because a recency effect is characteristic of learning in AD, this finding suggests that serial position profiles may serve as a marker of pre-clinical AD in this population.

Conclusions: These findings are suggestive of pre-clinical AD. A second wave of testing is underway to define the pattern and predictors of cognitive change over a 4-year interval.

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S.L. WILLIS, E. AYLWARD, R.K. MAHURIN & K.W. SCHAIE. Risk of Midlife Cognitive Decline and Brain Volume in Old Age.

Objective: Longitudinal studies of cognitive development report normative patterns of stability during midlife. However, prospective dementia studies indicate long preclinical periods of risk prior to diagnosis. Longitudinal studies can investigate atypical patterns of midlife cognitive trajectories (i.e., decline, gain). In this study we examine the relationship between midlife cognitive trajectories and structural brain volume in old age.

Participants and Methods: Seattle Longitudinal Study subjects (N = 400) received an extensive psychometric ability battery at 3 occasions at 7-year intervals in midlife (age 43-63). Subjects' trajectories on three abilities (executive functioning, verbal memory, psychomotor speed) were characterized as indicating reliable decline, gain or stability. While midlife trajectories were stable for most subjects, approximately 10-15% showed reliable decline or gain. Decliners and gainers did not differ in age or education. Brain MRI scans (whole brain, hippocampus, entorhinal, frontal, temporal) were conducted on midlife decliners and gainers (N = 97) who are now in old age (X age = 69).

Results: Analyses of variance showed significant differences in brain regions of interest for those showing midlife decline vs gain on verbal memory. Midlife memory decliners had significantly smaller whole brain-

to-intracranial volume ratios ($p < .02$) and whole brain white matter-to-whole brain volume ratios ($p < .03$) in old age. Midlife memory decliners had significantly larger hippocampal CSF-to-hippocampal volume ratios ($p < .005$) and significantly larger entorhinal CSF-to-entorhinal volume ratios ($p < .04$) in old age.

Conclusions: Findings show associations between midlife memory trajectories and brain volume in old age

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Symposium 7

9:00-10:30 a.m.

The Neurobiology of Fetal Alcohol Spectrum Disorders: Emerging Findings from Neuroimaging

Chair: Kimberly Kerns

S.N. MATTSON, S.L. FRYER, A. SPADONI, A. BAZINET, E.R. SOWELL & E.P. RILEY. Functional Brain Changes in Children and Adolescents with Heavy Prenatal Alcohol Exposure.

Objective: Previous studies demonstrate structural brain changes in children with heavy prenatal alcohol exposure, including reductions in caudate and cerebellum, and reductions and displacement of the corpus callosum. Cortically, changes in brain shape, alterations in the distribution of gray and white matter, and alterations in cortical thickness have also been reported. Functional changes are less well documented.

Participants and Methods: Recently, we investigated functional brain changes in children and adolescents with heavy prenatal alcohol exposure (ALC) and controls using several fMRI tasks.

Results: In a study of response inhibition, ALC participants showed greater blood oxygen level dependent signal (BOLD) response across prefrontal cortical regions and less activation in the caudate during portions of the task requiring inhibition. Task performance did not differ by group.

In a study of spatial working memory (SWM), ALC participants showed greater BOLD response relative to controls in prefrontal and posterior parietal regions associated with working memory performance. These results were not due to differences in task performance.

In a verbal paired associates task, ALC participants demonstrated less activation in the left medial and posterior temporal regions and more activation in right dorsal frontal cortex relative to controls. Again, differences were not dependent on task performance.

Conclusions: Heavy prenatal alcohol exposure affects brain activation in response to a variety of neurocognitive tasks. These studies highlight alterations in the function of frontal cortical regions, suggesting an increased reliance on this brain region. These studies also document reduced neural activation in task-relevant areas, suggesting that the increases in frontal activation may be compensatory.

Research supported by grants AA10820, AA10417, AA14834, DA17830. Correspondence: *Kimberly A. Kerns, PhD, Psychology, University of Victoria, PO Box 3050, Stn CSC, Victoria, BC V8W 3P5, Canada. E-mail: kkerns@uvic.ca*

C. RASMUSSEN, C. LEBEL, K. WYPER, G. ANDREW, J. YAGER & C. BEAULIEU. Diffusion Tensor Imaging (DTI) in Children with Fetal Alcohol Spectrum Disorder.

Objective: The goal of this project was to examine the range of white matter abnormalities in children with FASD using an advanced MRI method called diffusion tensor imaging (DTI). DTI permits the virtual dissection of white matter (i.e. the wiring) in the brain as well as a measure of their structural integrity (e.g. degree of myelination).

Participants and Methods: Thirty-one children with a diagnosis of an FASD were assessed on a variety of cognitive tests as well as on DTI. White matter integrity, average diffusion, and volumetrics were analyzed in the following tracts: superior and inferior longitudinal fasciculi, superior and inferior fronto-occipital fasciculi, uncinate fasciculus, corpus callosum (genu, body, splenium), cingulum, and corticospinal tracts.

Results: Children with FASD had difficulties with cognitive tests measuring executive functioning, memory, academics, and language. When compared to healthy controls, children with FASD showed significantly reduced white matter integrity in the superior and inferior longitudinal fasciculus and the splenium of the corpus callosum. They also showed differences in the average diffusion across various tracts and in volumetrics.

Conclusions: Children with FASD show gross white matter abnormalities using DTI. This form of imaging may provide vital information leading to improved diagnosis of children with FASD, probable early biomarkers of disease, and eventually to improved therapies, either instructional or pharmacological, once the underlying brain abnormalities are better understood.

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S.J. ASTLEY, H. CARMICHAEL OLSON, K.A. KERNS, E.H. AYLWARD, A. BROOKS, T.E. COGGINS, J. DAVIES, S. DORN, B. GENDLER, T. JIRIKOWIC, P. KRAEGEL, K. MARAVILLA & T. RICHARDS. Findings from an MRI, MRS, fMRI and Neuropsychological Study of Children with Fetal Alcohol Spectrum Disorders.

Objective: To determine if magnetic resonance imaging, MR spectroscopy and/or functional MRI could serve as non-invasive methods for identifying global and/or focal brain abnormality in individuals with cognitive/behavioral dysfunction and prenatal alcohol exposure, with or without the FAS facial phenotype.

Participants and Methods: Four groups (n=16-24/group; age: 8-15 years) diagnosed using the FASD 4-Digit Code, included: 1) FAS/Partial FAS; 2) Static Encephalopathy/Alcohol Exposed (SE/AE); 3) Neurobehavioral Disorder/Alcohol Exposed (ND/AE); and 4) healthy controls with no exposure. Assessed were: (a) size of selected brain regions; (b) neurometabolite concentrations; (c) performance on a neuropsychological battery, and on experimental tasks of inhibitory control and working memory; and (d) neuroactivation during a working memory task.

Results: Cognitive impairments increased, and brain regions decreased in size, in a generally linear fashion across groups from controls to FAS/PFAS. The caudate was disproportionately smaller in FAS/PFAS and SE/AE, and the frontal lobe in FAS/PFAS. FAS facial features were associated with more severe brain abnormality in alcohol exposed individuals. MRS revealed significantly lower choline levels in FAS/PFAS than controls, with decreased choline as size of specific brain regions decreased. fMRI activation during a working memory task and experimental tasks decreased in frontal/parietal regions in a linear fashion across groups.

Conclusions: Findings support and advance current FASD literature, and further validate the 4-Digit Code. The pattern of findings on cognitive and experimental tasks implicated neuronal circuits in children with prenatal alcohol exposure—shedding light on functional deficits these children experience. MRI, MRS, fMRI could augment diagnosis of FASD.

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E.D. SHEARD, K.A. WILLOUGHBY, K. NASH & J. ROVET. Prenatal Alcohol Exposure and Hippocampal Development.

Objective: The aim of this study was to examine the effect of prenatal alcohol exposure on hippocampal integrity and function in children.

Participants and Methods: 23 children with FASD-related diagnoses and 20 typically developing control children, aged 10-14 years, participated. Children completed tests of learning and memory (e.g. memory for everyday activities, stories, pairs, lists, and abstract forms) and underwent MRI imaging in a 1.5T scanner. In addition to structural MRI, proton MRS using the single-voxel PROBE technique and PRESS pulse sequence acquisition was employed to measure metabolite concentrations in voxels placed over the left and right hippocampi. Two raters masked to group status manually traced the right and left hippocampal formation for measures of width and volume.

Results: After controlling for IQ, FASD were outperformed by controls in everyday memory and verbal memory tasks. Structurally, no differences were found in right or left hippocampal volumes or linear width; however, disturbed maturational changes in hippocampal volume were evident: Whereas age was significantly correlated with hippocampal volume in controls, there was no effect for FASD. Metabolically, lower glutamine/glutamate concentration were found in children with FASD. Both metabolic concentrations and volume independently correlated with a unique set of memory tasks in FASD relative to controls.

Conclusions: Although we did not find evidence of abnormal hippocampal volume or width, differences from controls were observed in maturational trajectory, metabolic composition, and structure-function relations. These findings suggest hippocampal damage caused by prenatal alcohol exposure continues to impact hippocampal and memory function into adolescence.

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K.A. KERNS & T.E. BAKER. Electrophysiological Evidence of Atypical Reward Processing in Children with Fetal Alcohol Spectrum Disorders.

Objective: Neural mechanisms underlying reinforcement learning were investigated using electrophysiology in children with FASD and typical children. We hypothesize executive function deficits in FASD may result from abnormal reinforcement learning signals (ERN) carried by the mid-brain dopamine system.

Participants and Methods: We tested two groups of children aged 8-12; 9-participants with FASD and 9-typically developing controls on two tasks; (1) a virtual T-Maze task assessing external feedback processing “feedback ERN” (fERN), and (2) a ‘Fish’ flanker task assessing internal feedback processing “response ERN” (rERN). In the T-Maze task, participants navigated a “virtual maze” to find monetary rewards and where given their money earned twice; halfway through and at the end of the task. For the Fish Flanker, participants pressed a button in the direction that the center ‘fish’ of a string of arrow shaped fish was pointing.

Results: While the overall fERN was not significantly different between groups, examination of response pre/post payment revealed the interaction between group and time was significant, $F(1, 16) = 5.26, p < .05$. Posthoc revealed for typical children, fERN amplitude decreased slightly with time, while for FASD children it increased significantly after the midway payment. Children with FASD also showed a reduced rERN compared to the controls and diminished error positivity.

Conclusions: This study revealed a disrupted “fERN” in children with FASD. Furthermore, Children with FASD children showed diminished error positivity, which is associated with subjective/emotional, conscious evaluation of the error. Our results suggest potential and important differences in underlying neurological mechanisms of performance monitoring as measured by ERPs.

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K.A. KERNS, S. MATTSON, C. RASMUSSEN, H. CARMICHAEL OLSON, J. ROVET & K.A. KERNS. The Neurobiology of Fetal Alcohol Spectrum Disorders: Emerging Findings from Neuroimaging.

Symposium Description: Individuals affected by Fetal Alcohol Spectrum Disorders (FASD) demonstrate lifelong impairments in cognitive, social and psychiatric functioning. Accurate diagnosis and treatment of FASD are critical, but have been slowed by limited understanding of the neurodevelopmental impact of prenatal alcohol exposure on brain structure and function. This symposium will present emerging interdisciplinary information from structural and functional imaging studies on neurobiological and neurocognitive impacts of FASD. Dr. Mattson will describe integrated work conducted in programmatic research using multiple imaging technologies in the study of FASD highlighting recent functional imaging studies documenting altered function of frontal cortical regions. Dr. Rasmussen will describe gross white matter abnormalities in children with FASD identified through the use of Diffusion Tensor Imaging (DTI). Dr. Carmichael Olson, using magnetic resonance imaging, (MRI), magnetic resonance spectroscopy (MRS), and functional MRI (fMRI), will describe highlights from a larger study about the relationship between cognitive impairments and size of various brain regions, and choline concentrations in children with varying levels of prenatal alcohol exposure. Dr. Rovet will describe the nature of hippocampal damage caused by prenatal alcohol exposure indicated by altered maturational trajectories into adolescence, changes in metabolic composition, and abnormal structure-function relations. Dr. Kerns will describe functional electrophysiological differences between children with FASD, ADHD and typically developing children. Advances in understanding the underlying brain abnormalities in FASD will lead the way to better understanding of this spectrum of disorders, show promise for improving diagnosis, identifying early biomarkers, assist early identification and intervention, and lay the foundation for appropriate interventions.

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Poster Session 6: HIV, Epilepsy, Forensics

9:00–10:30 a.m.

Epilepsy

S.B. ASMUSSEN, S. GALE & K. KIRLIN. Non-Epileptic and Epileptic Seizures: Personality Assessment Inventory (PAI) Profiles and Gender Differences.

Objective: Compare PAI profiles in both males (M) and females (F) with non-epileptic (NES) and epileptic seizures (ES).

Participants and Methods: 63 NES (24 M) and 60 ES patients (29 M) were monitored with continuous video-EEG for diagnosis. MANOVAs were carried out by diagnosis and gender on PAI scales examining somatic complaints (SOM), depressive symptoms (DEP), and antisocial features (ANT). Additional variables included IQ, age, education, and memory performance.

Results: (1) NES vs. ES: the NES group had higher DEP-P and SOM scores. The ES group had higher ANT scores. ES patients were younger and had lower memory scores. (2) NES-M vs. NES-F: ANT scores were higher in M. DEP-P scores were higher in F. SOM-C was above clinical level in F. (3) ES-F vs. ES-M: ANT scores were higher in M. (4) NES-F vs. ES-F: NES-F had higher SOM scores. ANT scores were higher in ES-F. (5) NES-M vs. ES-M: the NES-M had higher SOM-C scores. ES-M were younger and had poorer visual memory scores.

Conclusions: Results concur with previous reports of higher rates of SOM, SOM-C and DEP-P among NES patients relative to ES patients. Gender comparisons suggest these findings differ to some extent by sex; NES-F endorsed more DEP-P symptoms than ES-F and NES-M. Both ES-M and ES-F were more likely to endorse ANT features compared to NES patients, potentially as a result of age differences between groups. Findings support the usefulness of the PAI in an EMU setting to identify psychopathological symptoms to be addressed in mental health treatment.

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M. BARKER, G. RECKESS, B. SACHS, S. EISENSCHENK, S. ROPER & R. BAUER. Executive Functioning in Temporal Lobe Epilepsy: Performance Before and After Anterior Temporal Lobectomy.

Objective: This study examined pre- and post-surgical executive functioning (EF) in patients with intractable temporal lobe epilepsy. We also evaluated whether the data support the concept of nociferous cortex, which would predict performance deficits due to adverse effects of epileptogenic cortex on extra-temporal regions that mediate EF.

Participants and Methods: Participants included 115 patients with temporal lobe epilepsy who underwent anterior temporal lobectomy (ATL; left n = 56, right n = 59). They received comprehensive neuropsychological assessment before and after ATL and had a Full-Scale IQ greater than 70. EF measures included the Wisconsin Card Sorting Test (WCST), the Trail Making Test, and semantic clustering, perseverations, and intrusions on the California Verbal Learning Test (CVLT).

Results: At the pre-surgical assessment, the percentage of participants impaired (<5%ile) on these measures ranged from 20–24% on WCST indices, 35% on Trails B, and 22–41% on CVLT measures. Based on repeated-measures ANOVAs, the only significant performance changes from pre- to post-surgery were improvements on Trail Making and CVLT perseverations, and an increase in the number of CVLT intrusions. No change score exceeded 0.6 SD. EF outcome was unrelated to the presence of mesial temporal sclerosis or seizure freedom and was only weakly related to duration of epilepsy.

Conclusions: A substantial portion of participants performed in the impaired range on EF measures, but post-operative changes were small and not consistently observed across measures. EF did not improve with post-operative seizure freedom, which is inconsistent with the concept of nociferous cortex.

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K.T. BAUM, A.W. BYARS, T.J. DEGRAUW, B.S. MUSICK, S.M. PERKINS, C.S. JOHNSON, D.W. DUNN, J.E. BATES & J.K. AUSTIN. Infant Temperament and Neuropsychological Functioning in Children with New-Onset Seizures.

Objective: Children with seizures demonstrate neuropsychological deficits within three years of seizure onset. These deficits, as well as early

difficult temperament, are predictive of later outcomes. Early difficult temperament is associated with both executive dysfunction and behavior problems. We investigated whether early difficult temperament was associated with other neuropsychological factors in children with new-onset seizures.

Participants and Methods: Parents of 291 children (mean age = 9.3 years) who had their first recognized seizure (FRS) within the past three months retrospectively assessed infant temperament using the Retrospective Infant Temperament Questionnaire (RICQ). Neuropsychological tests were administered at baseline, 18, and 36 months following the FRS. Correlation analyses were carried out to describe the associations of three RICQ subscales (difficultness, unadaptability, and resistance to control) and four neuropsychological factor scores (language, processing speed, executive function/construction, and verbal memory).

Results: Results at 36 months showed that all three temperament dimensions were negatively correlated with nearly all neuropsychological indices, excluding correlations between both difficultness and resistance to control, and executive function/construction ($r = .19 - .27, p < .05$). A higher score on the temperament dimensions, indicating a more difficult temperament, was associated with lower scores on neuropsychological tests.

Conclusions: Children with a new-onset seizure who have early difficult temperaments experience associated neuropsychological deficits. The combination of these factors may put these children at risk for the development of negative outcomes, including academic underachievement and behavior problems. It is possible that neuropsychological status serves as a protective factor against the development of behavior problems.

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C.J. BELZILE, P.A. KLAAS, J.S. HAUT, R.M. BUSCH, M.F. DULAY & E. WYLLIE. Postoperative Behavior Problems in Children with Temporal Lobe Epilepsy.

Objective: This study looked at preoperative variables that predict postoperative behavior problems in children with temporal lobe epilepsy (TLE).

Participants and Methods: The participants in this study included 59 pediatric patients (32 females; 27 males) with TLE (left = 34; right = 25). The following measures were used: Wechsler Intelligence Scale for Children-Third Edition, Trail Making Test-part A, Achenbach Child Behavior Checklist, Conner's Parent Report Scale-Revised, Conners-Wells' Self-Report Scale, Children's Depression Inventory, and Revised Children's Manifest Anxiety Scale.

Results: Multiple regression analyses were conducted to evaluate preoperative predictors of postoperative problems with the Achenbach Child Behavior Checklist subscales as the criterion variables. For children with left temporal lobe epilepsy, lower IQ, higher cognitive speed, and preoperative anxiety and depression were the best predictors of postoperative anxiety and mood problems, accounting for 86% of the variance ($p < 0.031$; $p < 0.011$; $p < 0.001$; $p < 0.052$). Similar to children with left temporal lobe epilepsy, lower IQ and preoperative anxiety and depression were the best predictors of postoperative anxiety and mood problems in children with right temporal lobe epilepsy, accounting for 80% of the variance ($p < 0.043$).

Conclusions: This study looked at predictors of postoperative behavior problems in children with TLE and it was found that preoperative behavior problems were, by and large, the best predictors of significant postoperative behavior problems. More specifically, a relatively high percentage of children with left TLE continued to have significant withdrawn and delinquent behavior while children with right TLE continued to have social, thought and attention problems after surgery. This finding reaffirms the importance of a thorough pre and postoperative behavioral assessment and highlights the need for behavioral intervention for those pediatric epilepsy patients who continue to have behavior problems after surgery.

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E.L. COADY, D.L. DRANE, E.S. STROUP, N. CHAYTOR, J.M. UOMOTO & M. HOLMES. Psychological Distress in Patients with Comorbid Epilepsy and Psychogenic Nonepileptic Seizures.

Objective: Patients with co-existing epileptic seizures (ES) and psychogenic nonepileptic seizures (PNES) experience a unique blend of physiological and psychological sequelae. We examined whether patients with CO would exhibit higher levels of distress than patients with ES or PNES alone, as patients with CO have both physical and psychological events.

Participants and Methods: Twenty-nine patients with CO were identified through long-term monitoring from 2001 to 2005, and matched on gender and age with twenty-nine patients with ES and twenty-nine patients with PNES. All participants completed the MMPI. We examined whether there were between group differences in higher levels of distress as measured by MMPI Scales 2 and 7, as these scales are indicative of distress.

Results: Two one-way ANOVAs were conducted to evaluate the relationships between diagnostic group and MMPI Scale 2, and diagnostic group and MMPI Scale 7. Neither ANOVA was significant, $F(2, 84) = 1.38, p = .26$, and $F(2, 84) = 1.24, p = .29$, respectively. A MMPI Scale 2 "cutoff score" was assigned to each participant to dichotomize clinically elevated Scale 2 scores. Results indicated 64% of all participants had clinically elevated levels on Scale 2, however, this did not differ significantly across groups.

Conclusions: These results indicate that patients with CO do not exhibit significantly higher levels of distress than patients with ES or PNES. This suggests that despite dealing with both physical and psychological illnesses, patients with CO may believe they only have one type of "seizure," thus they experience no more distress than patients with ES and PNES alone.

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D.K. SOETAERT, R.J. HEINRICHS, L.E. BAADE & E. COADY. Utilizing the MMPI-2 Validity Scales in Epileptic and Non-Epileptic Seizure Patients.

Objective: An epileptic seizure (ES) has EEG correlates whereas a non-epileptic seizure (NES) appears clinically similar, but lacks EEG correlates and may result from psychological or biologic processes. The Minnesota Multiphasic Personality Inventory - 2 (MMPI-2) is routinely used in seizure patients to identify psychopathology and to aid detection of NES. This study examined response patterns on validity scales of the MMPI-2 (F, Fb, Fp, L, K, S, FBS and RBS).

Participants and Methods: This study includes 74 inpatients on a video-EEG unit of a comprehensive epilepsy center. The MMPI-2 was administered, and an epileptologist, based on video-EEG data, diagnosed 22 patients with ES, 47 with NES, and 5 with both.

Results: Thirty-one participants created invalid profiles on the MMPI-2. Of the invalid profiles, 65% were NES, 31% were ES, and 6% were both. 50% of invalid NES profiles were found to have elevated F, Fb, or Fp; as opposed to 30% of ES profiles with this pattern. Among all cases, 9 were found to have FBS of > 27 ; all but one of these cases was NES. No elevations of RBS were found in this sample.

Conclusions: No one validity scale was found to discriminate between NES and ES. In general, more NES patients may have over-reported psychological symptoms than did ES patients. Though elevations of FBS > 27 discriminated fairly well between NES and ES, no elevations of RBS were found in this sample.

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M.J. COHEN, Y. PARK, M. KIBBY, L. STANFORD & T. GARRISON. Intellectual and Memory Performance in Children With Complex Partial Seizures of Left or Right Hemisphere Origin.

Objective: This study examined the IQ and memory performance of children with complex partial seizures who were being followed at two epilepsy surgery centers.

Participants and Methods: 105 children with complex partial seizures (49 with left and 56 with right hemisphere onset) based upon EEG monitoring/MRI underwent IQ (WISC-III/IV) and memory (CMS) assessment as part of a neuropsychological evaluation. Their performance was compared to that of a control group (n = 52) matched for gender, race, age, and handedness.

Results: ANOVA and Chi Sq analysis indicated that the two epilepsy groups did not differ ($p > .05$) on age of onset, duration of seizure disorder, number of AEDs, and etiology. Multivariate and follow-up pairwise testing revealed that both epilepsy groups performed significantly lower ($p < .01$) than controls across all four WISC Indexes but did not differ significantly from each other. Analysis of performance on the CMS indicated that both epilepsy groups performed significantly below ($p < .01$) controls but not from each other across the three attention/working memory subtests as well as on the verbal memory (Stories & Word Pairs) subtests. On visual memory assessment, the right hemisphere group exhibited more difficulty ($p = .005$) learning on the Dot locations subtest vs controls with no significant differences seen at immediate or delayed recall. The right hemisphere group demonstrated significant ($p < .01$) difficulty on the immediate and delayed recall portions of the Faces subtest vs controls. They also performed significantly below the left hemisphere group at immediate recall.

Conclusions: The results indicate that both epilepsy groups performed significantly below controls (approximately one SD) on all aspects of intellectual assessment. Both groups demonstrated similar deficits in working memory as well as verbal learning and memory. In contrast children in the right hemisphere group exhibited significantly more difficulty learning spatial location (where) as well as learning and recalling faces (what).

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C.V. FLAHERTY-CRAIG, T. HAINES, D. WAGNER, P.H. MCCABE & P.J. ESLINGER. Pre-surgical Personality Traits Serve as Prognostic Indicators of Psychosocial Success Following Surgical Relief of Seizures in Temporal Lobe Epilepsy.

Objective: Current definitions of successful outcome following surgery for temporal lobe epilepsy (TLE) emphasize post-surgical seizure frequency, with less consideration given to psychosocial indicators. We hypothesized that pre-surgical personality factors, identified by the Minnesota Multiphasic Personality Inventory-2 (MMPI-2), could serve as prognostic indicators of post-surgical psychosocial success, defined by the Washington Psychosocial Seizure Inventory (WPSI).

Participants and Methods: Twenty-four post-surgical seizure-free TLE subjects were assessed pre- and post-surgically by the WPSI and MMPI-2 self-report measures. Multiple regression analysis was performed using pre-surgical MMPI-2 subscale response set T-scores as predictor variables and WPSI post-surgical subscale clinical rating scores as criterion variables.

Results: Level of pre-surgical Depression was predictive of post-surgical Interpersonal Adjustment ($r = .443$, $p < .023$) and Medical Management ($r = .486$, $p < .016$). Level of pre-surgical Masculinity-Femininity was predictive of post-surgical Vocational Adjustment ($r = .464$, $p < .017$). Level of pre-surgical Psychasthenia was predictive of post-surgical Interpersonal Adjustment ($r = .469$, $p < .018$). Level of pre-surgical Schiz-

ophrenia was predictive of post-surgical Vocational Adjustment ($r = .514$, $p < .007$) and Medical Management ($r = .474$, $p < .014$). Level of pre-surgical Social Introversion was predictive of post-surgical Emotional Adjustment ($r = .516$, $p < .007$), Interpersonal Adjustment ($r = .550$, $p < .004$) and Adjustment to Seizures ($r = .406$, $p < .040$).

Conclusions: Findings suggest that the pre-surgical MMPI-2 generated personality profile may serve as a reliable predictor of post-surgical psychosocial success among TLE surgical candidates following the relief of seizures by temporal lobectomy. Such an approach to pre-surgical candidate assessment would allow for the identification of high risk groups, with respect to adjustment issues relatively unmitigated by surgical relief of the seizure disorder itself.

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C.V. FLAHERTY-CRAIG, T. HAINES, D. WAGNER, P.H. MCCABE & P.J. ESLINGER. Pre-surgical Executive Functioning Capacities Predictive of Psychosocial Outcome Following Surgical Relief of Seizures in Temporal Lobe Epilepsy.

Objective: The purpose of this study was to investigate the potential of the pre-surgical executive functioning profile to serve as a prognostic indicator of post-surgical psychosocial outcome following surgical relief of temporal lobe epilepsy (TLE). We hypothesized that pre-surgical executive functioning abilities associated with attention and mental flexibility would be predictive of post-surgical psychosocial outcome, as defined by the Washington Psychosocial Seizure Inventory (WPSI).

Participants and Methods: Thirty-eight post-surgical seizure-free TLE subjects were assessed pre- and post-surgically by administration of psychometric measures of executive functioning within the domains of attention [Trail Making Test-B(TM)], associative fluency [Letter Fluency (LF)], and shift of response set [Wisconsin Card Sort-64 Perseverative Errors]. Multiple regression analysis was performed using pre-surgical executive functioning scores as predictor variables and WPSI post-surgical subscale clinical rating scores as criterion variables.

Results: Pre-surgical LF ability was inversely related to post-surgical Emotional Adjustment ($r = -.457$, $p < .025$), Interpersonal Adjustment ($r = -.445$, $p < .029$) and Medical Management ($r = -.510$, $p < .011$). Pre-surgical TM ability demonstrated a trend toward an inverse relationship to post-surgical Emotional Adjustment ($r = -.483$, $p < .068$).

Conclusions: Findings suggest that pre-surgical executive functioning capacities within the domains of divided visual attention and verbal associative fluency may serve as predictors of post-surgical psychosocial outcome among TLE surgical candidates following surgical relief of seizures. Such an approach to pre-surgical assessment would allow for the identification of high risk individuals. Subsequent application of a pre-surgical cognitive remediation program could optimize their potential for post-surgical psychosocial success within areas identified as unmitigated by surgical relief, including emotional and interpersonal adjustment, as well as medical management.

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J.R. GAWRYLUK & J. MCGLONE. Does the Concept of Emotional Intelligence Contribute to Our Understanding of Temporal Lobe Resection?

Objective: Temporal lobe resection (TLR) alters cognition and emotion differentially depending on laterality. Bar-On et al. (2003) reported that 3 patients with right TLR had lower 'emotional intelligence' (EI) than average; left resections were not studied. The current study aims: 1) to determine if Bar-On's Emotional Quotient Inventory (EQ-i) was

sensitive to side of the lesion; 2) to discover if individuals with left resections had lower verbal memory and naming scores than those with right; 3) to determine if the EQ-i offers new information about people with TLR than does intelligence (FSIQ) and psychosocial adjustment scales.

Participants and Methods: The EQ-i was administered via mail (82% response rate). EQ-i scores, Wechsler estimated FSIQ, verbal memory (% correct Delayed Logical Stories), confrontation naming (Boston Naming), and psychosocial adjustment (Washington Psychosocial Adjustment Scale) data were analyzed for 19 left and 19 right TLR patients.

Results: EQ-i scores did not show a laterality effect ($p=.34$). When right and left groups were combined, EQ-i self-ratings were significantly lower than the Average range FSIQ ($p=.000$). Verbal memory ($p=.006$) and naming ($p=.001$) were significantly worse after left than right TLR. EQ-i Total correlated significantly with psychosocial adjustment ($r=-.47$), but not with FSIQ ($r=.05$).

Conclusions: There was no compelling evidence for lateral specialization of EI. EQ-i provides unique information beyond intelligence and psychosocial adjustment. Future study of chronic epilepsy will determine if the low EQ-i scores related to seizures or surgery.

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J. WILLIAMS, M. MARTIN & J. MCGLONE. Subjective Memory Change Following Temporal Lobe Resection for the Treatment of Medically-Intractable Complex Partial Seizures: A Meta-Analysis.

Objective: Memory loss following temporal lobe resection (TLR) is a key concern for specialists and patients alike (e.g., Alpherts et al., 2006). We used meta-analysis to synthesize studies of subjective memory change following TLR.

Participants and Methods: Nineteen studies were identified through PsycINFO, PubMed, Clinical Evidence and email contact with authors. Inclusion criteria were an adult sample, literate, temporal lobe seizures, TLR, and pre-post operative data collection up until 2006. Effect size statistics (Hedges' g) and confidence intervals were assessed for homogeneity. A weighted mean effect size was calculated that was converted to a z -statistic to evaluate statistical significance using DSTAT (Johnson, 1993).

Results: Six studies met criteria, resulting in 25 effect sizes representing 450 patients and 171 relatives. Time from surgery to follow-up ranged from 6 to 36 months. Four memory questionnaires were used tapping current function, change in perceived function since surgery, and distress related to memory problems. Despite differences in methodologies, effect sizes were homogeneous, $QT(24) = 30.63$, $p > 0.05$. The weighted mean effect size of 0.27 was minimal to small, yet significantly different from zero ($z = 5.31$, $p < .001$, 95% confidence interval = +0.12 to +0.28) in the direction of perceived improvement. No laterality effects were found.

Conclusions: This meta-analysis demonstrated that ratings of subjective memory do not deteriorate following TLR for the treatment of partial complex seizures. Perception of memory remains stable or minimally improved regardless of laterality of the lesion, questionnaire content, person providing opinion, and length of follow-up. This outcome contrasts with the objective memory literature that documents material specific deficits, especially after left-sided resections. It is time that both objective and subjective memory literature be incorporated into the decision-making process about whether to proceed with TL surgery.

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N.M. GRIFFITH, K.M. SMITH, B.K. SCHEFFT & M.D. PRIVITERA. Assessing Optimistic and Pessimistic Explanatory Style in an Intractable Seizure Disorder Population.

Objective: Explanatory style – how one explains the causes of good or bad self-relevant events – may be particularly relevant in intractable epilepsy due to the unpredictability and uncontrollability of seizures. Pessimistic explanatory style is strongly associated with depression; depression is highly prevalent in seizure disorder populations. We used the Revised Optimism-Pessimism Scale (PSM-R), a content-based MMPI-2 scale, to assess explanatory style in an intractable seizure disorder population.

Participants and Methods: Our sample consisted of 87 participants (women = 52) evaluated for classification of seizures in 2006-07 with reading level appropriate for completion of the MMPI-2. We computed optimistic and pessimistic composite raw scores and PSM-R T-scores for both the full MMPI-2 and an abbreviated version (first 370 items).

Results: Participants in the seizure disorder sample were less optimistic (women: $t(51) = -9.11$, $p < .001$; men: $t(34) = -5.49$, $p < .001$) and more pessimistic (women: $t(51) = 4.35$, $p = .001$; men: $t(34) = 4.52$, $p < .001$) than the PSM-R normative sample. The distribution of small differences between full and abbreviated PSM-R T-scores ($M = 1.05$, $SD = 2.94$) indicated good agreement. In addition, 81 of 87 abbreviated PSM-R scores (93.1% of sample) were within the 95% CI of the corresponding full PSM-R score.

Conclusions: The PSM-R is a valid measure of optimistic and pessimistic explanatory style in a seizure disorder population. There is good agreement between PSM-R scores derived from the full and abbreviated MMPI-2.

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S.W. HILL, A.M. STRUTT, L. UBER-ZAK, M. ROPACKI & T.G. FOGEL. Seizure Laterality Predicted by the NAB Shape Learning & WMS-III Visual Reproduction.

Objective: To date, there has been inconsistent empirical support for the clinical utility of visual memory tests in the classification of unilateral temporal lobe seizures. Discrepant findings have been attributed to the bimodal processing of visual memory stimuli. The Neuropsychological Assessment Battery Shape Learning (NAB SL) subtest uses abstract designs which may reduce bimodal encoding and increase the correct classification of temporal lobe epilepsy (TLE); however, the NAB SL has not been studied with seizure disorder patients.

Participants and Methods: This study compared the classification rates of Video-EEG verified unilateral right ($n=23$) and left ($n=29$) TLE patients based on the NAB SL and the WMS-III Visual Reproduction (WMS-III VR). The total sample had a mean age of 34.3 years, 13.4 years of education, and 15.2 years of seizure activity. Binary logistic regressions were used to compare the ability of these visual memory tests to classify unilateral TLE patients.

Results: Results from this study indicated the NAB SL had comparable divergent validity to the WMS-III VR and better univariate and multivariate TLE classification rates. For combined subtest models of the NAB SL versus WMS-III VR immediate and delayed recall, the NAB SL showed the strongest positive predictive value (82%), overall correct classification (80%), and specificity (88%), but lower sensitivity (70%).

Conclusions: In conclusion, the NAB SL demonstrated sufficient divergent validity, a marginally stronger ability to correctly classify right TLE cases while minimizing false positives, and a stronger ability to correctly classify right and left TLE cases. These results support use of the NAB SL in TLE neuropsychological evaluations with comparable or marginally stronger unilateral TLE classification in relation to the WMS-III VR. Further, results indicated the NAB SL may minimize bimodal encoding.

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J.E. JONES, L. RAMIREZ & B.P. HERMANN. Psychosocial Outcomes of Anterior Temporal Lobectomy: A 10-year Follow-up Investigation.

Objective: This study examined the long-term (mean 10 years) psychosocial outcomes of a consecutive series of individuals with epilepsy who underwent an anterior temporal lobectomy (ATL) compared to individuals treated only with medication. This sample was initially assessed in 1999 (mean 5 years) (Jones et al., 2002). The second follow-up occurred in 2005. The primary focus of the study was to examine changes in actual life performance in the following areas: employment, independent living, driving, and financial independence. Quality of life was assessed. Interview questions were included pertaining to the presence or absence of mood and anxiety disorders.

Participants and Methods: The sample included 57 adults who underwent ATL and 18 controls that were evaluated for surgery during the same time period but continued to receive medical management. Participants were interviewed 8–15 years after surgery or presurgical evaluation. A structured interview was conducted to obtain information regarding seizure frequency and psychosocial status. Seizure frequency was evaluated for the number of seizures in the past year and number seizures since the initial follow-up interview in 1999.

Results: Individuals in the surgery group were more likely to be employed (70.2% v. 44.4%), driving (72.2% v. 33.3%), living independently (80.7% v. 44.4%) and financially independent (80.7% v. 44.4%). Notably there were no differences in terms of self reported quality of life. In terms of seizure frequency 71.9% of the surgery group was seizure free in the past year compared to 27.8% of the medically managed group. Since 1999 50.4% of participants who had surgery reported a diagnosis of a mood or anxiety disorder in the past year compared to 17.6% in the medically managed group.

Conclusions: Surgery appears to be associated with long term maintenance of favorable psychosocial outcomes 8–15 years after surgery. Seizure freedom and reduced seizure frequency appear to be a significant long term outcome of surgery.

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B.M. KORMAN, P. KRSEK, M. DUCHOWNY, P. JAYAKAR, B. MATON, E. PACHECO-JACOME, C. DUNOYER, G. MORRISON, J. RAGHEB, T. RESNICK, D. LUDWIG & G.J. REY. Cognitive Profile of Children with Histopathological Subtypes of Cortical Dysplasia and Intractable Epilepsy.

Objective: Focal cortical dysplasia (FCD), the predominant etiological substrate of intractable epilepsy (IE) in childhood, has been categorized into distinct subgroups based on specific histopathological findings. This study examined cognitive performance in relation to other clinical variables and FCD subtypes.

Participants and Methods: We examined the neuropsychological performance of 42 children with FCD who were operated on for IE, and assessed the influence of clinical, EEG, MRI, and histopathological variables on cognitive status. Cognitive domains examined pre-surgically included intelligence, language, constructional praxis, memory, and executive skills. Cortical malformations were classified as FCD type I or FCD type II. Principle component analysis (PCA), univariate comparisons, and multiple regression were used for data analyses.

Results: PCA revealed one latent cognitive variable associated with the five measured domains. Univariate analyses indicated that pre or perinatal risk factors ($p < 0.0001$), abnormal findings on neurological exam ($p = 0.0003$), background EEG slowing ($p = 0.0162$), and extent of dysplastic pathology on MRI ($p = 0.003$) were associated with greater cog-

nitive dysfunction. Multiple regression analysis showed that pre or perinatal risk (partial $R^2 = .09$, $p = .0171$), abnormal neurological exam (partial $R^2 = .04$, $p = .0529$), and background EEG slowing (partial $R^2 = .05$, $p = .0752$) constituted the best predictors of cognitive function. Pre or perinatal risk factor by itself explained 32% of the total variance in cognition, while neurological findings and background EEG together accounted for an additional 12%. Histopathology, seizure frequency, age of onset, and duration of illness were not significantly related to cognitive scores.

Conclusions: Our data indicate that the cognitive deficits seen in cases of FCD in children with IE are not related to histopathological classification. Rather, associated clinical factors appear to create more widespread disturbance of neural circuits and greater cognitive morbidity.

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J.E. KULUVA & S.P. CERCY. Treatment of Gelastic Seizures with Associated Improvement in Cognitive Function: A Case Presentation.

Objective: We describe a case of new-onset gelastic seizures associated with right frontal focus.

Participants and Methods: An 83-year-old Caucasian man developed stereotyped episodes of laughing, high-pitched screaming, and disorientation. He was admitted for observation and returned to baseline mental status, but remained in hospital due to new-onset cardiac arrhythmia. Subsequently, several more episodes occurred, each resolving after several minutes. EEG revealed focal right frontal paroxysmal epileptiform activity; he was started on levetiracetam. He had one additional episode as the medication was being titrated to therapeutic level, but has since been seizure-free. Brain imaging was unremarkable. One-month repeat EEG was normal. Neuropsychological evaluation was conducted 3 days after starting levetiracetam and again 23 days later.

Results: Initial evaluation revealed impairments of visual recognition memory, speed of visual search, cognitive flexibility, and visual abstraction. Visual recall memory, verbal recognition memory, language, visuospatial organization, processing speed, and verbal abstraction were deficient. Clinical seizure activity was evident during initial evaluation. Follow-up showed interval improvements in verbal memory, language, visuospatial organization, and executive functions. Visual recall memory remained stable; visual recognition memory showed marginal decline.

Conclusions: The patient's seizures responded to anticonvulsant treatment. Moreover, the cognitive deficits were likely attributable primarily to seizure disorder, and interval cognitive improvement was associated with seizure control. Gelastic seizures are overwhelmingly related to hypothalamic hamartoma, typically with childhood onset. A few adult-onset cases due to right frontal seizure focus have been described. Implications for frontal mediation of laughter mechanisms and dissociation of motor versus emotional aspects of laughter will be discussed.

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D.W. LORING, S.C. BOWDEN, G.P. LEE & K.J. MEADOR. Utility of Multiple-Level Likelihood Ratios in Characterization of Wada Memory Asymmetry Scores.

Objective: Wada memory testing is an important component in the evaluation of epilepsy surgery candidates. Traditional methods to charac-

terize Wada memory asymmetries have typically employed cut-scores, failing to assess the potential contribution associated with discrepancy score magnitude. In this report, we demonstrate the utility of multiple-level likelihood ratio to characterize the predictive utility of Wada memory scores asymmetries.

Participants and Methods: A total of 324 patients (L=172; R=152) who underwent Wada testing (MCG Wada protocol) were studied. All patients subsequently underwent anterior temporal lobectomy. Wada memory left-right asymmetry scores were group according to both the magnitude of difference and distribution of difference scores to insure adequate cell sizes, and ranged from >4.0 to -3.0. In addition, traditional logistic regression using a 2 point discrepancy for group classification was performed for comparative purposes.

Results: Using a cutpoint classification based on a 2 point Wada memory asymmetry for seizure onset lateralization, the positive likelihood ratio (LR+) was 3.6 (95% CI=2.7 to 4.9). By comparison, the multiple-level LRs for discrepancy scores varied as a function of magnitude discrepancy. A difference score of +4.0 or greater increased the likelihood of left seizure focus over base rates by an infinitely large factor (42% vs 0%). A difference between +2.5 and 4.0 increased the likelihood of left focus by a factor of 7.6 (20% vs. 3%). A difference score -7.5 to -6.0 reduced the likelihood of left focus from the base rate by a factor of 0.1 (2% vs 26%). At the lowest extreme, a difference score -8 reduces the likelihood of left focus, from the base rate by an infinitely small factor (0% vs. 7.9%).

Conclusions: The logistic regression using traditional cutpoint analysis, although statistically significant, was modest and on the group level is of limited clinical utility. Provision of LRs across the range of asymmetry scores provides greater interpretive guidance.

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D.R. MANDABACH, P.S. FASTENAU, D.W. DUNN & J.K. AUSTIN. Association Between Handedness and Neuropsychological Function in Children with Epilepsy.

Objective: Children with epilepsy (especially with early onset left-hemisphere seizure foci) show an increased rate of left-handedness, which has been attributed to cortical reorganization. We hypothesized that such reorganization would decrease efficiency in well-lateralized cognitive functions. We predicted that language, auditory-verbal working memory (AVWM), and verbal memory/learning scores would be lower in left-handers compared to right-handers. We further predicted that spatial memory and spatial perception/construction would be lower in left-handers compared to right-handers, but this was considered exploratory due to limited previous research.

Participants and Methods: The sample was drawn from a longitudinal study of 164 children diagnosed with non-refractory epilepsy (Fastenau et al., 2004). Age ranged from 8 to 15 years (M=11.3, SD=1.9); 16% (n=26) were left-handed; 49% were girls. Children were excluded for mental retardation (IQ M=93.3, SD=14.9). Various seizure types were represented; 17.9% had generalized absence seizures as their primary type, 21.4% had non-absence generalized seizures; and 60.7% had focal seizures (19.7% with secondary generalization). All children completed tests of language, memory, learning, and spatial abilities.

Results: Verbal learning scores were significantly lower in left-handers compared to right-handers, $t(163) = -1.97, p = .03, d = .43$. No significant differences were observed in any other domain ($p > .10$).

Conclusions: Left-handedness could help identify children with epilepsy who might be at risk for verbal learning deficits and potentially for academic challenges. [Supported by NIH NR04536 (JKA) and an IUPUI University Research Opportunities Program Grant (DRM)].

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C.R. MCDONALD, M.E. AHMADI, D.J. HAGLER, V.J. IRAGUI, E.S. TECOMA, L. GHARAPETIAN, A.M. DALE & E. HALGREN. Multimodal Imaging in Patients with Temporal Lobe Epilepsy (TLE): Examining the Contributions of the Uncinate Fasciculus (UF), Arcuate Fasciculus (AF), and Neocortical Thinning to Memory and Language Functioning in TLE.

Objective: It is well-known that structural pathology contributes to impaired memory and language in TLE. However, the degree to which specific cortical and subcortical structures contribute to impairments is unknown. The current study combines diffusion tensor imaging (DTI) with volumetric MRI to explore the contribution of key white matter tracts and cortical regions to neuropsychological performances in TLE. The AF, UF, and temporal neocortex were selected based on their presumed contribution to language and memory.

Participants and Methods: DTI, volumetric MRI, and neuropsychological data were obtained for 16 TLE patients (8 right, 8 left). Fractional anisotropy (FA), mean diffusivity (MD), and fiber volumes for the UF and AF were quantified from DTI. Volumetric MRI was used to obtain hippocampal volumes and cortical thickness measurements in temporal lobe regions. Regression analyses were performed to examine the contribution of each structure to memory and language scores after regressing out age and intracranial volume.

Results: Higher FA values of the left and right UF predicted higher verbal memory scores. Interestingly, FA of the UF was a stronger predictor of delayed verbal memory than left hippocampal volume. Together, these measures explained over 50% of the variance in verbal memory. In addition, higher volume of the left AF predicted higher confrontational naming scores. Temporal lobe cortical thinning did not contribute to verbal memory or naming. Rather, cortical thinning of the left fusiform was a strong predictor of immediate face recognition; whereas, right hippocampal volume predicted delayed face recognition.

Conclusions: These data elucidate the importance of the UF and AF in memory and language functioning, respectively. The data also support the known role of the fusiform gyrus in face recognition. Most importantly, this study demonstrates the utility of multimodal imaging that includes DTI and volumetric MRI for understanding cognitive dysfunction in TLE and other neurologic disease.

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D. MRELASHVILI, J.M. SEELEY, M. GALLAGHER, A. ARAIN & B. ABOU-KHALIL. Role of Behavioral Adverse Effects in Discontinuation of Pregabalin in Patients with Intractable Partial Seizures. A Post-Marketing Analysis.

Objective: Evaluate tolerability and efficacy of pregabalin (PGB) with focus on behavioral adverse effects.

Participants and Methods: Medical records were reviewed for all patients started on PGB for epilepsy between September 2005 and December 2006. Patients on PGB for refractory partial epilepsy were included if they had at least one follow up visit or phone communication.

Results: 119 patients (54 women) qualified for the study. Their mean age was 39.5 years (range 12 to 78). 73 patients (61%) were still taking PGB at the last follow up. The average duration of treatment was 41 weeks. 33% (15/46) of patients who discontinued PGB did so for lack of efficacy only while the other 66% (31/46) stopped the medication for adverse effects alone or for both. The most common adverse effect causing discontinuation was behavioral and psychiatric adverse effects, including agitation, irritability, and depression (9 patients - 20% of those discontinuing). The most common adverse effect overall was drowsiness (23 patients- 19% of all patients). Weight gain was the second most common reason for discontinuation, in 7 patients (15% of those discontinuing).

There were 88 patients who qualified for efficacy analysis. The median reduction in seizure frequency was 41%. Seven patients (8%) became seizure free, 13 patients (15%) reported >90% seizure reduction, 38 patients (43%) reported >50% seizure reduction, 20 patients (46%) reported no significant change, and 10 patients (11%) had greater than 50% increase in seizure frequency.

Conclusions: PGB efficacy post-marketing is similar to that noted in clinical trials. However, behavioral adverse effects which were not reported in controlled trials were the most important reason for discontinuation. Weight gain was the second most common.

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L. NAKHUTINA, P. PRAMATARIS, C. MORRISON, W. BARR & O. DEVINSKY. Test-Retest Reliability and Reliable Change Indices for the Rey-Osterrieth Complex Figure Test for Partial Epilepsy.

Objective: The Rey-Osterrieth Complex Figure (ROCF) is a commonly used measure in evaluating long-term outcome in epilepsy patients. Previous studies reported test-retest norms for various measures, however, none included the ROCF and none investigated change beyond a 6-month period. Our previous attempt to obtain test-retest norms for ROCF (3-year interval) resulted in wide range indices, related to the effects of having multiple raters. Purpose of this study was to reexamine this issue by rescoring the figure with an emphasis on establishing a high interrater reliability (IRR).

Participants and Methods: We assessed test-retest performance on the ROCF in a sample of thirty epilepsy patients undergoing testing on two occasions (mean interval = 33.7 months) in order to derive reliable change indices (RCI) and regression-based norms. Diagnoses were made according to clinical symptomatology and EEG findings. None of the patients had undergone surgery, and all were maintained on antiepileptic agents. Patients' ROCF reproductions were rescored by three experienced raters. Once high IRR was obtained, mean ratings were used to derive norms.

Results: Rating procedures resulted in a high IRR (Copy: 0.963; DR: 0.986). The derived adjusted RC (90%) cutoff values for ROCF copy were (≤ -6 , $\geq +8$) and for ROCF DR were (≤ -6 , $\geq +9$). Additional findings were obtained from regression-based analyses including age, education, seizure duration, age of onset, and a baseline score in a step-wise procedure.

Conclusions: The results provide a means to evaluate long-term outcome in epilepsy patients using the ROCF. The importance of the rescoring procedure in deriving test-retest norms is emphasized.

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L. SEPETA, J. HORSFALL, S. BOOKHEIMER, B. PAUL, E. BRANGLING-BENNETT & S. FONG. Memory Functioning in Children with Temporal Lobe Epilepsy.

Objective: This study compared verbal memory in children (7-16 yrs) with left (LTLE) vs. right (RTLE) temporal lobe epilepsy. LTLE adults show greater impairments on verbal memory measures than RTLE adults. However, in children seizures occur during cortical maturation, possibly leading to memory reorganization and a different pattern of verbal memory performance. Therefore, we hypothesized that LTLE and RTLE children will perform similarly on verbal memory measures.

Participants and Methods: Verbal memory functioning was tested in children with LTLE (n=4) vs. RTLE (n=4). Measures included: Children's Memory Scale (CMS) Verbal Composite Scores, CMS Stories (CMS-S), CMS Word Pairs (CMS-WP), and California Verbal Learning Test-Children's Version (CVLT-C).

Results: There was no difference between LTLE vs. RTLE children on CMS Verbal Immediate and Delayed Composites, CMS-S Immediate, Delayed, and Delayed Recognition, CMS-WP Immediate and Delayed, or CVLT-C Total Score. LTLE children performed worse than RTLE children on CMS-WP Recognition ($p < .05$; LTLE mean=4.25, sd=4.57; RTLE mean=11.00, sd=1.16) and CMS Delayed Recognition Composite Score ($p < .05$; LTLE mean=63.00, sd=17.68; RTLE mean=98.00, sd=19.03).

Conclusions: Preliminary results support memory reorganization in TLE children. However, while free recall of verbal information was low average to borderline in both groups, RTLE children displayed a trend toward better performance. Furthermore, on recognition measures RTLE children displayed a trend towards better performance on noncontextual (CMS-WP) compared to contextual verbal tasks (CMS-S), while LTLE children performed poorly, regardless of context. This indicates RTLE children encoded and recognized verbal information, particularly noncontextual verbal information, but LTLE children had difficulty encoding, retaining, and recognizing contextual and noncontextual verbal information.

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E.M. SHERMAN, S.J. AKDAG, M.B. CONNOLLY, L. HAMIWKA, W. HADER, P. STEINBOK, S.L. MCLEOD & A.J. KELLER. Pre-Surgical Evaluation of Pediatric Epilepsy Surgery Candidates: Construct Validity of Memory Measures.

Objective: Tools for measuring memory in children under evaluation for epilepsy surgery must be carefully chosen because results are used to estimate cognitive risks associated with surgery. As a first step to evaluating the construct validity of memory measures for children with intractable epilepsy, we measured associations between the Rey Complex Figure Test, California Verbal Learning Test, Children's Version, and Children's Memory Scale subtests of Family Pictures, Faces and Stories. Because some memory tests are reported to have real-world predictive ability in children, association with quality of life was also examined.

Participants and Methods: Archival neuropsychological data from 52 children under evaluation for epilepsy surgery were reviewed. Data included delay scores on memory tests, along with a parent-rated quality of life scale (Impact of Childhood Illness scale).

Results: Visual memory tests were moderately intercorrelated ($r = .31 - .43$), and none had large correlations with verbal memory tests except for Family Pictures, which was highly related to verbal memory tests ($r = .55 - .58$). Verbal memory tests were highly intercorrelated ($r = .59$), but had only small to medium correlations with visual memory tests ($r = .25 - .42$). Only Faces was associated with quality of life ($r = -.41$).

Conclusions: The convergent and divergent validity of most of these memory tests in children with epilepsy was supported. Verbal tests were highly interrelated and visual tests showed moderate correlations with each other. Family Pictures emerged as a test with combined verbal-visual underpinnings. Only Faces appeared to be a useful predictor of quality of life in children undergoing epilepsy surgery.

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A.M. TAYLOR, G. WOO, D.A. CAHN-WEINER, D.S. FILIPPI, P.A. GARCIA & D. KING-STEPHENS. Psychometric Discrimination of Patients with Epileptic from Nonepileptic Seizures.

Objective: Research exploring the psychological characteristics of patients with nonepileptic seizures (NES) has found that the personality and mood features associated with this seizure disorder may help differentiate them from patients with epileptic seizures (ES). The purpose of this study was to explore the discriminative properties of mood and personality measures in classifying patients with NES and ES.

Participants and Methods: Upon admission to the video-EEG (v-EEG) monitoring unit and prior to receiving their diagnosis, recruited patients completed the PAI and POMS. Of the 139 patients who met the inclusion criteria for this study, 88 patients (56 female, 32 male) with definitive diagnoses and complete protocols were included in the analysis. NES and ES patients were matched on age, education, gender distribution, and current number of medications. V-EEG monitoring resulted in 58 diagnoses of ES and 30 diagnoses of NES.

Results: On the PAI, the NES and ES groups differed significantly on Somatic Complaints (SOM), Depression (DEP), and Antisocial Features (ANT) scales. On the POMS, groups were significantly different on the Tension-Anxiety and Depression-Dejection scales. In a discriminant function analysis (DFA) with v-EEG confirmed diagnosis as the dependent variable, the three significant PAI subscales provided an overall classification accuracy of 78.4%. In a separate DFA, the two significant POMS scales provided an overall classification accuracy of 67%. When entered jointly, the five scales provided an overall classification accuracy of 78.4%.

Conclusions: These results suggest that used jointly, measures of enduring personality features, rather than current mood state, help to differentiate these two patient populations. These findings also have clinical implications for the development of targeted interventions to address chronic psychiatric disturbances associated with this patient population. Correspondence: *Alex M. Taylor, UCSF, 2349 Railroad St. #251S, Pittsburgh, PA 15222. E-mail: ataylor@mail@gmail.com*

A. VEDERMAN, W. BARR, R. HOLTZER & O. DEVINSKY. Ictal Auras and Memory Performance on the CVLT.

Objective: The aim of this study was to examine the relationship between ictal auras and memory performance.

Participants and Methods: Forty-two individuals (24 male, mean age in years = 42; 18 female, mean age in years = 38) with intractable seizures and ictal déjà vu auras were selected by chart review along with forty-two individuals with epilepsy and non-mnemonic auras or no auras (21 male, mean age in years = 43; 21 female, mean age in years = 38). The comparison group was matched on key demographic variables known to affect memory performance.

Results: Logistic regressions were conducted using aura vs. no aura as the two level independent variable and memory performance (dichotomized into impaired vs. not impaired on a given index) served as the dependent variables. All analyses controlled for age, gender, education, and number of years with seizures as covariates. The presence of any aura relative to no aura was associated with increased false positive errors ($\text{Exp}(B)=6.8$, $95\%CI=1.2-43.0$, $p=.044$) though déjà vu auras specifically were not associated with impairment in word acquisition, long delay memory, or recognition memory indices.

Conclusions: These findings suggest partial support to the notion that the presence of auras is associated with impaired memory in persons with epilepsy.

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F.S. WINSTANLEY, S.J. SWANSON, D.S. SABSEVITZ, M. RAGHAVAN, W.M. MUELLER, R. MUSHTAQ & T.A. HAMMEKE. Category-specific naming during electrical stimulation mapping identifies wider cortical language representation and predicts naming outcome.

Objective: To examine the cortical representation of category (common vs. proper nouns) and modality (auditory vs. visual) specific naming during extra-operative electrical stimulation mapping (ESM) in a patient undergoing temporal lobe epilepsy surgery.

Participants and Methods: One L-ATL patient (DW) underwent ESM for identification of eloquent cortex. Visual naming stimuli were taken from Snodgrass and Vanderwart (common nouns) and Tranel's Famous

Faces/Landmarks (proper nouns) Auditory naming stimuli for both common and proper noun categories were taken from a normative study at our center. ESM parameters followed a standard protocol previously described. The patient was tested pre and postoperatively in each of these categories with items used during the mapping procedure.

Results: Stimulation of numerous cortical areas produced dysnomia with one or more sensory modalities and semantic categories. Several category specific sites were also identified for visual naming of Famous Faces and Landmarks. Two of these sites relevant to visual landmark naming in the anterior inferior temporal lobe were subsequently resected. Postoperatively, naming deficits were more specific to visual proper noun naming (e.g. Famous Faces and Landmarks).

Conclusions: This is the first case to show that category specific stimuli (i.e. visual proper noun naming) can be used during ESM to 1) identify unique areas of language cortex, and 2) predict postoperative category specific naming deficits. Identification of unique proper noun naming sites and category specific postoperative decline seen in this study supports past studies demonstrating the role of the left anterior temporal lobe for proper noun naming.

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J.R. WOLKIN, W.B. BARR, K. ALPER, V. ZEMON & O. DEVINSKY. Assessment of Major Depressive Disorder in Patients with Epilepsy using the BDI.

Objective: Rates of co-morbid Major Depressive Disorder (MDD) reported in patients with epilepsy vary widely (7.3% - 75%). The most identified reason for the variability in rates is the inconsistency regarding assessment measures used across studies to diagnose psychopathology. The current study sought to validate the Beck Depression Inventory (BDI) and its extracted components in a sample of epilepsy patients using structured interview criteria (SCID) as the standard.

Participants and Methods: The sample consisted of 312 epilepsy patients, 92% of whom were diagnosed with partial epilepsy. All subjects completed both the entire BDI, and the Mood Module of the SCID. Over half of the sample (58%) was female.

Results: Receiver Operating Characteristic Curve (ROC) Analysis indicates that the BDI's ability to predict a SCID-diagnosis of MDD is significant ($p<.001$) with 78.4% accuracy (95% CI, 703-.864). A cut-off score of greater than or equal to 12 provided optimal sensitivity (72.2%) and specificity (68.8%). Further, Principal Component Analysis (PCA) extracted five components from the BDI: 1. Cognitive Affective/Negative View Toward Self; 2. Performance Impairment/Anhedonia; 3. Somatic Concerns; 4. Pessimism and Irritability; and, 5. Physiologic Factors related to Appetite. The best predictor of SCID-diagnosed MDD was generated by the Cognitive-Affective/Negative View Toward Self factor, which identified depression with 79.3% accuracy.

Conclusions: The findings confirm the BDI's ability to identify depression in patients with epilepsy.

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Forensic Neuropsychology

A. BAGLEY & D. KOSSON. The Neuropsychological Effects Associated with Taser Shock Administrations.

Objective: Although Taser use is quickly becoming an integral part of policing, little research has been devoted to the effects of its administration. Existing research provides compelling evidence to suggest this relatively non-lethal method is safe; however, no safety study to date has

examined the cognitive effects associated with the electrical shock of a Taser gun. Because past research has found electrical injury (EI) to result in neuropsychological deficits in areas such as verbal memory, processing speed, attention, motor speed, and mood, it is hypothesized these same deficits could occur from a Taser shock. Consequently, this study's objective is to investigate the effects of Taser administrations on cognitive functioning as measured by various neuropsychological measures.

Participants and Methods: Because police officers are commonly Tased as part of training demonstrations, the current study has recruited 32 Tased and 30 non-Tased participants from several IL police departments. Each of the officers completed a brief interview and a 1½ hour neuropsychological battery.

Results: Consistent with previous study of EI, T-test analyses indicate that officers with a history of being Tased scored significantly lower than non-Tased officers in areas of verbal memory, attention, and processing speed. However, in contrast to EI research, no significant differences between groups were found for motor speed or mood measures. Additionally, Tased officers scored significantly lower in visuospatial performance; a finding not commonly reported in EI research. Finally, these objective deficits were found in absence of any subjective cognitive complaints.

Conclusions: Overall, the current results are consistent with previous literature examining cognitive deficits in EI. However, the variations in the pattern of neuropsychological performance between Tased and EI individuals may suggest distinct differences between these populations. Further interpretation, limitations, and future directions are discussed in more detail.

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D. LORING, S. BOWDEN, E. BIGLER, M. BUNNAGE, N. GREGG & A. SHORES. When is a new test ready for clinical application? The validity of the Word Memory Test under the microscope.

Symposium Description: In this symposium consideration is given to the criteria by which any new test may be judged valid for clinical application. In view of the apparent popularity and also the controversy regarding the Word Memory Test (WMT), this test is chosen for a clinical case-study of validity status. All of the presenters in this symposium are active clinical researchers with experience in the application and interpretation of symptom validity tests (SVT's). Each presenter will report a different patient population. Diverse methodologies will be described to provide independent scrutiny of critical validity claims underpinning the use the WMT. In addition to the common and well-known criteria for establishing validity, namely acceptable reliability and validity demonstrated in primary research findings, presentations in this symposium will highlight the importance of independent replication of validity, independent of the test author's claims. Some of the first independent studies of the WMT will be described. These studies are conducted in clinical populations of direct relevance to appraisal of any SVT, and use a combination of established and innovative methods for evaluation of the construct of effort. All of these studies suggest caution in the unqualified application of the test author's and publishers claims for validity of the WMT. The studies illustrate the critical importance of independent replication of validity, prior to any new test being adopted for clinical practice. In contrast, some clinicians may be willing to take a test publisher's validity claims on face value. However, such clinicians need to be prepared to change their testing practices if independent replication does not support the claims of the test publisher. The approach chosen by any clinician will involve consideration of important issues regarding ethical and scientific standards.

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E. BIGLER, M.D. ALLEN, P.F. CLEMENT, J. LARSEN, N.J. GOODRICH-HUNSAKER & R.O. HOPKINS. Functional and Structural Neuroimaging Correlates of Symptom Validity Test Performance.

Objective: Symptom validity testing (SVT) literature is very limited in critical studies dealing with the clinical significance of false positive SVT performance in patients with verifiable neuroimaging abnormalities. Neuroimaging findings can also address another major limitation of SVT research — a complete absence of SVT literature that examines underlying neural processing during SVT performance, as SVT measures are in fact neuropsychological tasks. In the current study, neuropsychological assessment findings of failed SVT performance in patients with bona fide neuroimaging deficits who were not considered to be malingering were reviewed. For the functional neuroimaging component Green's Word Memory Test (WMT) was adapted for fMRI presentation. We hypothesized that widespread fMRI activation during WMT performance would be observed and that focal frontal and/or temporal lobe pathology results in WMT failure.

Participants and Methods: Subjects were identified with documented history of acquired brain injury, independently verified by medical records and/or neuroimaging studies, who failed one or more commonly used SVT measures, but clinically deemed to not be malingering. fMRI studies were conducted using the WMT.

Results: fMRI activation during the WMT demonstrated a highly reliable activation pattern involving widespread cortical areas commonly associated with task difficulty, memory load, concentration, and cognitive effort, including dorsolateral prefrontal cortex, anterior insula, superior parietal cortex and the dorsal anterior cingulate. Presence of frontotemporal damage was associated with at least one SVT failure.

Conclusions: Performance of the WMT requires the intactness of an extensive neural network. False positive SVT performance occurs in patients with frontotemporal damage.

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M. BUNNAGE, C. EICHINGER, N. PEARCE, A. DUCKWORTH & M. NEWSON. Criterion Validity of the Word Memory Test: An Audit of a Sample of Patients Assessed for Clinical not Litigious Reasons.

Objective: Data from a group of clinical patients were audited to determine the frequency of WMT failure and the relationship between failure on the WMT and identifiable external incentives that may be thought to encourage symptom manipulation.

Participants and Methods: A sample of 132 consecutive adult patients (aged 16-80, mean age 45 years) with available data was retrospectively audited. These patients underwent neuropsychological assessment as part of their clinical health care, not for the purposes of litigation. The patients were referred for assessment by their treating Neurologist or Neuropsychiatrist working within an acute hospital diagnostic service. The WMT was routinely administered to all patients. The frequency of WMT failure, using the published cut-offs, was determined. Identifiable potential external incentive for each patient was determined from a thorough review of the patient's medical records and information derived from the neuropsychological assessment. The association between external incentive (i.e. a crucial component of Slick's (1999) criteria for possible malingering) and WMT performance was determined.

Results: Using the three cut-off scores published for the WMT-IR trial (82.5% correct, 85% correct and 87.5% correct) failure rates amongst this sample of patients were 25.8%, 37.1% and 37.1% respectively. Of the sample 9% had an identifiable potential external financial incentive. Using the three cut-off scores for the WMT in this sub-group failure rates were 50%, 58% and 58% respectively. The conjunction of identifiable external incentive and failure on the WMT occurred in approximately 5% of the total sample.

Conclusions: The conjunction of failure on the WMT and identifiable external incentive for symptom manipulation in a health setting was between 5 and 7.4 times less frequent than failure on the WMT alone. It may be, therefore, that there is a considerable risk of diagnostic false positive error regarding the sub-optimal effort interpretation of WMT failure in this setting.

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N. GREGG, W. LINDSTROM, J. LINDSTROM & C. COLEMAN. Validity of Commonly-Used Measures of Effort When Used With Adults Demonstrating Learning Disabilities or AD/HD.

Objective: The purpose of this study was to investigate the construct validity of the Word Memory Test (WMT; Green, 2003), the Test of Memory Malingering (TOMM; Tombaugh, 1996), and the Word Reading Test (WRT; Osmon et al., 2006) for the classification of adults with learning disabilities (LD), those feigning LD, those with no reported disability, and those with AD/HD.

Participants and Methods: The study used a partial simulation design with quasi-random assignment of participants to experimental and control conditions. Four groups were included: students with LD (N=20), LD-simulators (N=20), a control group (N=20), and an AD/HD clinical comparison group (N=20).

Results: ANOVAs and post hoc tests were used to determine the discriminatory capacity of each measure. Using malingering cut-offs, the sensitivity, specificity, positive predictive validity, and negative predictive validity of each measure were determined, providing classification accuracy data. Correlational analyses were used to evaluate the processing abilities and academic skills presumed intact by the three measures.

Conclusions: The findings of this study call into question the validity of the WMT and the TOMM as measures of malingering for the adult population demonstrating LD. Linguistic/processing deficits that appear to be confounding the rates of classification were identified. Recommendations for best practices for the use of such measures with these populations were suggested.

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K. BATT & E.A. SHORES. The TOMM is More Resilient than the WMT to Distraction in Patients with Moderate to Severe Brain Injury: Implications for Clinical Practice.

Objective: The Word Memory Test (WMT) and Test of Memory Malingering (TOMM) are commonly used validity tests, which have been generally accepted as measures of effort, as opposed to cognitive function. This research assessed how a sample of participants with moderate-severe brain-injury performed on the WMT and TOMM under conditions of 1) full effort, 2) distraction, or 3) when asked to exaggerate their memory deficits.

Participants and Methods: The study included 60 participants with an acquired brain injury (38 traumatic brain injuries; 22 non-traumatic brain injuries), and restricted randomisation was used to assign individuals to the control, distraction or malingering groups. Following Craik (1982) an auditory distraction task was used during the learning phase in the distraction group, while a scenario adapted from Tombaugh (1997) was used to encourage exaggeration of memory impairment in the malingering group.

Results: Analysis found the groups did not differ in terms of age, education, type of injury, age at injury, depression, anxiety or stress, or with order of test presentation. Significant main effects for group, test, and group by test interaction were found.

Conclusions: This study shows that the TOMM is significantly less susceptible to the effects of distraction than the WMT. The results suggest that when used in patients with more severe brain injuries the WMT may be less a test of effort and more a test of cognitive capacity.

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K.L. CURTIS, R. BRASSEUX, K.W. GREVE & K.J. BIANCHINI. Classification Accuracy of Finger Tapping and Grooved Pegboard Variables to Malingering in Traumatic Brain Injury.

Objective: A known-groups design was employed to determine the classification accuracy of finger tapping and grooved pegboard variables in detecting Malingered Neurocognitive Dysfunction (MND) in traumatic brain injury (TBI).

Participants and Methods: TBI patients (n = 256) were classified into one of four groups: not MND (n = 115), Indeterminate (some evidence of MND; n = 80), Probable MND (n = 47) and Definite MND (n = 14) based on the Slick et al. (1999) criteria for MND. Classification accuracy of finger tapping and grooved pegboard variables was examined to determine which were most accurate at differentiating MND from non-MND.

Results: Within the overall TBI sample, specificities of 92% to 95% resulted in sensitivities to MND ranging from 10% to 20% for finger tapping variables. For grooved pegboard variables, specificities of 93% to 97% resulted in sensitivities ranging from 0% to 25%. Examining scores as a function of injury severity showed that specificity and sensitivity were improved in the mild TBI group. Specifically, specificities of 93% to 100% corresponded with sensitivities ranging from 29% to 39%. Finger tapping and grooved pegboard variables were not effective at detecting malingering in the moderate/severe group. ROC analysis indicated that grooved pegboard dominant hand (raw score) and grooved pegboard dominant hand (scaled score) were the most accurate at differentiating MND from non-MND performance.

Conclusions: The present study demonstrates good sensitivity to well-defined MND in mild TBI in the context of excellent specificity particularly for grooved pegboard variables. However, it appears that sensitivity is adversely affected by objectively documented neuropathology (e.g. moderate/severe TBI).

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J. DENBOER, S. HALL & D. ZADE. Memory for Complex Pictures (MCP) vs. the Test of Memory Malingering (TOMM): Sensitivity, Specificity, and Face Validity.

Objective: The importance of the study of the sensitivity, specificity, and face validity of symptom validity tests (SVT's) has been recently emphasized through published research (Greve & Bianchini, 2004; 2007) and policy statements (Bush et al., 2005). This study compared the sensitivity, specificity, and face validity of the TOMM and MCP (a new SVT).

Participants and Methods: Undergraduate students (n=188) without a history of neurological, psychological, or alcohol/drug problems were randomly assigned to one of three groups: controls (n=61), coached brain injury simulators (CBIS) (n=66), who received detailed instructions to fake cognitive impairment, and uncoached brain injury simulators (UBIS) (n= 61), who received briefer directions.

Results: Using MCP Trial 2 < 44 as the cutoff score, the MCP, when used alone, correctly identified 100 out of 127 brain injury simulators as giving suboptimal effort (79%). The TOMM, when used alone, correctly identified 85 out of 127 malingerers as giving suboptimal effort

(67%), significantly less than that of the TOMM ($z = 2.84$, $p < .05$). In terms of specificity, neither the MCP nor the TOMM demonstrated any false positive errors. Controls rated the MCP the highest in terms of face validity rating of any test in the current study, whereas CBIS and UBIS rated the TOMM and MCP as relatively equivalent.

Conclusions: As hypothesized, the sensitivity ratings of the MCP were significantly better than those of the TOMM. Contrary to the original hypothesis, the MCP and TOMM were not significantly different in terms of specificity. The MCP demonstrated slightly better face validity than the TOMM.

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T. GOLLA & S. MOONEY. Prediction of Cognitive Symptom Validity Tests by Fake Bad Scale and Response Bias Scale.

Objective: The recently developed MMPI-2 Response Bias Scale (RBS) has been postulated by some researchers to be a better indicator of poor effort and motivation on cognitive testing than the FBS. The present study examined the relationship between performances across the RBS and FBS on several cognitive measures of effort and motivation.

Participants and Methods: 27 patients (48% M) with an mean (SD) age of 45.3 (10.8) participated in a independent neuropsychological evaluation owing to presumed post-concussive syndrome (46%), mild traumatic brain injury (21%), orthopedic injuries (21%), or other etiologies (12%). MMPI-2, TOMM, WCST-128, Hand Dynamometer (GRIP), Finger Oscillation (TAP) test data are reported. All Patients exhibited elevated FBS scores (i.e., > 23 M, > 25 F) on otherwise valid MMPI-2 protocols. Alpha = .01.

Results: The RBS and FBS were not correlated ($r = .30$) or associated with TOMM and WCST Failure to Maintain Set performances (i.e., all p 's $> .12$). RBS did not predict GRIP or TAP performances (i.e., all p 's $> .25$). FBS was associated with GRIP dominant and non-dominant hand (i.e., r 's = $-.53$ & $-.71$, respectively; both p 's $< .01$) and TAP non-dominant hand (i.e., $r = -.56$; $p < .01$) performances.

Conclusions: The RBS failed to predict sub-optimal effort on several indicators of effort on cognitive testing. The RBS also was not significantly correlated with the FBS, a finding which may be explained by the fact our sample did not include extreme FBS scorers. The FBS was associated with poor performances on psychomotor tests, replicating previous research.

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L. HANE, K. KNAUFF, S. HALL, J. DENBOER & J. PAULI. Face Validity of Two Effort-Detection Measures: Memory for Complex Pictures and the Word Memory Test.

Objective: This study compared the face validity of two tests of client effort: the recently developed Memory for Complex Pictures (MCP) and the Word Memory Test (WMT). The face validity of these two measures was examined in the context of a battery that included several other standard neuropsychological tests.

Participants and Methods: Twenty-seven undergraduate students were randomly assigned to the control group (instructed to give their best effort) or the coached malingering group (provided information about effects of brain injury). After finishing all tests, participants completed several measures of face validity. First, they were asked to indicate the cognitive domain they thought each test was measuring and then rate their confidence level in their domain identification. Next, participants were told that some tests were designed to detect poor effort. They were then asked to identify the test(s) they thought were measures of effort and then rate their confidence level of their identification.

Results: Both the MCP and WMT were identified 96% of the time as measures of memory. When asked to rate their level of certainty in domain identification, participant ratings were similar (MCP, 6.83; WMT, 6.00). After participants were alerted to the fact that several measures within the test battery were in fact measures of effort, participants identified the MCP as a measure of effort slightly more than the WMT (63% and 52% respectively). The MCP and WMT yielded similar certainty ratings (6.88 and 7.50 respectively). In addition, two of the standard tests were identified as effort tests at a higher percentage than the MCP and WMT.

Conclusions: Results suggest that the MCP and the WMT have good face validity. Both tests were identified as tests of memory and participants were confident in their classification. After being alerted to the fact that some tests were measures of effort, participants identified the MCP slightly more than the WMT as an effort test and the certainty ratings for both tests were similar.

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M.J. HERKOV & H. MORAIS. Neuropsychological Functioning in Serial Murder: A Case Study of Aileen Wuornos.

Objective: Neuropsychological research on violent offenders has found deficits involving frontal, temporal and limbic function and associated impulsivity and impaired executive function. Little research exists, however, on perpetrators of planned, ritual acts of violence such as serial murder and no research exists on neuropsychological functioning among female serial killers. It is hypothesized that serial murderers have better executive function than other violent offenders. This research involves a case study of the neuropsychological test performance of convicted serial killer, Aileen Wuornos.

Participants and Methods: These data were obtained by the senior author and other professionals during court ordered evaluations of Ms. Wuornos. Tests included the WAIS-R, WCST, Category Test, Bender Gestalt, WMS, PPVT and MMPI-2. IRB approval for this project was obtained.

Results: Test results revealed generally average IQ (WAIS-R FSIQ=89; BETA-II=99; PPVT=100) and above average memory functioning (WMS= 115). Measures of executive function were mixed. While performance on the WCST (PerE=9) and Stroop (CW=T+6) were generally within normal limits, she did show some deficit on the Category Test (78 Errors).

Conclusions: These data present a unique perspective into the cognitive function of a female serial killer. Consistent with the hypothesis, Ms. Wuornos' test results did not reveal deficits in executive functioning frequently seen among violent offenders. While case study data must be viewed with caution, these results may reflect superior executive function of serial murders, consistent with the increased planning and control exhibited (e.g., selection of victims, stalking, rituals, etc.) in their crimes. These data may aid in increasing our understanding of these unique offenders.

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M. MARIANI, R. HANKS & S.R. MILLIS. Assessing Insufficient Effort Using the Yes/No Recognition Foils of the CVLT-II.

Objective: The CVLT-II yes/no recognition trial has proven effective in distinguishing between patients with genuine traumatic brain injuries (TBI) and individuals supplying inadequate effort during evaluations (Bauer et al., 2005; Millis et al., 2007). However, the types of recognition errors committed have not been studied in this manner. Thus, the present study sought to investigate the ability of different types of recognition foils to detect insufficient effort output.

Participants and Methods: The total sample was made up of 35 patients with unequivocal moderate-severe TBI and 10 litigants with questionable TBI who had claimed pervasive deficits and who had failed at least two effort tests. The CVLT-II was administered as part of a comprehensive battery.

Results: The variables analyzed in this study were the different types of recognition foils endorsed (i.e., UN, BN, PR, and BS). Univariate logistic regression analyses yielded significant results only for the UN variable (Wald $z = 9.20$; $p < .01$; Odds-ratio = 9.95). The UN variable correctly classified 84% of participants; with 60% sensitivity and 91% specificity. Using a more stringent cut-off, the overall hit rate increased to 87%, with 40% sensitivity and 100% specificity. Positive predictive power ranged from 67% to 100%, respectively.

Conclusions: The results of this study showed that the UN foils reliably distinguished between patients with bona fide TBI and individuals with poor effort. There was a high probability that a litigant was supplying inadequate effort given a score above either cut-off, especially using a stringent cut-off.

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S. MOONEY & T. GOLLA. Performances of the MMPI-2 Restructured Clinical Scales in Patients with Elevated FBS.

Objective: Presently, there is a paucity of research regarding the performance of the MMPI-2 Restructured Clinical (RC) scales in patients who exhibit elevated Fake Bad Scale (FBS) scores. Therefore, this study was undertaken to elucidate the typical patterns of performance of the RC scales in patients with elevated FBS.

Participants and Methods: Participants were 13 males and 14 females whose average age was 45.3 (SD 10.8) with the majority of patients having at least 12 years of education (92%). 92 percent of the sample were referred as outpatients for an independent neuropsychological evaluation owing to presumed mild traumatic brain injury (21%), post-concussive syndrome (46%), orthopedic injuries (21%), or other etiologies (12%). All patients exhibited elevated FBS scores (i.e., males = 24, females = 26) on otherwise valid MMPI-2 protocols.

Results: The sample yielded the following average (SD) scores: Demoralization (RCD) = 61.0 (7.8), Somatic Complaints (RC1) = 58.1 (14.0), Low Positive Emotions (RC2) = 44.4 (16.7), Cynicism (RC3) = 48.1 (12.5), Antisocial Behavior (RC4) = 39.4 (4.2), Ideas of Persecution (RC6) = 52.7 (11.0), Dysfunctional Negative Emotions (RC7) = 53.7 (11.6), Aberrant Experiences (RC8) = 53.8 (9.6), and Hypomanic Activation (RC9) = 42.9 (6.9).

Conclusions: Patients with elevated FBS but otherwise valid MMPI protocols performed within the average range across all of the revised clinical scales. These findings are surprising given the item overlap between the FBS and several restructured scales, such as RCD and RC1, but may be accounted for by the lack of extreme FBS scorers in our sample.

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J.S. ORD, A. BOETTCHER, K.W. GREVE & K.J. BIANCHINI. Detection of Malingering in Traumatic Brain Injury with the Conners' Continuous Performance Test-II.

Objective: The present study uses a known groups design to examine the sensitivity and specificity of two selected measures from the Conners' Continuous Performance Test-II (CPT-II) to detect malingered neurocognitive dysfunction (MND) in traumatic brain injury (TBI).

Participants and Methods: Data were collected from mild and moderate-to-severe (M/S) TBI patients seen for neuropsychological examination, most in the context of financial incentive to perform poorly. Criteria from Slick et al. (1999) were used to classify MND status us-

ing only well validated indicators of malingering. CPT-II performance differences between mild TBI not MND ($n = 32$), mild TBI MND ($n = 28$), and M/S TBI not MND ($n = 23$) groups were examined. Individual and joint classification accuracies are presented for a range of scores for two selected CPT-II variables.

Results: ROC and regression analysis indicated that omissions and standard error showed the best overall classification accuracy. At cutoffs associated with 97% specificity in mild TBI (one false positive), sensitivity to MND was over 30% for omissions and over 40% for standard error. Interestingly, no false positives were found in the M/S TBI group at these cutoffs. Examining joint classification accuracy indicated that approximately 45% of mild TBI malingerers could be identified at cutoffs associated with good specificity ($> 95%$) in both mild and M/S TBI.

Conclusions: This study found that omissions and standard error from the CPT-II have good overall classification accuracy in mild TBI along with high specificity in moderate-to-severe TBI. These results support the use of the CPT-II as a reliable indicator for the detection of malingering in TBI when used as part of a comprehensive diagnostic system. Correspondence: *Jonathan S. Ord, B.S., Psychology, University of New Orleans, 2000 Lakeshore Dr., Department of Psychology, New Orleans, LA 70148. E-mail: jord@uno.edu*

A. POSTHUMA. Legal and Psychological Research on the Assessment of Remote Mild-Traumatic Brain Injury.

Objective: The window of opportunity supporting neuropsychological testing for the possible residual effects of a mild traumatic head injury (MTBI) is less than three months post injury. Yet many legal proceedings see neuropsychological assessments of MTBI 1-2 years post injury. Psychologists are bound by the 2002 A.P.A. Ethical Principles requiring that we have sufficient research evidence to support the use of neuropsychological testing generally and specifically on suspected MTBI assessments.

In addition, Daubert/Joiner and Kuhmo as well as Federal Rules of Evidence (FRE) and Code of Federal Regulations (C.F.R) require scientific support for our MTBI evidence. The American College of Radiology (ACR) have established criteria for acceptance of SPECT, PET and fMRI evidence. This paper will focus on legal and psychological research considerations for similar criteria from A.P.A., N.A.N and INS for remote MTBI evidence in court.

Participants and Methods: This paper will review the current research, including:

Belanger, H. Curtiss, G et al. (2005)., Ethical Principles of Psychologists and Code of Conduct. (2002)., Daubert v. Merrell Dow, 509 U.S. 579 (1993)., Grudzinskas, A.J. (1999). Kuhmo Tire Company Ltd. vs. Carmichael, Larrabee, G. (2005)., Lilienfeld, S.O., Lynn, S.J., and Lohr, J.M. (2003)., Posthuma, A., Prodrouzek, W. and Crisp, D. (2002).

Results: Both Psychological and Legal research are consistent in establishing scientifically based criteria for forensic evidence on the assessment of remote MTBI.

Conclusions: This paper's conclusion is that there is no justification for the use of neuropsychological testing in establishing residual effects of remote Mild-Traumatic Brain Injury beyond three months post injury. Correspondence: *Allan Posthuma, Ph.D., Private Practice, 2154 West Broadway, Vancouver, BC V6K 2E1, Canada. E-mail: posthuma@uniserve.com*

G. SARTORI, S. AGOSTA & C. CIVAI. Neural Correlates of Detecting Lies Using the Forensic-IAT.

Objective: We developed a new highly effective method of lie detection. The F-IAT based on a modified version of Implicit Association Test. The method measures the positive and negative associations a suspect has between a crime related verbal description and the evaluative dimension TRUE. Here we investigate the neural correlates of concealed knowledge using the F-IAT (Card Test Paradigm).

Participants and Methods: Forty participants were asked to select one of two playing cards ("4 of diamonds" and "7 of clubs"). Then they

were administered the F-IAT combined with ERPs registration. In one stage, participants categorized both sentences referred to the card that they had chosen and TRUE sentences on the same computer key and both sentences referred to the non chosen card and FALSE sentences on the other computer key (congruent condition). In a later stage, the tasks were reversed and participants categorized sentences referred to the non-chosen card and TRUE sentences on the same computer key and sentences referred to the chosen card and FALSE sentences on the other computer key (incongruent condition).

Results: RT analysis confirmed that F-IAT is highly accurate in identifying the card selected by participants. We found a larger negative deflection peaking at about 300 msec (N200) in the incongruent condition with respect to the congruent condition.

Conclusions: Our results show that the N200 is the neural marker of the F-IAT used as lie detector.

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A. SIM, B. MARCOPULOS & E. AUCONE. The Impact of Low Education on Test of Memory Malingering (TOMM) Performance Among Forensic and Non-forensic Psychiatric Inpatients.

Objective: To investigate the impact of low education on TOMM performance given that low education can result in misclassifications of impairment and all published studies to date have utilized samples in which subjects had on average 12-14 years of education.

Participants and Methods: Data for 134 forensic and non-forensic inpatients at a state psychiatric hospital who were administered the TOMM and had <12 years of education were extracted from the archival database of the facility's neurocognitive assessment laboratory. Mean years of education was 9.0 (SD=1.7).

Results: There was no significant correlation between Trial 1 scores and years of education, whereas a significant but modest correlation was found between education and Trial 2 scores ($r=.205$, $p=.017$). An ANOVA revealed no group differences on Trial 1 scores between patients who had a middle school (<9 years) vs a high school (9-11 years) level of education. In contrast, a medium-sized effect and significant relationship was found for Trial 2 scores ($p=.033$, $d=.40$). No significant differences were found between the forensic and non-forensic patient groups on Trial 1 or 2 scores.

Among those who scored <45 on Trial 2 ($n = 21$), middle school educated patients were significantly more likely to fail the TOMM than patients with a high school level of education ($p=.021$). No difference in pass/failure rates between the forensic vs non-forensic patient groups was observed. The presentation will also present further analysis of descriptive characteristics of those patients who scored <45, including an assessment of whether they meet elements of the Slick et al. (1999) criteria.

Conclusions: The present study provides previously unavailable data on the validity of the TOMM in patients with low levels of education. Findings suggest that caution is warranted when administering the TOMM to low educated patients. The presentation will also present conclusions regarding the potential influence of low education in patients with and without external incentive to malingering.

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T.L. VICTOR, K.B. BOONE & E.A. ZIEGLER. Interpreting the Meaning of Multiple Effort Test Failure: Examination of Free-standing Effort Tests.

Objective: Recent data suggest using a model of pair-wise failure is robust and replicable across a wide range of embedded effort indices. Whether this finding is also true of free-standing effort measures is unknown.

Participants and Methods: Archival data were analyzed from 104 patients (excluding cases of mental retardation, dementia or somatoform disorder) seen for outpatient neuropsychological evaluation, including the following free-standing measures: Rey 15-Item, Dot Counting, Rey Word Recognition, and Warrington Recognition Memory tests. Non-credible performance was identified by failure on ≥ 2 embedded effort tests and incentive to feign; credible subjects had no motive to feign and failed ≤ 1 embedded indices.

Results: Test sensitivities ranged from 43.6 to 53.7 while specificities ranged from 75.9 to 93.4. Classification rates for failure on any one-, two- or three- test combinations revealed the superiority of the pair-wise failure model (overall hit rate = 76.0%, sensitivity = 63.4%; specificity = 84.1%) as compared to one failure (overall hit rate = 64.4%, sensitivity = 90.2%, specificity = 47.6%) or three (overall hit rate = 68.3%, sensitivity = 26.8%, specificity = 95.2%). Further, the pair-wise failure model was comparable to logistic regression including all four free-standing indicators as continuous predictors (overall hit rate = 78.3%, sensitivity = 66.7%, specificity = 86.8%).

Conclusions: The pair-wise failure model was the most accurate and practical approach to identifying suspect effort; however, estimates were lower than those found for embedded indicators, possibly reflecting the fact that many dedicated effort tests are memory tasks and therefore more redundant.

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R. VILAR-LÓPEZ, M. GÓMEZ-RÍO, A. RODRÍGUEZ-FERNÁNDEZ, M. PÉREZ-GARCÍA & A.E. PUENTE. Congruence between reported symptoms and neuropsychological results in malingering detection.

Objective: Lack of congruence is considered the central key in malingering detection. For example, inconsistencies between reported symptoms and results of the neuropsychological tests could be considered as an indicator of malingering. Nevertheless, these aspects rarely have been studied scientifically. The aim of this study was to examine if reported symptoms are related to neuropsychological tests results in malingerers and non-malingerer patients.

Participants and Methods: Two groups were studied: Ten individuals suspected of malingering (SM) based on scores indicative of poor effort on two or more malingering tests (VSVT, TOMM, the b test, Dot Counting Test and Rey 15-item test) that were involved in litigation, and 20 patients with mild traumatic brain injury (MTBI). All of them underwent an extensive neuropsychological assessment that also included the Rivermead Post Concussion Symptoms Questionnaire (RPCQ), d2, TAVEC (Spanish adaptation of the CVLT), phonetic fluency and the Rey Complex Figure Test.

Results: The results showed that reported symptoms of poor memory measured with the RPCQ are correlated with the TAVEC just in the MTBI group ($-.565^{**}$). In the malingering group, poor memory and poor concentration were correlated with the result of the phonetic fluency test ($.998^{**}$ and $.997^{**}$, respectively).

Conclusions: Only MTBI group pattern of reported symptoms and test results makes neuropsychological sense. It seems that lack of congruence between reported symptoms and neuropsychological assessment should be considered as a possible malingering indicator.

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M. WEINBORN, S. WOODS & A. FOX. A Validation of the Verbal and Nonverbal Medical Symptom Validity Tests Using a Simulation Design.

Objective: Identification of invalid symptom presentation remains an area of importance in neuropsychology practice. Availability of infor-

mation specific to existing Symptom Validity Tests (SVT) may threaten the utility of such measures, and development of new measures with classification accuracy levels at or above those obtained with existing SVTs is required to address such threats. Two newer SVTs, the Medical Symptom Validity Test (MSVT) and the Nonverbal Medical Symptom Validity Test (NV-MSVT) were compared with a well-validated existing SVT, the Test of Memory Malingering (TOMM).

Participants and Methods: Two coaching procedures, Symptom-Coaching (SC, $n = 27$) and Test-Coaching (TC, $n = 27$) were compared with a "best effort" (BE, $n = 26$) condition in a randomized simulation design using 80 undergraduate and graduate students.

Results: Specificity for all SVTs was 100%; that is, none of the Best Effort group were misidentified. The TOMM and MSVT obtained 100% sensitivity in the Symptom-Coached condition, while the NV-MSVT produced marginally lower sensitivity for this condition (93%). When participants were provided with test-specific coaching instructions, the sensitivity of MSVT (89%), NV-MSVT (85%) and TOMM (89%) were all somewhat reduced, but remained acceptable. Classification accuracy did not differ between SC and TC groups for any SVT (all χ^2 , $p > .05$). Overall classification accuracy for the MSVT (100% for Symptom-Coached, 94% Test-Coached) and NV-MSVT (96% Symptom-Coached, 93% Test-Coached) compared quite favorably to the TOMM (100% Symptom-Coached, 94% Test-Coached), with no differences in classification accuracy obtained among SVTs (all McNemar χ^2 , $p > .05$).

Conclusions: These results provide empirical support for the classification accuracy of the MSVT and NV-MSVT using a simulation design, but it is important to note that all three measures displayed some vulnerability to test-specific coaching procedures. Further validation using a known groups design and impaired clinical samples is needed.

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B.R. WILLIAMS, D. ZAMORA & P.J. DONOVICK. Incidence of Learning Disability in Inmates Compared to Civilian Populations.

Objective: On average, the IQ of incarcerated individuals is lower than that of the general population. Not surprisingly, they also obtain fewer years of formal education. Given that the intelligence and education of inmates is generally lower than that of the nonincarcerated population, we investigated whether there is a higher incidence of learning disability in incarcerated as compared to nonincarcerated individuals.

Participants and Methods: The sample included 467 individuals evaluated at a civilian community hospital ($n=111$), two community outpatient practices ($n=130$), and two mental health units associated with New York State prisons ($n=226$). Verbal and nonverbal IQ scores were calculated by combining WAIS-III Verbal IQ scores with KBIT Vocabulary scores, and WAIS-III Performance scores with KBIT Matrices scores. Discrepancies between verbal and nonverbal IQ scores were then calculated.

Results: Overall, inmates had lower verbal ($M=76.5$, $SD=14$) and nonverbal ($M=76.5$, $SD=15.5$) IQs than the hospital (Verbal: $M=93$, $SD=18.5$; Nonverbal: $M=89.5$, $SD=18.5$) and outpatient (Verbal: $M=76.5$, $SD=14$, Nonverbal: $M=97$, $SD=17$) groups. Not surprisingly, on average, inmates also failed to go beyond their 9th year of school, whereas the nonincarcerated groups earned either high school diplomas or GEDs. As expected, we found a higher occurrence of verbal learning disabilities in inmates (25%) than in individuals tested at outpatient practices (18%). On the contrary, it was found that inmates (25%) and hospital patients (25%) experienced verbal learning disabilities at the same rate, despite inmates having a significantly lower level of formal education. Surprisingly, it was found that inmates (18%) experienced a lower incidence of nonverbal learning disabilities than did the outpatient practice (28%) and hospital (35%) groups.

Conclusions: These findings suggest that factors other than low intelligence and limited education may play a larger role in the development of learning disabilities.

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S. YLIOJA, A. BAIRD & K. PODELL. Developing a Spatial Analogue of the Reliable Digit Span: A Within-test Measure of Performance Validity in Neuropsychological Examination after Suspected Traumatic Brain Injury.

Objective: Effort is increasingly recognized as an important factor in neuropsychological testing, and it has been recommended that it be assessed in all cases involving external incentive. There has recently been a move toward developing cognitive tests that are commonly used by neuropsychologists into dual measures of valid performance and cognitive function. The Reliable Digit Span (RDS), based on the digit span task, is one such within-test measure of performance validity that has been reliably documented as distinguishing invalid performers with a high level of accuracy. The present study sought to develop another within-test measure based on the visuospatial analogue of digit span, the spatial span task (WMS-III), as well as to replicate the utility of RDS as a measure of performance validity.

Participants and Methods: Using a sample of 83 litigants evaluated for suspected mild TBI, a Reliable Spatial Span (RSS) was calculated in an identical manner to RDS. Specificity, sensitivity, and predictive power values were determined.

Results: These values for RSS were in the range of other within-test measures, suggesting this calculation may be useful in distinguishing invalid performance in mild TBI cases. However, specificity and sensitivity were not equivalent to tests dedicated to effort measurement (TOMM and WMT). RDS classification accuracy within the present sample was lower than that of previous research, as well as of RSS.

Conclusions: RSS may be an especially valuable addition to the within-test measures currently available, given the paucity of measures in the visuospatial domain. Possible explanations for the failure to replicate RDS utility are discussed.

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K. ZAKZANIS, Z. CAMPBELL & D. JOVANOVSki. Cognitive Variability in High-Functioning Individuals.

Objective: Knowledge of the literature pertaining to patterns of performance in normal individuals is essential if we are to understand intraindividual variability in neuropsychological test performance in neurobehavioral disorders. This is particularly true for mild Traumatic Brain Injury (mTBI) particularly given that a large number of tests with little to no sensitivity to mTBI are employed and when an in appropriate heuristic of pre-injury cognitive functioning is utilized whilst base rates of persisting symptoms are low.

Participants and Methods: To this end, we demonstrate that intraindividual variability in neuropsychological test performance can be demonstrated on a small number of tests in a sample of 20 healthy individuals with a particularly high level of educational training whereby one might reasonably assume that little to no such cognitive variability would exist.

Results: Some participants in our sample achieved test scores at the very poor to borderline range against scores in the above average to superior range on tests of neuropsychological ability which demonstrated the presence of marked intraindividual variability.

Conclusions: Our results should concern neuropsychologists who often base clinical inferences about the presence of cerebral dysfunction, at least in part, on marked variation in a patient's level of cognitive test performance particularly within the context of ascribing "cognitive impairment" to a neurobehavioral disorder such as mTBI wherein test sensitivity and the disorder itself, would suggest otherwise.

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K. ZAKZANIS, Z. CAMPBELL & D. JOVANOVSKI. Detecting inadequate effort using forced-choice formats of the Benton facial recognition and judgment of line orientation tests: A pilot study.

Objective: This study investigated the potential utility of the Benton Facial Recognition (FR) and the Judgment of Line Orientation (JLO) tests when modified and used as measures of inadequate effort.

Participants and Methods: With the permission of the test publisher, both tests were modified into a forced-choice format. The sample included 30 subjects that had been evaluated in the context of a medical-legal neuropsychological assessment. All subjects met criteria for sustaining mild TBI and had performances that were consistent with dissimulative behavior. Each subject received a common battery of tests.

Results: The results indicated that most subjects demonstrated suspect but above average performance on both measures. Lastly, performances on these measures were found to correlate positively with several other standard measures of suboptimal effort.

Conclusions: The findings suggest that neuropsychologists should consider better evaluating dissimulative behavior in areas of cognition beyond memory.

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K. ZAKZANIS, Z. CAMPBELL & D. JOVANOVSKI. Validation of the Dementia Rating Scale-II as a Measure of Cognitive Dissimulation: A Pilot Study.

Objective: As memory impairment is a hallmark of brain injury, individuals who attempt to feign head trauma symptoms often report a variety of disturbances across memory domains. It follows then that the majority of specialized tests of malingering follow memory paradigms, with the exception of a relative few. Yet, research investigations contrasting simulating or known groups of malingerers to patients with moderate or severe traumatic brain injury showed atypical performance (by the former group) on measures of perception, motor function, attention, and problem solving. The present investigation employs a multifactorial cognitive rating scale to evaluate its sensitivity in terms of malingering in patients with mild traumatic brain injury (mTBI). Specifically, the purpose of this pilot study was to investigate the potential utility of the Dementia Rating Scale II (DRS-II) as a measure of malingering in a sample of litigating patients with mTBI. Given its multifactorial cognitive subtests, we wanted to illustrate whether suspect performance on a memory based forced choice recognition task would predict suspect performance across cognitive domains as indexed on the DRS-II.

Participants and Methods: Twenty-five (13 males) litigating patients completed a neuropsychological test battery that included the DRS-II and the Test of Memory Malingering (TOMM).

Results: The results suggest that specific DRS-II subscales (Attention, Initiation-Perseveration, and Memory) were sensitive in the detection of patients demonstrating suspect effort in this sample (as measured by performance on the TOMM).

Conclusions: It is concluded that various subscales of the DRS-II can be of potential value for the detection of malingering in the context of forensic neuropsychological evaluation.

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HIV/AIDS

M.A. COLE, L. CHANG, X. CUI, B. STOKES, R. YAKUPOV, V.A. STENGER, H. NAKAMA & T. ERNST. Altered Default Mode Network in Individuals Infected with HIV.

Objective: The “default mode”, or “resting state”, consists of a distributed network of activation that includes neural systems implicated in HIV infection such as the prefrontal cortex (PFC) and temporal lobe regions. The current study evaluated the possibility of an altered default mode in individuals infected with HIV (HIV+).

Participants and Methods: Functional MRI (fMRI) was performed on 7 HIV+ individuals and 7 HIV-seronegative individuals (HIV-). Groups were matched by age, education, estimated verbal IQ, ethnicity, and drug use history. Default mode activation was first assessed by a univariate linear model of the increased hemodynamic response during the rest periods of a ball-tracking attentional task using a fixed effects analysis. We also applied a tensor probabilistic independent component analysis (tensor-PICA) for detection of coherent resting state signals at a single group level.

Results: The univariate linear model of the resting state in HIV- individuals revealed a pattern of activation commonly reported for the default mode ($p < .01$). Qualitatively, a more dispersed pattern of activation was observed in the HIV+ individuals. In addition, significant activation was not found in HIV+ individuals in several commonly reported default mode regions such as the medial PFC, precuneus, and middle and superior temporal gyri. Contrasts between the groups revealed greater activation in the HIV- subjects in the precuneus, posterior cingulate cortex, orbital PFC, ventral lateral PFC, and medial PFC ($p < .01$). Separate analyses of the HIV- and HIV+ groups via tensor-PICA largely reflected the findings obtained through linear modeling.

Conclusions: The altered default mode network in subjects infected with HIV suggests an altered conscious inactive state that may have significant implications for information and affective processing. This study also highlights the utility of incorporating simultaneous model driven and data driven (i.e., tensor-PICA) analytic approaches to fMRI research.

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J. CONLEY, K.A. BOLDEN, R.H. PAUL, K. COOP, K. TASHIMA, T. FLANIGAN, C.R. GUTTMANN & D.F. TATE. Neurocognitive Performance of HIV+ Patients Correlates With MRI Volumetric Measures of the Basal Ganglia.

Objective: HIV is known to have deleterious effects on the CNS that result in MRI and cognitive alterations. The relationship between these changes is not completely understood. This study sought to assess the association between quantitative MRI measures of the basal ganglia and neurocognitive impairment among HIV+ patients.

Participants and Methods: 39 HIV+ patients receiving ART, with similar substance abuse histories, were recruited from a University Hospital HIV Clinic. Each patient was tested with a battery of tests sensitive to HIV-related cognitive impairment. HIV+ patients underwent MRI scanning and automated quantitative measurement of multiple brain structures using FreeSurfer. Volumetric reductions in the basal ganglia were statistically compared to specific NP tests (known to be mediated by subcortical regions), with the expectation that size reductions would correlate with poorer performance on these tests. Additionally, patients were divided into below and above average cognitive groups using the mean performance of ten demographically matched controls.

Results: The size of the caudate, putamen, and pallidum were significantly related to performance on the grooved pegboard non-dominant test ($p < .05$). Additional significant relationships were noted for Trails

B for all structures ($p < 0.05$), except the right pallidum. Comparison of volumes between the two cognitive groups revealed an average reduction in volume for all basal ganglia structures of approximately 9% for the below average group, though this reduction did not reach statistical significance.

Conclusions: Neurocognitive performance significantly correlated with basal ganglia volumetric reductions in a diverse cohort of HIV+ patients. These results illustrate the value of examining brain/behavior relationships using MRI for the HIV+ population.

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R. FAMA, N. NICHOLS, M.J. ROSENBLUM, A. PFEFFERBAUM & E.V. SULLIVAN. Information Processing Rate in HIV Infection, Alcoholism, and Their Comorbidity.

Objective: Rate of information processing can be affected by HIV infection and alcoholism and may be exacerbated by HIV-alcoholism comorbidity.

Participants and Methods: Here, we measured rates of information processing on simple and complex attention and memory tasks at baseline and 1-year follow-up in 34 HIV, 23 ALC, 37 HIV+ALC, and 31 normal controls. Subjects were administered subtests of the MicroCog [digits forward, digits backwards, immediate memory, delayed memory, calculations]. Information processing rate was the ratio of accuracy over response time.

Results: At baseline, HIV+ALC had slower information processing rates than each of the other groups on digits forward and immediate memory. At follow-up, differences in information processing rate were observed on all subtests: HIV+ALC had slower rates than 1) controls on all subtests, 2) ALC on all subtests except calculation, and 3) HIV on the memory subtests. Although HIV and ALC groups did not differ from one another, HIV had slower rates than controls on digits backward at follow-up. Unlike HIV+ALC, which showed no significant improvement, controls showed an increased rate of information processing over time (i.e., practice effect) on working and recognition memory. Alcoholics who drank between testing sessions had slower information processing on immediate memory at follow-up than alcoholics who remained abstinent. HIV-infected individuals with AIDS had a greater rate of decline in processing on working memory than HIV without AIDS.

Conclusions: Slowing of information processing of these attention and memory functions was exacerbated in HIV+ALC comorbidity, reflecting a pattern consistent with compromised frontostriatal systems marking these conditions. [Support: AA12999, AA17347, AA12388]

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J.M. FOLEY, M.J. WRIGHT, J. JANG, A. GOODING, S.A. CASTELON & C.H. HINKIN. Classification of HIV-Related Cognitive Decline and Dementia Differs by Functional Assessment Method.

Objective: Recently proposed diagnostic criteria for HIV-Associated Neurocognitive Disorder (HAND) relies upon an algorithm that incorporates level of cognitive impairment as well as functional status. This study examines the proposed schema with a focus on subjective vs. objective methods for assessing functional status.

Participants and Methods: Participants were 201 HIV+ adults who were HAND classified using objective cognitive (NP testing) and subjective (self-report) ADL impairment as follows: 65 HIV-Associated Dementia (HAD), 24 HIV-Associated Mild Neurocognitive Disorder (MND), 11 Asymptomatic Neuropsychological Impairment (ANI),

and 9 normal (N). Ninety-two participants could not be classified based upon strict criteria application. Non-classified subjects fell in two groups: severe cognitive impairment without significant ADL impairment (COG_IMP) and severe ADL impairment without significant cognitive impairment (ADL_IMP). Two Discriminant Function Analyses (DFA[1]; DFA[2]) were derived using the classified subjects. DFA[1] used NP function and subjective ADL scores as predictors. DFA[2] differed only in use of objective ADL assessment. The resultant functional equations were then applied to unclassified subjects.

Results: Using DFA[1], 100% of the COG_IMP were classified as HAD despite an absence of significant functional deficits; among the ADL_IMP group 71% were classified as HAD. Using objective indices of functional status (DFA[2]), the percentage of the COG_IMP group who were classified as HAD dropped to 85%; the percentage of the ADL_IMP group who were classified as HAD increased to 89%.

Conclusions: Strict application of proposed HAND criteria leads to diagnostic ambiguity for a subset of patients. Statistical techniques for forcing diagnostic assignment suggests self-reported functional impairment may overestimate rates of neurocognitive dysfunction relative to objective ADL indices.

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A. GONGVATANA, B.C. SCHWEINSBURG, M.J. TAYLOR, R.J. THEILMANN, S.L. LETENDRE, O.M. ALHASSOON, J. JACOBUS, S.P. WOODS, D.R. FRANKLIN, T.L. JERNIGAN, L.R. FRANK & I. GRANT. HIV-Associated White Matter Tract Injury and Neurocognitive Impairment in the HAART Era.

Objective: Up to half of people infected with HIV exhibit cognitive impairment, which has been related to preferential damage to cerebral white matter. Despite the general effectiveness of modern combination antiretroviral (ARV) treatment, cognitive deficits remain common even in ARV-treated individuals with undetectable plasma and CSF viral loads. This has been attributed to limited CNS penetration of many ARV drugs.

Participants and Methods: We utilized diffusion tensor imaging (DTI) to investigate the relationship of white matter integrity to cognitive impairment and antiviral treatment variables, including plasma and CSF viral load and an index of ARV penetration into the CNS. Participants included 39 HIV-infected individuals (HIV+) and 25 seronegative controls. DTI indices were mapped onto a common whole-brain white matter tract skeleton, allowing voxelwise statistical analyses.

Results: HIV+ exhibited abnormal water diffusion in the internal capsule, inferior longitudinal fasciculus, and optic radiation; while HIV+ with AIDS exhibited generally more widespread damage, including in the internal capsule and the corpus callosum. White matter injury was related neither to a marker of ARV treatment efficacy, nor the degree of ARV CNS penetration. Cognitive impairment, however, was related to white matter injury in the internal capsule, corpus callosum, and superior longitudinal fasciculus.

Conclusions: DTI was useful in identifying changes in specific white matter tracts associated with more advanced HIV infection. Relationships between cognitive impairment and diffusion alterations in specific white matter tracts provide support for the potential utility of DTI in examining the anatomical underpinning of HIV-related cognitive impairment. The study also confirms that CNS injury is evident in persons with AIDS despite advent of HAART.

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T.B. HARRISON, B.C. SCHWEINSBURG, J. JACOBUS, R.J. THEIL-MANN, M.J. TAYLOR, S.P. WOODS, A. GONGVATANA, D.R. FRANKLIN, R.J. ELLIS, S.L. LETENDRE, R. HEATON, L. FRANK, I. GRANT & T. JERNIGAN. Abnormal White Matter Signal and Lower CD4 Nadir Independently Predict Lower White Matter Fractional Anisotropy in HIV-infected Individuals.

Objective: Human immunodeficiency virus (HIV) is associated with development of abnormal white matter signal (AbWMS) on structural MRI. To clarify the relationship between AbWMS and underlying fiber integrity in HIV+ individuals, we used multi-spectral structural imaging and diffusion tensor imaging (DTI) to examine anatomical change and white matter microstructure, as represented by fractional anisotropy (FA). We hypothesized overall AbWMS and disease severity levels would both predict FA, independent of age.

Participants and Methods: Fifty-three HIV+ volunteers (86% male, age 40.8 ± 8.4 , median CD4 nadir 230, IQR [112, 408]) received multi-spectral (T1, T2, proton density), regression based anatomic segmentation and spiral DTI (whole brain coverage; TE=120ms, TR=6000ms, 3.9 cubic mm voxels, b-value=2416, 42 directions). DTI tract based spatial analysis, identifying shared fiber structure across participants, facilitated voxelwise multiple regression with predictors age, CD4 nadir, and cerebral vault size corrected AbWM.

Results: Total AbWMS and CD4 nadir accounted for a significant amount of variance in FA independent of age effects. Effect size magnitude exceeded Cohen's d of .57 for all significant clusters. Higher AbWMS and lower CD4 nadir were associated with reduced FA. Prominent findings for CD4 nadir were in superior and anterior corona radiata, frontal and occipital corpus callosum projections, and internal capsule. Likewise, the relationship between AbWMS and FA was widespread but tended to cluster in the corona radiata and frontal and occipital corpus callosum projections.

Conclusions: Lowest past level of immune suppression and extent of observable AbWMS on anatomic imaging predicted reduced FA. These associations were pronounced in the frontal corpus callosum projections, corona radiata, and internal capsule. While AbWMS was not prominent in this group, findings suggest substantial related underlying change to white matter microstructure. This could be associated with neurocognitive impairment often seen in HIV.

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J.E. IUDICELLO, S.L. LETENDRE, C.L. CAREY, M.S. DAWSON, J. DURELLE, I. GRANT & S.P. WOODS. HIV-associated Deficits in Action (Verb) Fluency Reflect Astrocytosis.

Objective: Action (verb) fluency is a novel measure of verbal fluency whose development was inspired by the double dissociation between the neural systems involved in retrieving verbs (i.e., frontostriatal) and nouns (i.e., temporoparietal). We previously reported selective action fluency deficits in HIV, which are incrementally predictive of dependence in daily functioning. Here, we explore whether action fluency deficits are related to biomarkers reflecting different aspects of HIV neuropathogenesis, including viral burden, neuroaxonal damage, macrophage activation, neuroprotectants, inflammation, and astrocytosis.

Participants and Methods: Standardized measures of action and noun (i.e., animal) fluency were administered to 75 HIV+ persons, who also received neuromedical and laboratory studies. Plasma and CSF biomarkers (and the processes they may reflect) included HIV RNA (viral burden), tau (neuroaxonal damage), monocyte chemoattractant protein-1 (macrophage activation), erythropoietin (possible neuroprotectant), interferon induced protein (IP 10; inflammatory marker), and S100B (astrocytosis).

Results: After controlling for antiretroviral therapies, current CD4 lymphocyte count, and verbal IQ, higher levels of S100B in CSF were significantly associated with lower

performance on action ($p < .005$), but not noun fluency ($p > .10$). No other biomarker was

associated with either action or noun fluency ($ps > .10$).

Conclusions: Findings suggest that HIV-associated impairment in action fluency may reflect astrocytosis (i.e., elevated S100B), which is one of the primary neuropathogenic mechanisms of HIV infection. Extending prior neuropsychological findings in HIV and

Parkinson's disease, these data also support the hypothesis that action fluency may be dissociable from noun fluency at the neural level.

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S. NEUFELD, C. LYSACK & A. SANKAR. Cognition's Role in Patient Adherence to Antiretroviral HIV Therapy and in Treatment Outcomes.

Objective: The purpose of this study was to evaluate the influence of cognition and mental well-being on antiretroviral adherence and treatment outcomes among HIV+ African Americans ($n=138$).

Participants and Methods: A sample of urban inner city HIV+ African Americans were interviewed up to 8 times each over a period of 5 years. Knowledge of HIV and its transmission was assessed using the Catz HIV Knowledge Scale. Mental well-being was measured using the Beck's Depression Inventory (BDI) and the SF-36v2 mental health subscale (SF-36v2-MH). Medication adherence was assessed using 2 self-report measures (3 month global assessment, and MOS Measure of Patient Adherence) and treatment outcomes were measured using CD4 counts and viral loads (VL).

Results: The BDI and SF-36v2-MH scores were significantly correlated with knowledge of HIV ($p < .05$) and with medication adherence ($p < .05$) and with the clinical markers CD4 counts and VL ($p < .05$). However, knowledge of HIV was not significantly associated with adherence or with treatment outcomes. Thus, while mental well-being affects an individual's cognitive ability to answer questions about HIV, this knowledge does not exert an influence on medication adherence or on treatment outcomes.

Conclusions: This research highlights the importance of depression and mental well-being on cognitive tasks, and on medication adherence and treatment outcomes. Focusing on improving mental health may be more effective in promoting adherence to antiretroviral medications and in improving treatment outcomes than efforts to increasing knowledge and awareness of HIV.

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B.A. PYYKKONEN, C.A. SMITH, D. HAN, R. BARTT, E. MARTIN & G.T. STEBBINS. Depression Symptoms and Gray Matter Atrophy in Individuals with HIV infection: Differential Patterns Associated with Unique Symptomatology.

Objective: Base rates for major depression are elevated in HIV infection. Apathy in HIV has been associated with atrophy within the nucleus accumbens. The current study examined patterns of regional brain gray matter (GM) atrophy associated with depressive symptomatology derived from the Chicago Multiscale Depression Inventory (CMDI) subscales (mood, evaluative, and vegetative) in individuals with HIV infection.

Participants and Methods: We used voxel-based morphometry (VBM) to investigate the association between regional GM atrophy and increased depressive symptoms in 15 HIV+ participants. High-resolution SPGR T1 images were obtained on a 1.5T GE MRI with LX upgrade. Voxel-wise correlations between CMDI subscales and gray matter volume were assessed using regression analysis with age and total GM volume entered as covariates in SPM5 ($p < .005$, 30 extent).

Results: Increased Mood symptoms were negatively correlated with multiple regions, including the right medial frontal, left putamen, and left parahippocampal regions. Vegetative symptoms negatively correlated with GM volume were generally more posterior, and included right parahippocampal gyrus, left inferior parietal and left angular gyrus. The distribution of Evaluative symptoms were negatively correlated with GM volumes predominately involving the anterior and inferior frontal lobes, bilaterally.

Conclusions: In this sample of adults with HIV infection, unique regional GM atrophy is associated with distinct depressive symptomatology. While mood and evaluative symptoms were associated with more anterior changes, vegetative symptoms were associated with posterior alterations. The contribution of HIV and other factors, such as medication and drug use history, on the GM volume changes remains to be evaluated.

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P. QUARTANA, R. GONZALEZ, J. VASSILEVA & E.M. MARTIN. Cognitive Reserve, Viral Load and Information Processing Speed in HIV Infection.

Objective: Mental slowing indexed by reaction time (RT) deficits is a hallmark neurocognitive feature of HIV. In the context of a cognitive reserve hypothesis, we investigated whether IQ moderated the influence of HIV disease severity on RTs among substance dependent individuals.

Participants and Methods: One-hundred and thirty-nine male and 36 female, primarily African-American, HIV seropositive individuals (M age = 43.5) partook in a computerized color-naming RT Stroop task with known sensitivity to HIV-associated cognitive deficits. Plasma RNA viral load served as a biomarker of HIV severity, and premorbid IQ estimates were derived from the AmNART. All participants met DSM criteria for substance dependence. The most commonly abused substances were crack/cocaine (88.6%), cannabis (49.4%) and heroin (45.4%). Abstinence was required and verified on testing day.

Results: Median Stroop RTs were DVs. Age was employed as a covariate. Hierarchical regression analyses revealed significant IQ x RNA effects on RTs (F-changes ≥ 6.2 , p 's $< .05$). Analysis of simple slopes revealed significant relationships between RNA and RTs only at high IQ (p 's $< .05$) such that, as RNA increased, higher IQ was associated with speedier RTs.

Conclusions: These data suggest that IQ, a fundamental marker of cognitive reserve, moderates the effect of HIV disease severity on mental speed. Specifically, IQ appears to mitigate the mental slowing commonly associated with greater disease severity, perhaps by increasing the threshold for neurocognitive deterioration associated with HIV. More comprehensive analysis of cognitive reserve factors on HIV-associated cognitive deficits appears warranted.

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S.A. SASSOON, M.J. ROSENBLUM, E.M. MÜLLER-OEHRING, S. FRANKLIN, J. SANDLER, A. PFEFFERBAUM & E.V. SULLIVAN. Global vs. Local Processing Predictors of Visuospatial Memory Performance in Alcoholism, HIV Infection, and Their Comorbidity.

Objective: Visuospatial perception involves the integrated processing of global stimulus features primarily by the right hemisphere and local features by the left hemisphere. Conditions such as alcoholism or HIV, both affecting corpus callosum integrity, may disrupt interhemispheric communication and global/local feature integration. Using the Rey-Osterrieth Complex Figure Test (ROCF) of visuospatial construction and memory, we previously found that individuals comorbid for alcoholism

and HIV had impaired constructional ability, whereas alcoholics with or without HIV demonstrated impaired recall. The contribution of global and local processing to these impairments, however, was unknown. Here, we tested whether impaired global or local processing would differentially contribute to alcoholism-related deficits in copying and recalling the ROCFT.

Participants and Methods: We employed a novel strategy for scoring the ROCFT to examine the effect of attention to configurational (global) and detail-oriented (local) stimulus elements on visuospatial construction and memory. All participants, 31 alcoholics (ALC), 36 with HIV (HIV), 45 with both diseases (A+H), and 35 healthy controls (CON), were right-hand dominant.

Results: Results indicated that A+H copied fewer global and local elements correctly and recalled fewer global elements than the other groups; further, A+H recalled significantly fewer local elements than HIV and CON but not ALC. Regression analysis revealed that global but not local copy performance predicted immediate and delayed recall in CON and HIV but not ALC; A+H showed an intermediate effect.

Conclusions: Alcoholism comorbidity in HIV infection attenuated the benefit to recall of global copy processing. [Support: AA12999, AA12388, AA10723, AA17347]

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J. SCOTT, S.P. WOODS, S. GIBSON, M.R. PARIKH, R.J. ELLIS, S.C. ROESCH, J.H. ATKINSON, R.K. HEATON, I. GRANT & T.D. MARCOTTE. Predictors of Sustained Cognitive Normality in HIV Infection.

Objective: As individuals are living longer with HIV infection, there is a growing need to understand the predictors of long-term cognitive normality in this population. In light of prior cross-sectional research, it was hypothesized that high cognitive reserve and better immunological health markers (i.e., viral load, CD4 count) would be predictive of long-term neurocognitive normality in individuals infected with HIV.

Participants and Methods: Study participants included 66 HIV+ individuals with sustained cognitive normality (SCN), 45 persons with sustained HIV-associated cognitive impairment (SCI), and 59 HIV+ individuals who evidenced variable global cognitive functioning (VCF; i.e., both impaired and normal performances across different visits) over a minimum 3-year study period. Groups were matched on estimated duration of HIV infection. A mean "cognitive reserve z score" (CRZ) was created from occupational attainment, educational level, and a reading-based estimate of premorbid intelligence.

Results: In a series of multinomial logistic regressions evaluating demographic (e.g., age), psychiatric (e.g., depression, anxiety), and HIV disease (e.g., viral load) variables, the baseline CRZ ($p < .001$), CD4 lymphocyte count ($p = .04$), and Profile of Mood States (POMS) tension/anxiety scale ($p < .001$) were significant independent predictors of group membership. Receiver-operating characteristic curves revealed that CRZ (area under the curve = 0.73, SE = .04, $p < .001$) was superior to chance in classifying cognitive normality.

Conclusions: HIV-infected individuals with higher premorbid cognitive reserve, higher CD4 lymphocyte counts, and lower levels of anxiety were more likely to experience sustained cognitive normality across a minimum 3-year follow-up period. Findings suggest that robust cognitive reserve capacity and high CD4 counts may have protective effects against HIV-associated neuropsychological impairment.

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D.R. SEICHEPINE, K. SULLIVAN, S. MORALES, S. DODD & A. CRONIN-GOLOMB. Clock Drawing Differentiates Cortico-Striatal-Thalamic Disorders: HIV More Sensitive to Executive Dysfunction than Parkinson's Disease.

Objective: Human Immunodeficiency Virus (HIV) and Parkinson's disease (PD) are associated with pathophysiological dysfunction within cortico-striatal-thalamic networks. These networks have reciprocal connections to posterior parietal and prefrontal cortices, suggesting that cognitive functions that depend on the integrity of these areas will be impacted by these disorders. This study assessed the performance of individuals with HIV and PD on the Clock Drawing Test, a standard neuropsychological measure requiring intact functioning of these areas.

Participants and Methods: Nineteen asymptomatic adults with HIV, 31 non-demented individuals with PD, and 29 healthy control participants (HC) were tested. Participants were provided the standard "10 after 11" instructions. Clocks were scored according to the Clock Drawing Interpretation Scale (CDIS; Mendez et al., 1992). The CDIS is composed of three subscales associated with visuospatial perception, attention and numerical processing.

Results: The overall performance of the HIV group was significantly worse than that of PD and HC. Group differences in age, education, and level of depression did not account for the results. Subscale analyses indicated group differences on numerical processing, but not on visuospatial perception and attention. Specifically, the groups differed on criteria related to planning and executing the length and accurate placement of the clock hands.

Conclusions: These findings indicate that although HIV and PD are both disorders affecting the basal ganglia and associated cortices, HIV confers a more significant performance deficit than PD on a test sensitive to abnormalities in multiple cognitive abilities. In particular, the distinctive HIV impairment was driven by executive dysfunction, suggesting more extensive prefrontal dysfunction in this disorder than in PD. Correspondence: *Daniel R. Seichepine, M.A. Psychology; Clinical Psychology; Boston University; 648 Beacon Street, Room #203, Boston, MA 02115. E-mail: daniel13@bu.edu*

L. SPINA, S. KIM, C. PANSARASA, J. BORROW, C. STASIO & H. MAHNCKE. Computer-Based Cognitive Rehabilitation in HIV-Associated Neurocognitive Impairment: A Case Study.

Objective: HIV-associated neurocognitive impairment (NCI) is considered to be the result of HIV-1 infection of the central nervous system, and remains highly prevalent despite highly active antiretroviral therapy. NCI can impair quality of life, affect disease prognosis, and compromise medication compliance. Optimal treatment for NCI has not been established. This case study examines the feasibility and neuropsychological effects of utilizing a brain-plasticity-based computerized training program for NCI. The program (originally designed for older adults) intensively exercises auditory and language systems to strengthen the representational salience of speech input, and is designed to engage neuromodulatory systems involved in learning and memory.

Participants and Methods: A 55-year-old man with NCI (20 years HIV+) trained for 38, 60-minute sessions over 5 weeks. Pre- and post training psychophysical and neuropsychological tests were administered (using alternate forms where possible).

Results: The individual completed 96% of the program, based on complexity level of the exercises. On psychophysical assessments, gains were seen in speed of processing and auditory word memory tasks. On neuropsychological testing, T-score improvements of 10+ points were seen on measures of processing speed, auditory working memory, immediate and delayed verbal memory, and confrontation naming.

Conclusions: An individual with HIV-associated NCI was able to make gains on a computer-based training program originally designed for older adults. This initial attempt to assess a computer-based cognitive therapy shows promise in improving cognitive function in individuals with HIV-associated NCI. A large scale, randomized control trial is needed to evaluate the efficacy of this computer-based training program in this population.

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M.J. TAYLOR, T.L. JERNIGAN, B.C. SCHWEINSBURG, S.P. WOODS, I.S. ABRAMSON, D.B. CLIFFORD, A.C. COLLIER, R.J. ELLIS, A.C. GAMST, B.B. GELMAN, R.K. HEATON, S.L. LETENDRE, T.D. MARCOTTE, C.M. MARRA, J.C. MCARTHUR, J.A. MCCUTCHAN, S. MORCELLO, D.M. SIMPSON & I. GRANT. Frontal White and Gray Matter Integrity Measured by Proton Magnetic Resonance Spectroscopy Predict Different Neuropsychological Functions in HIV-infected Individuals.

Objective: HIV has been associated with a variable or "spotty" pattern of neuropsychological impairment. Among the most prominent deficits are slowing on motor and psychomotor tasks, attention deficits, impairment of executive functions, and inefficient learning of novel material. The goal of this proton magnetic resonance spectroscopy study was to test whether neuropsychological dysfunction in HIV patients would be differentially predicted by poorer neuronal integrity in frontal white matter (FWM) and frontal gray matter (FGM).

Participants and Methods: The CNS HIV Anti-Retroviral Therapy Effects Research (CHARTER) study is a longitudinal multisite study of HIV patients undergoing treatment. Single-voxel MR spectroscopy was used to assess 238 HIV infected CHARTER participants, yielding measurements of N-acetylaspartate (NAA) in right FWM and midline FGM as an indicator of neuronal integrity.

Results: Higher FWM NAA ($R^2=.06$, $p<.0001$) and FGM NAA ($R^2=.10$, $p<.0001$) significantly related to better global neuropsychological performance (mean demographically-corrected T-score). When simultaneously predicting global neuropsychological performance, the two regions together were better predictors than each one alone ($R^2=.13$, $p<.0001$). Regression analyses were conducted to examine the relative contributions of gray and white matter NAA predicting performance in different neuropsychological domains. Executive function, learning, recall, and motor function were significantly predicted by gray matter integrity (FGM NAA) without a significant additional contribution of white matter integrity. Working memory was significantly predicted by white matter integrity alone (FWM NAA), while speed of information processing was significantly predicted by integrity of both regions.

Conclusions: These results suggest some dissociation of damage to cortical gray and cerebral white matter in those infected with HIV, and that the brain tissues affected may account for the "spotty" cognitive deficits often associated with this disease.

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H. VAN DER VLUGT, S. ROURKE, H.V. VLUGT & B. ROURKE. Contribution of depression and neuropsychological impairment on cognitive symptom burden in HIV/AIDS and their impact on overall health.

Objective: To examine the degree to which presence of NP impairment (NPI), AIDS diagnosis and depression are related to severity and pattern of cognitive symptom burden and the impact these have on overall health-related quality of life (MOS-HIV).

Participants and Methods: We used MANOVA to examine the impact and degree to which presence of NPI (using Heaton clinical rating system – global ratings 1-4 = NP-normal; ratings 5-9 = global NPI), depression (Beck Depression cognitive-affective score: < 10 = not depressed; > 10 = "depressed"); and AIDS (CDC-93 stage C vs non-AIDS = CDC A/B) are associated with cognitive symptom burden using the Patient's Assessment of Own Functioning inventory (organized into cognitive, memory, language and sensory-motor subscales) in 294 adults with HIV-infection; mean age and education = 42.0 (8.4) and 14.4 (2.6), respectively.

Results: Both main effects for NP status and depression were significant ($p < 0.01$) for all cognitive symptom subscales as was the NP X depression interaction ($p < 0.05$) for cognitive, memory and language cognitive symptoms (sensory-motor, $p = 0.10$). Relative to those with normal NP and no depression, presence of NPI without depression was associated with increase in cognitive symptom burden of 26-59% whereas those with both NPI and depression had 73-127% increase in symptom burden. Overall health was reduced significantly with depression in NP normal (53%) and NPI groups (96%).

Conclusions: There is a 2-fold increase in cognitive symptom burden and a similar decrease in overall health in persons with HIV/AIDS who have concurrent NPI and depression.

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M.J. WRIGHT, A.L. GOODING, J. JANG, S.A. CASTELLON & C.H. HINKIN. Recent Cocaine use Exacerbates Verbal Memory Deficits in HIV+ Individuals.

Objective: We sought to determine if cocaine use exacerbates HIV-associated verbal memory deficits. HIV and cocaine appear to negatively impact white matter, the hippocampus, and the striatum. We predicted that cocaine use would worsen HIV-related verbal memory deficits.

Participants and Methods: 66 HIV+ participants who recently used cocaine (indicated by self-report or urine screen; HIV/Coc) and 61 HIV+ participants without recent use (indicated by self-report and clean urines for drugs of abuse; HIV/Clean) were compared on a averaged California Verbal Learning Test (CVLT) score and Item Specific Deficit Approach (ISDA) indices of encoding, consolidation, and retrieval. Most participants had histories of cocaine abuse/dependence (HIV/Clean=34-past, 7-current; HIV/Coc=20-past, 29-current). Study exclusions included psychiatric disturbance, CNS injury/disease, CNS opportunistic infection/neoplasm, and learning disability.

Results: Groups were matched on demographics and HIV/AIDS status. A 2X2 ANOVA revealed poorer HIV/Coc-CVLT performance in comparison to HIV/Clean, $F(1,123)=6.27$, $MSE=86.50$, $p=0.014$, $d=0.41$. The effect of abuse/dependence and the recent use by abuse/dependence interaction were not significant, $F_s < 1.85$. Scores on the CVLT based ISDA indices were evaluated with 2X2 ANOVAs. An effect of recent use was found, where HIV/Coc showed poorer encoding in comparison to HIV/Clean, $F(1,123)=9.33$, $MSE=8.04$, $p=0.003$, $d=0.48$. The effect of abuse/dependence and the recent use by abuse/dependence interaction were not significant, $F_s < 2.60$. Additional analyses failed to reveal group or interactive effects for the consolidation or retrieval indices, $F_s < 2.22$.

Conclusions: These findings suggest that recent cocaine use exacerbates HIV-related verbal memory encoding deficits. This may occur via amplified disruption of neural systems affected by both HIV and cocaine. Correspondence: *Matthew J. Wright, Ph.D., Psychiatry & Biobehavioral Sciences, UCLA, 760 Westwood Plaza, CS-746, Los Angeles, CA 90095. E-mail: mjwright@mednet.ucla.edu*

Infectious disease: HIV/AIDS

B.W. BECKER, A.L. GOODING, J. JANG, M.J. WRIGHT, R.S. DURVASULA, S.A. CASTELLON & C.H. HINKIN. Longitudinal Relationship Between Neurocognitive Dysfunction and Medication Adherence in HIV-Infected Adults.

Objective: Neuropsychological dysfunction has been shown to be associated with poor medication adherence among HIV-infected

adults (Hinkin et al., 2002). However, to date no study has examined how changes in neuropsychological functioning over time may relate to longitudinal change in medication adherence rates. In this study we hypothesize that declines in neurocognitive function would be associated with declines in medication adherence rates.

Participants and Methods: Participants included 177 HIV-infected adults who underwent neuropsychological testing at study entry and then six months later. Medication adherence was assessed continuously over the course of the study using electronic monitoring devices. Based upon neuropsychological test-retest comparisons, participants were grouped as: Stable NP normal ($n=63$); NP decline ($n=21$); NP improved ($n=36$); and Stable NP impaired ($n=57$). The four groups were comparable on key demographic and disease-related variables.

Results: Profile analysis, which provides data regarding slope, level of performance, and parallelism, was used to compare adherence data over time. The groups were found to significantly differ on overall adherence rates ($F=5.1$, $p=.002$) with the stable NP impaired group demonstrating significantly lower overall adherence rates than the other three groups. Tests of parallelism revealed a significant Group X Time interaction (Wilks $\Lambda=.83$, $F=1.8$, $p=.03$). This was attributable to a significant decline in adherence rates among the NP decline group, whose adherence rates dropped precipitously from month 3 (71%) to month 6 (58%). In contrast, over the same time period the NP improvers' adherence rate did not decline (77%-76%).

Conclusions: These findings suggest that HIV-associated declines in neuropsychological functioning are associated with a corresponding decline in medication adherence. Questions regarding direction of causality (i.e. decline in cognition causing a drop in adherence or do declining adherence rates lead to the development of neurocognitive problems) remain to be determined.

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J. JACOBUS, B.C. SCHWEINSBURG, R.J. THEILMANN, M.J. TAYLOR, S.P. WOODS, T.B. HARRISON, A. GONGVATANA, D.R. FRANKLIN, S.L. LETENDRE, R.J. ELLIS, R.K. HEATON, L.R. FRANK, I. GRANT & T.L. JERNIGAN. Neurocognitive Performance Predicts Altered White Matter Fractional Anisotropy in HIV-infected Individuals.

Objective: Human immunodeficiency virus (HIV) is associated with cognitive dysfunction, but the underlying neuropathogenic role of white matter (WM) fiber change is not well understood. In this study we used diffusion tensor imaging (DTI) to characterize the relationship between WM fiber structure and neuropsychological (NP) functioning among a sample of HIV+ individuals. We hypothesized that poorer NP performance would be related to lower fractional anisotropy (FA), a scalar measure related to WM integrity.

Participants and Methods: Seventy-six HIV+ volunteers (age 41.7 ± 3.2 , education 13.3 ± 2.4 , median CD4 nadir 219, IQR [108, 383]) received spiral DTI with whole brain coverage. Volunteers were 89% male and each received a comprehensive NP battery from which an average global and domain based T-score were derived. Tract based spatial analysis identified shared fiber structure across individuals and facilitated voxelwise multiple regression using the predictors age and each NP domain (analyzed separately). Type I error was minimized by intensity and cluster based thresholding ($p < .05$, 38 microliters).

Results: There was a significant, widespread, positive association between global NP and FA above and beyond age effects. Lower executive domain T-scores were associated with lower FA, particularly in frontal lobe fibers. Speed of information processing T-scores were associated with levels of FA across a broad range of fiber structures. Poor performance in the motor domain was associated with reduced FA in motor pathways such as internal capsule. Effect sizes were medium or large in all cases.

Conclusions: Diffuse WM microstructural change was associated with worse NP performance, and findings were independent of age. Lower domain scores showed cluster patterns consistent with purported structure-function relationships (e.g., frontal lobe and executive dysfunction). Detection of WM alterations may have implications in identifying early NP dysfunction in HIV+ individuals.

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K. KIT & F.F. SARAZIN. Chronic Neurocognitive Sequelae Associated with Progressive Multi-focal Leukoencephalopathy (PML): A Case Report 8 years Post Infection.

Objective: This case-study highlights the cognitive deficits associated with Progressive Multi-focal Leukoencephalopathy (PML). PML infection is typically seen in immuno-compromised individuals, especially those with HIV/AIDS. Until recently, this infection had been extremely lethal in nature and most individuals died within months of symptom onset. With improvement in HIV medication, an increasing number of individuals now survive beyond the acute infection phase. However, little is known about the long-term effects of PML and its influence on cognition. Hence, this case-study underscores the need for transdisciplinary research between neuropsychology, medicine (infectious diseases) and neuroscience.

Participants and Methods: Results from a comprehensive neuropsychological assessment are presented for a 45-year old man who suffered a PML infection 8 years ago. He has a 20-year history of HIV infection and is stable on HAART medication.

Results: The neuropsychological test results revealed diminished abilities in complex attention, processing speed, and executive functions, which were qualitatively distinct from those observed in HIV-associated dementia (HAD). More importantly, the individual's intact insight, marked expressive language impairment (i.e., word-finding problems, stuttering/slurring, poverty of content, and incomplete sentences), and lateralized motor deficits were also inconsistent with HAD. The findings were compatible with multiple foci of damage seen on MRI from his previous PML diagnosis.

Conclusions: This case study suggests that the chronic cognitive effects of PML are varied and severe in nature. Continued research, beyond single-case design studies, is required to better delineate the long-term cognitive effects associated with PML and to determine whether there is a characteristic symptom profile.

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Infectious disease: Other (e.g., hepatitis C, West Nile virus)

S.P. CERCY & J. COLE. Atypical Cognitive Findings In A Case Of Probable Sporadic Creutzfeld-Jakob Disease.

Objective: To describe atypical cognitive findings in a case of probable sporadic Creutzfeld-Jakob disease (CJD).

Participants and Methods: Approximately 3 months prior to presentation, a 58-year-old, high school-educated man developed demarcated memory decline and prominent visuospatial symptoms, including difficulty identifying specific rooms at home and failure to recognize his long-time physician. Prior medical and psychiatric history included hypertension, heart disease, diabetes, and undifferentiated schizophrenia managed with Trilafon. He underwent neuropsychological, neurological, and psychiatric, and brain imaging studies.

Results: Recall and recognition memory, visuospatial processing, speed of visual search, naming, and flexibility were severely impaired. There

was extinction in the left superior visual quadrant but no quadrantanopia. Initial neurological examination was non-focal. MRI showed FLAIR hyperintensity and restricted diffusion in the left striatum, and gyriform hyperintensity involving bilateral occipital, posterior parietal and cingulate, and mesio-basal temporal regions. EEG showed non-specific slowing. Infectious, autoimmune, and paraneoplastic etiologies were ruled out, as were limbic encephalitis and Morvan syndrome. CSF 14-3-3 protein was elevated. Subsequently, he developed bilateral upper-extremity fasciculations and myoclonus progressing to the face and lower extremities, and exaggerated startle. The course was rapidly progressive. Profound expressive aphasia was evident within 3 months of presentation; he expired 6 months following presentation. Family declined post-mortem.

Conclusions: Convergent evidence was consistent with CJD, likely the Heidenhain variant (HV). Early, prominent global memory impairment may be atypical in CJD, including HV. The findings support previous evidence for considerable phenotypic heterogeneity of sporadic CJD. Moreover, CJD phenotypes may be determined by individual variability in neuropathology.

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C. POSADA, D.J. MOORE, S.P. WOODS, O.R. VIGIL, S.L. LE-TENDRE & I. GRANT. Hepatitis C Infection Affects Frontal Systems Behaviors.

Objective: Hepatitis C virus (HCV) infection is neurovirulent and associated with neuropsychological (NP) impairments, especially executive functions (Bieliauskas et al., 2006). However, little is known about non-cognitive frontal behavioral changes among HCV+ persons, and the possible correlation of these behaviors with NP functioning.

Participants and Methods: We examined 31 HCV+ individuals and 39 healthy controls (HCV-) with the self-rating form of the Frontal Systems Behavior Scale (FrSBe) and a comprehensive NP battery. The FrSBe generates a total frontal dysfunction score, and three subscale scores: apathy, disinhibition and executive dysfunction. Participants were HIV- and had no history of methamphetamine dependence.

Results: HCV+ individuals had significantly higher T-scores (indicating greater frontal dysfunction) on the FrSBe total and on each of the FrSBe subscales ($p=0.001$) as compared to HCV- participants. The HCV+ group performed worse on tests of executive functioning (all $p's < 0.01$); however, significant correlations between FrSBe total score and NP tests of executive functioning were not observed when examining the HCV+ group alone. Significant correlations were observed between Wisconsin Card Sorting Test Perseverative Responses ($r=-0.24$, $p < 0.001$) and FrSBe total scores when examining the combined group. No correlations were found between FrSBe scores and plasma HCV viral load.

Conclusions: HCV+ persons reported significant disruptions of frontally-mediated behaviors and showed impairments on tests of executive functioning; however, we did not find a significant correlation between these outcomes in this preliminary study. These findings are provocative and the relationship between behavioral and cognitive changes among HCV infected persons warrants further investigation.

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B. POTTER, D. BLOOM & K.R. KRULL. Neuropsychological Functioning in an 11-year-old female with Influenza A Encephalopathy.

Objective: Influenza, a relatively common disease, has a wide symptom presentation and range of severity. The changing epidemiologic pattern

is indicative of variations of the influenza virus. This case study presents assessment findings at baseline and two-month follow-up of a previously high functioning patient with Influenza A Encephalopathy. The changing neuropsychological profile and behavioral manifestations is reviewed.

Participants and Methods: This is a single case study of a previously high functioning eleven-year-old Asian-American female diagnosed with Influenza A Encephalopathy. Neurobehavioral and Neurocognitive evaluations began as inpatient and continued post discharge.

Results: Initial assessment found the patient to be significantly disoriented and confused with reported visual hallucinations and deficits in adaptive functioning. She performed significantly below expectations on language and explicit memory tasks; however, implicit memory was preserved. A brain MRI at that time was normal. Orientation and adaptive functioning improved slowly over a two-week course. After discharge and complete physical recovery (2 months after diagnosis), she was fully oriented and demonstrated average intellect. However, she continued to demonstrate very significant executive dysfunction and continued visual perception difficulties. A follow-up MRI as an outpatient revealed cortical atrophy.

Conclusions: Influenza is a relatively common and potentially devastating childhood disease with a wide symptom presentation that changes over time. This case study demonstrates the course of recovery in a high functioning 11-year-old child with Influenza A Encephalopathy. Residual executive function deficits persisted for at least two months, which may suggest neurodevelopmental sensitivities. The associations between Influenza A Encephalopathy and the Tamiflu in leading to neurocognitive outcomes will be discussed.

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Paper Session 7

10:45 a.m.–12:15 p.m.

Cognitive Neuroscience

J. GLÄSCHER, L.K. PAUL, D. TRANEL & R. ADOLPHS. Large-scale Lesion Mapping of Cognitive Abilities Derived from the Wechsler Adult Intelligence Scale.

Objective: The Wechsler Adult Intelligence Scale (WAIS and its descendants, WAIS-R and WAIS-III) is one of the most widely used neuropsychological tests, yet the relationship between performance scores and regional brain dysfunction remains more a matter of clinical lore than empirical fact.

Participants and Methods: We mapped the anatomical extent of lesions in over 200 neurological patients as a function of their performance on 4 cognitive indices derived from the WAIS battery: verbal comprehension (VC), working memory (WM), perceptual organization (PO), and processing speed (PS). Lesion overlap analyses were conducted using voxel-based lesion-symptom mapping (Bates et al., 2003), which calculates, at each voxel, the mean difference in performance between subjects whose lesions included that voxel and those whose lesions excluded that voxel. Statistical significance was assessed using the non-parametric Brunner-Munzel Test (Rorden et al., 2007) with a false discovery-rate correction for multiple comparisons. Statistical power maps were also calculated to visualize the sensitivity of finding significant lesion-deficit relationships at each anatomical location.

Results: We found significant associations between VC and WM with lesions in the left inferior frontal lobe extending into underlying white matter, and between PO and PS with lesions in the right frontal and parietal lobes (corresponding to the territory of the middle cerebral artery). Furthermore, PS also showed a significant association with lesions in the left inferior parietal cortex, suggesting that this cognitive index depends on regions in both hemispheres.

Conclusions: Our findings provide new insights into the neuroanatomical substrates of cognitive ability using inferential statistics that balance sensitivity and specificity.

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S.W. MACDONALD, S. CERVENKA, L. NYBERG, L. FARDE & L. BÄCKMAN. Dopamine Binding Modulates Intraindividual Variability in Cognitive Performance.

Objective: Intraindividual variability (IIV) reflects lawful but transient within-person changes in performance, such as trial-by-trial fluctuations on a reaction-time (RT) task. Increased IIV in cognitive performance shares systematic associations with aging-related processes (e.g., cognitive and physiological deficits), neurodegenerative pathology (e.g., Alzheimer's disease), and brain injury. However, comparatively little research has examined the neural underpinnings of IIV, with no studies of potential neuromodulatory correlates. Alterations in dopamine (DA) are of particular interest as populations that exhibit neuromodulatory changes in DA also exhibit increased behavioral IIV (e.g., the elderly, ADHD children, schizophrenics, patients with Parkinson's disease). In the present study, we examined links between IIV for various cognitive outcomes and DA D2 receptor binding.

Participants and Methods: Participants were 8 women and 8 men (M=56.06 years, SD=7.67) with no history of psychiatric or somatic illness. Using positron emission tomography (PET), D2-receptor availability was determined in the striatum using the radioligand [¹¹C]raclopride and in extrastriatal brain regions using the radioligand [¹¹C]FLB 457. Measures of executive function, visual memory, sustained attention, and sensorimotor speed were administered from the CANTAB cognitive battery.

Results: An index of IIV, the intraindividual standard deviation (ISD), was computed across successful response latency trials for each of the cognitive outcomes. Increasing ISDs for the executive and memory measures were systematically associated with diminished D2 receptor binding ($r = -.34$ to $-.43$).

Conclusions: These findings are consistent with claims that dysfunctional DA modulation leads to increased neural noise, less distinct cortical representations, and ultimately to increased variability in cognitive functioning.

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M.E. KRAMER, C. CHIU, S.L. WADE & N. CHERTKOFF WALZ. "Would You Do This?": Neural Correlates of Social Information Processing in Healthy Adults and Children.

Objective: Social information processing (SIP) involves a series of problem-solving steps that are implemented when an individual responds to a social situation. These steps include interpreting cues; clarifying goals; generating, selecting, and implementing a response; and evaluating outcomes. SIP shows a developmental progression, and is an important determinant of social competence. This project examines the neural correlates of response evaluation, which is the final step in SIP.

Participants and Methods: While undergoing a functional magnetic resonance imaging (fMRI) scan, 12 healthy adults (mean age 20.9 years) and 12 healthy children (mean age 9.3 years) viewed video vignettes of

child actors portraying the experience and resolution of problematic social events. For each vignette, participants were prompted to make a judgment as to whether or not they would have responded to the situation in the same way as the protagonist (SIP task), or to monitor the number of children present in the video (control task).

Results: Both children and adults activated similar networks of brain regions during the SIP task, although adults demonstrated greater overall activation in this network compared to children. Adults recruited brain regions hypothesized to be involved in social cognition to a greater extent during the SIP task compared to the control task. In contrast, children recruited largely the same brain regions during the two tasks.

Conclusions: Although both groups activated the same neural network during the SIP task, subtle developmental differences in the brain activation patterns were noted. These differences are likely due to the social situations in the vignettes being more familiar to children, as well as the relative immaturity of cognitive control processes in children.

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K. CHIOU, N. FITZPATRICK, J. WANG, J. VESEK, E. HILLS, D. GOOD & F. HILLARY. Longitudinal Investigation of Axonal Disruption and its Influence on Brain Activation.

Objective: Traumatic brain injury (TBI) commonly results in diffuse axonal injury (DAI), which has widespread consequences for neural activity. Diffusion tensor imaging (DTI) can be used to measure white matter integrity and is highly sensitive to identifying DAI. To date, investigators have successfully used DTI to examine common sites of where axonal disruption occurs (e.g., the corpus callosum). However, the relationship between discrete sites of axonal disruption and functional brain activation remains unknown. The complementary use of DTI and functional magnetic resonance imaging (fMRI) can aid in determining the association between local axonal recovery, brain function, and cognitive performance. The influence of axonal recovery was examined longitudinally by examining sites of discrete axonal disruption to determine the influence of axonal recovery on proximal and distal functional brain activation and working memory.

Participants and Methods: Using a Phillips 3T scanner, MRI data were acquired at 3 and 6 months post injury in 5 participants sustaining moderate to severe TBI. fMRI data were collected while subjects performed a visual spatial working memory task. DTI and T2* were used to identify discrete areas of axonal disruption. Fractional anisotropy (FA) maps were co-registered with functional data, and the relationship between FA, BOLD signal change, and reaction time (RT) was examined.

Results: A negative correlation was found between activation and FA values. When comparing the two measurements, RT was positively correlated with change in activation and negatively correlated with change in FA values.

Conclusions: The disruption and recovery of axonal functioning correspond to specific changes in functional brain activation and cognitive performance.

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D.L. MOLFESE, J. SWEATT & F.D. LUBIN. Long-Lasting Changes In Hippocampus Gene Regulation Following Traumatic Experience.

Objective: Traumatic experiences can result in lasting memories. While post-traumatic stress (PTSD) is well documented, the underlying cause is unknown.

Participants and Methods: In an animal model of fear memory, rats exposed to footshock in a novel context exhibit freezing (fear) behavior when re-exposed to the same context 24 hours later, indicating they remember the footshock. We examined gene regulation following fear memory. New memories require modifications to histone proteins packaging the DNA.

Results: One hour after footshock, we observed an increase in tri-methylation of Histone H3 at Lysine 4 (H3K4me3) in hippocampus. This modification is associated with gene transcription, a necessary first step in long-term memory formation. Furthermore, when the fear memory was extinguished over 5 days, the increased H3K4me3 persisted, suggesting long-lasting changes in memory regulation from a single traumatic experience. However, when the shock and context were dissociated by pre-exposing the animal to the context prior to shock, we did not observe freezing behavior from animals re-exposed to the context. We also did not observe a change in H3K4me3. We did observe an increase in dimethylation of Histone H3 at Lysine 9 (H3K9me2). This modification is associated with gene suppression, suggesting the prevention of the traumatic memory by dissociating the context from the shock.

Conclusions: These data suggest that traumatic experiences induce long-lasting changes in gene regulation, and consequently in long-term memory. Drug therapies targeting histone-level gene regulation may enable the prevention of PTSD by blocking the molecular cascade necessary for long-term storage of the traumatic memory.

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Invited Symposium

10:45 a.m.–12:15 p.m.

Neuropsychiatric Aspects of Combat Exposure (Blast Injuries, TBI, PTSD)

Chair: Roberta White

R.F. WHITE, K. HEATON, W. RINGE, M. KRENGEL & J. VASTERLING. Neuropsychiatric Aspects of Combat Exposure (Blast Injuries, TBI and PTSD).

Symposium Description: Introduction and the experience of deployment. Roberta F. White

This symposium reviews some of the determinants of diminished cognition and affective complaints among military personnel following deployment to combat. Recent findings report that deployment itself is associated with changes in cognition in individuals who are tested both before and after deployment relative to controls tested at similar intervals. This research is briefly reviewed as background to presentations covering the following topics:

Nerve gas agents, neuroimaging and cognition in Gulf War veterans. New research strategies for the investigation of Gulf War-related illnesses.

Effects of blast injuries among Iraq veterans.

Traumatic brain injury and post-traumatic stress effects in Iraq veterans.

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K. HEATON, S.P. PROCTOR, C.L. PALUMBO, R.J. KILLIANY, D. YURGELUN-TODD, T.C. HEEREN & R.F. WHITE. Neuropsychological and Neuroanatomical Findings in 1991 GWVeterans with Estimated Low-level Exposures to Sarin and Cyclosarin*.

Objective: In March 1991 more than 100,000 US troops were potentially exposed to low levels of the organophosphate nerve agents sarin and cyclosarin following demolition operations at a munitions storage complex at Khamisiyah, Iraq. The structural and functional impacts of low-level exposure to sarin/cyclosarin on the human brain are poorly understood. However, some recent research has indicated subtle, persistent neurobehavioral and neurochemical changes in humans exposed to sarin/cyclosarin at levels insufficient to produce obvious clinical symptoms. In two studies we examined the association between modeled estimates of sarin/cyclosarin exposure levels and neurobehavioral and neuroanatomical outcomes in 1991 Gulf War veterans with varying degrees of possible low-level sarin/cyclosarin exposure. The results of these two studies provide evidence of subtle but persistent central nervous system pathology in Gulf War veterans up to 10 years post-deployment.

*Disclaimer: The views expressed in this presentation are those of the authors and do not reflect the official policy of the Dept of Veterans Affairs, Dept of the Army, Department of Defense, or the U.S. Government. Correspondence: *Roberta F. White, PhD, Boston University School of Public Health, 715 Albany St.—T2E, Boston, MA 02118. E-mail: rwhite@bu.edu*

W.K. RINGE, C. CULLUM, J. HART, M.T. POSAMENTIER, R.W. BRIGGS & R.W. HALEY. Gulf War Illness Neuroimaging and Biomarker Studies.

Objective: Epidemiological studies at the University of Texas Southwestern Medical Center at Dallas suggest the presence of three distinct syndromes of Gulf War Illness (GWI). Results from neuropsychological testing, magnetic resonance spectroscopy (MRS), and other clinical and genetic tests indicate potential basal ganglia dysfunction, in addition to other subtle findings. Here we briefly review these findings and present the design and preliminary results from a current project aimed at longitudinal examination of our original sample as well as extension to a larger randomized sample of GWI subjects. Methods include repeat neuropsychological testing and several functional MRI and EEG protocols designed to target key symptoms of GWI. Additional studies include repeated and extended SPECT cholinergic challenge experiments, MRS, diffusion tensor imaging, and arterial spin labeling MRI, as well as various clinical and genetic tests. The goals of the project are to identify the patterns of brain dysfunction that characterize GWI variants and to develop an accurate, efficient, objective testing strategy for diagnosis.

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M. KRENGEL, K.M. SULLIVAN & L. GRANDE. The Impact of Blast Injury on Cognitive, Psychosocial and Health Outcomes: A preliminary analysis of mild traumatic brain injury in OIF/OEF returnees.

Objective: This presentation summarizes research designed with two aims: 1) to compare cognitive functioning and current health symptoms in Operation Iraqi Freedom/Operation Enduring Freedom veterans with either exposure to blast munitions or non-blast TBI and 2) to evaluate the relationships among health symptoms and diagnostic outcomes in blast exposed versus non-blast exposed mild TBI. Study participants included OIF/OEF returnees with mild traumatic brain injury (TBI). Each participant completed a battery of neuropsychological tests, psychological interviews and health symptom questionnaires. Results of multivariate analyses showed differences in the areas of attention, ex-

ecutive function and short-term memory between the blast injury group and the non-blast TBI group. Results were maintained when controlling for PTSD. In addition, differences were seen in health symptoms between the two groups. The long-term implications of these findings are discussed.

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J.J. VASTERLING, K. BRAILEY & S.P. PROCTOR. The Effects of Mild Traumatic Brain Injury and Exposure to Extreme Stress on Neuropsychological Functioning in the Iraq War: “Shell Shock” revisited?*

Objective: This presentation discusses neuropsychological outcomes among Iraq-deployed service members who experienced mild traumatic brain injury during deployment. In particular, it addresses the influence of context, including stress exposures, on neuropsychological outcomes. Prospective neuropsychological outcome data obtained as part of the Neurocognition Deployment Health Study serve as the basis for this discussion. Specifically, the presentation incorporates data regarding head injury and PTSD rates in the study sample, and associations found among mild traumatic brain injury, exposure to extreme deployment stress, post-traumatic stress symptoms, and neuropsychological functioning.

*Disclaimer: The views expressed in this presentation are those of the authors and do not reflect the official policy of the Dept of Veterans Affairs, Dept of the Army, Department of Defense, or the U.S. Government. Correspondence: *Roberta F. White, PhD, Boston University School of Public Health, 715 Albany St.—T2E, Boston, MA 02118. E-mail: rwhite@bu.edu*

Symposium 8

10:45 a.m.–12:15 p.m.

Predicting Real-World Functioning in at-Risk Populations: The Roles of Everyday Problem Solving and Decision Making Competence.

Chair: Stacey Wood

A. THORNTON & H. KRISTINSSON. Predicting Life Skills Functioning in Patients with Serious Mental Illness.

Objective: The ecological validity of measures of cognition is increasingly recognized as essential to the fields of clinical neuropsychology and psychiatry. Recent developments in everyday problem solving suggest that these measures may be superior to traditional cognitive measures in predicting real-world functional capacities. We report on the extent to which measures of everyday problem solving (EPS) predict daily functioning over and above that of intellectual abilities.

Participants and Methods: The current sample consisted of 22 chronically mentally ill inpatients with psychotic disorders seen at a tertiary psychiatric hospital. Patients underwent interview based measures of psychiatric symptoms (i.e., Signs and Symptoms of Psychiatric Illness; SSPI), nurses' observations of daily functioning (i.e., Routine Assessment of Patient Progress; RAPP), and measures of intellectual functioning (i.e., Kaufmann Brief Intelligence Test – 2nd Edition) and everyday problem solving.

Results: Everyday problem solving was significantly associated with ($r = -.38$) nurse's observations of life skills (e.g., socialization, budgeting, social problem solving), but not in their observations of the patients' basic self-care (e.g., sleep, elimination, safety) or psychopathology (e.g., anxiety, hallucinations; all r s $< \pm .05$). Once psychiatric symptoms and intellectual functioning were statistically controlled, EPS showed a trend in the predictions of nurses' based observations of life skills functioning.

Conclusions: Our results indicate that EPS ability accounts for 'real world' life skills functioning above that of intellectual functioning and psychiatric symptoms. Consequently, it appears beneficial to assess everyday problem solving in patients with serious psychiatric disorders.

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S. GELB, W. THORNTON, R.J. SHAPIRO & H. DUMKE. **Kidney Transplantation: Neuropsychological Abilities as a Mediator of the Relationship between Health Status and Everyday Problem Solving.**

Objective: Everyday Problem Solving (EPS) is a measure of interest when attempting to identify cognitive tests that accurately reflect one's ability to function in everyday life. In previous work, we have demonstrated that kidney transplant (TX) recipients perform worse than controls on traditional neuropsychological measures. We have also found that for Chronic Kidney Disease (CKD) participants, neuropsychological abilities partially mediate the relationship between health status and EPS performance. In the present study, we assessed whether neuropsychological abilities mediate the relationship between health status (TX recipient versus healthy control) and EPS performance, and hypothesized that findings for kidney TX recipients would be similar to those found for persons with CKD.

Participants and Methods: We used a cross-sectional design in order to compare EPS and neuropsychological performance in 48 kidney TX recipients and 49 control participants. Groups were matched on age and education, and were carefully screened for other conditions (e.g., stroke) with known neuropsychological sequelae.

Results: In a series of regression analyses, TX status predicted worse EPS performance and memory/executive functioning abilities. Hierarchical regression analysis revealed that memory/executive abilities partially mediated the relationship between health status and EPS ($\beta = .11$; Sobel's $Z = -2.31$, $p < .05$), although TX status still remained significantly associated with worse EPS performance.

Conclusions: Although neuropsychological abilities appear to partially underlie EPS declines in chronic illness, TX recipient status remained independently associated with reduced EPS. This suggests that EPS measures may provide additive value beyond traditional neuropsychological measures, thereby highlighting the potential benefits of including EPS measures in neuropsychological assessments.

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M.L. FINUCANE, A.E. WILLIAMS & R.B. COWAN. **The Dynamics of Aging and Disease Risk Recognition.**

Objective: Declines in physical resilience in later life mean that poor judgments by older adults about their health can have dramatic consequences. The rapid aging of the world's population demands a better understanding of how age-related changes in judgment processes affect the quality of disease risk recognition. However, little is known about how risk judgments are impacted by basic cognitive processes that change with age and with learning opportunities in a probabilistic environment.

Participants and Methods: In this paper, we present two studies that examine the ability of older adults (65-100 years) versus younger adults (18-40 years) to learn to change their risk evaluations under the impe-

tus of external stimuli (symptoms inversely vs. directly related to disease status). We developed new measures of three skills required for good judgment and decision-making (comprehension, consistency, and insight). Unlike previous research on aging and decision-making competence, which has typically measured these skills in a static environment, our new measures captured performance in a dynamic, changing environment.

Results: Overall, the results show that external cues (symptoms) that are inversely (versus directly) related to disease status are particularly challenging for older adults to understand and use.

Conclusions: We will discuss the theoretical implications of these findings for theories of aging and risk judgment. We will also highlight the practical implications for decision support systems and risk communication in later life.

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S. WOOD, B. TANIUS, Y. HANOCH & T. RICE. **Optimal choice in medical decision making in older adults: the role of numeracy and speed.**

Objective: Current Medicare Part D requires seniors to sift through dozens of options in making choices about prescription drug plans. However, recent research suggests that too much choice can lead to poor decision-making. Older adults may be particularly at risk for poor choice behavior given changes in cognitive functioning that are associated with the normal aging process. The goals of the current study were to determine if number of choices impacts choice performance and to examine potential mediators in the decision making of older adults: numeracy and speed of processing

Participants and Methods: Sixty-four older adults and 84 younger adults selected an insurance drug plan from material designed to simulate the Medicare Part D website. Participants were assigned to choose from either a 6 or 24 plan choice array. Participants were also required to complete a speed of processing measure and a measure of numeracy

Results: A 2 (age group: old versus young) by 2 (choice array: 6 versus 24 plans) between participants ANOVA revealed a main effect for age group ($p < .05$) and condition ($p < .05$) such that younger adults did better in all conditions and all participants were more likely to choose the best plan when in the smaller choice set condition. However, both speed of processing and numeracy were significant covariates and when added to the model, eliminated the effects of age.

Conclusions: Less choice resulted in better decision-making across age groups. Results further indicated that individual differences in numeracy and speed of processing, rather than age per se, accounted for variability in performance.

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S. WOOD & W. THORNTON. **Predicting real-world functioning in at-risk populations: the roles of everyday problem solving and decision making competence.**

Symposium Description: A growing body of evidence supports the existence of reductions in everyday problem solving (EPS) and decision making competence (DM) in older age and in a variety of clinical populations. Recent developments in the EPS and DM literatures suggest that assessment of these abilities may prove superior to traditional cognitive measures in predicting certain aspects of real-world functioning. As such, it is important to elucidate the predictive utility of emerging EPS and DM measures, and to determine their additive value with regards to traditional neuropsychological measures. In this series of presentations, we will examine evidence linking reductions in EPS and DM to real world functioning, and examine risk factors and neuropsychological correlates in three clinical populations. Toward these ends,

two presentations will examine the dynamic interplay of cognitive factors and EPS in individuals with schizophrenia and chronic kidney disease (Thornton and Gelb). Findings support the utility and additive value of EPS measures in these populations. Secondly, cognitive and non-cognitive factors will be examined on medical DM tasks with older adults. Finucaine will present findings examining the role of learning and memory in a probabilistic environment in the determination of medical risk in older adults. Finally, Wood will examine the role of age, processing speed and numeracy on the ability of older adults to choose a prescription drug plan. Major themes to be explored include, the role of health status on EPS and DM in clinical populations, and augmentation of traditional neuropsychological measures when assessing everyday functioning.

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Poster Session 7: Aging, Hormones, Genetics

11:00 a.m.–12:30 p.m.

Aging

R. ANAND, M.J. MAGUIRE, S.B. CHAPMAN, J. HART & P.S. MOORE. *Gist-based and Detail-based Processing of Information: Effects of Normal Cognitive Aging.*

Objective: Emerging research in cognitive aging suggests that memory for details (specific content) declines with normal aging despite relatively preserved memory for gist (global meaning), as observed during recall paradigms. To date, the neurological underpinnings of detail and gist-based processing in young adults and aging individuals remain largely unexplored. The current study used event-related potentials (ERPs) to examine processing differences in gist and details.

Participants and Methods: Fifteen cognitively normal young adults (18 - 35 years) and 15 cognitively normal seniors (65 - 85 years) were studied. Participants were asked to judge whether a given statement corresponded to gist or details conveyed in a picture. A total of 240 statement-picture pairs were used. ERPs and behavioral response in terms of reaction time (RT) and accuracy were recorded.

Results: Young adults showed no RT differences between gist and details, whereas seniors responded faster to details than gist. Overall, young adults were significantly faster in responses than seniors, but both groups had comparable accuracy scores. Spatio-temporal Principal Components Analyses done on ERP data of each group revealed similarities and differences in topographical distributions for gist and details. Both groups displayed higher amplitudes for details than gist in anterior areas at 990-1200ms, although the time range was delayed in seniors. There were hemispheric differences between groups in that young adults showed laterality differences for gist and details unlike seniors.

Conclusions: These results have theoretical implications in evaluating existing theories of cognitive aging. Furthermore, these findings have potential clinical implications in understanding differences between normal and pathological aging.

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K.J. BANGEN, L. DELANO-WOOD, C.E. WIERENGA, N.R. HORNE, A. MCCAULEY, K. KIMBRELL, D.P. SALMON & M.W. BONDI. *The Relationship Between Stroke Risk and Cognition in Normal Aging and Alzheimer's Disease.*

Objective: Vascular risk factors have been associated with cognitive decline in normal aging and with rate of progression to dementia in non-demented older adults with cognitive impairment. However, the mechanism linking stroke risk to cognition remains unclear. We examined the associations among stroke risk, cognition, and genetic risk for Alzheimer's disease (AD) in AD patients and nondemented older adults (NC). We hypothesized that stroke risk would be negatively correlated with cognitive performance in NC and AD participants. In addition, we expected that higher stroke risk would be associated with genetic risk and predictive of AD status.

Participants and Methods: Forty-four AD participants (mean age = 74.84, SD = 7.65) and 44 NC participants (mean age = 75.48, SD = 9.59) were matched on age, sex, and education. All participants were administered a neuropsychological test battery and underwent a medical examination including APOE genotyping. Stroke risk was calculated using the Framingham Stroke Risk Profile (FSRP), a validated stroke risk scale that estimates the 10-year probability of stroke.

Results: Results demonstrated that AD participants had significantly higher stroke risk values relative to NC's ($p = .01$). Collapsed across group, stroke risk was negatively associated with measures of global cognition ($r = -.24$, $p = .02$) and executive functioning ($r = -.30$, $p < .01$). APOE genotype was not significantly associated with stroke risk. Logistic regression of diagnosis by stroke risk and APOE genotype was performed, resulting in the accurate classification of 71.1% of participants as AD or NC ($p < .01$).

Conclusions: Our findings provide evidence that AD is associated with increased stroke risk. In addition, irrespective of diagnostic status, our findings demonstrate associations between cognition and stroke risk. Results suggest that cognitive decline may be moderated by stroke risk and support the potential utility of assessing stroke risk and other health-related variables.

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S.M. BELKONEN, K.J. MILLER, J. KIM & G.W. SMALL. *Detecting Cognitive Impairment in Older Adults Using List Learning Tasks and Genotyping.*

Objective: Research has explored the presence of APOE-4 genes, functional impairment, and memory, specifically list learning tasks, when trying to understand memory related cognitive impairment. Prior research has suggested that semantic and rote list learning tasks have shown sensitivity and specificity when used for diagnosis of mild cognitive impairment (MCI) and Alzheimer's disease (AD). Prior research has also shown that those with MCI and AD have a higher prevalence of the APOE-4 gene. The goal of the current study is to determine if rote list learning tasks are more sensitive to early decline than semantic list learning tasks, and if APOE-4 has an impact on their sensitivity.

Participants and Methods: Twenty-five participants, 11 with age-consistent memory impairment (ACMI), 2 with AD, 12 with MCI, completed semantic (Hopkins Verbal Learning Task) and rote (Buschke Selective Reminding Task) list learning tasks and underwent APOE-4 genotyping. Participants were diagnosed through neuropsychological testing and brain imaging.

Results: Pearson's correlations suggest that level of memory impairment is correlated with worse performance on both types of learning tasks, even when controlling for age, education, and sex (r 's = .47-.71, p 's < .05). APOE-4 was not correlated with diagnosis, but the MCI group with APOE-4 performed worse on the delayed recall of the rote learning task ($r = .64$, $p < .05$).

Conclusions: This study confirmed that both list learning tasks are sensitive in detecting cognitive decline, including MCI, suggesting both are essential in diagnosing cognitive decline in older adults. The presence of the APOE-4 gene did not predict diagnosis of MCI or AD, but those with APOE-4 did perform worse on the rote list learning task.

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M.L. BENJAMIN, K.M. MCGREGOR, Y. CHANG, K.D. WHITE, C. RACKELMAN, M. SHEROD, I. LEVY & B. CROSSON. Hemispheric Asymmetry Reductions in Older Adults during Category Exemplar Generation.

Objective: Old adults demonstrate frontal hemispheric asymmetry reduction during fMRI of picture naming compared to young adults (Wierenga et al., 2007); this finding results from increased right frontal activity for old adults. Although Wierenga et al. (2007) found small reductions in right basal ganglia activity in old persons, her event-related paradigm appeared less sensitive to basal ganglia differences. Block category exemplar generation has demonstrated sensitivity to left and right basal ganglia activity in young adults during word generation (Crosson et al., 2003). The current study examined the functional anatomy of aging and category exemplar generation with a block design during FMRI.

Participants and Methods: Twenty-two old (>65 years old) and 22 young (18-35 years old) participants completed a block fMRI paradigm, silently generating exemplars for 17 seconds/category for 16 categories. FMRI data was analyzed using AFNI 3dANOVA and subsequent t-tests ($p < .005$).

Results: Old participants demonstrated greater functional activity than young adults in several cortical and subcortical areas. Left hemisphere differences included inferior frontal (BA47/11), precentral (BA6), sensorimotor (BA4, BA3/1/2) and medial frontal (BA6) cortices, as well as striatocapsular gray matter. Right hemisphere differences were found in middle frontal (BA10) and posterior perisylvian areas (supramarginal and angular gyri), as well as dorsomedial thalamus. Bilateral differences included the putamen, anterior thalamus, precuneus, and posterior cingulate.

Conclusions: Compared to young adults, old adults exhibited greater activation for several cortical and subcortical areas, including regions implicated in intentional aspects of language. However, changes were distributed across the hemispheres rather than concentrated in one hemisphere.

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P.S. BISIACCHI, E. BORELLA, S. BERGAMASCHI, B. CARRETTI & S. MONDINI. Is Memory Loss the Distinctive Feature of Alzheimer Disease?

Objective: Cross-sectional and longitudinal behavioral studies on aging have mapped contrasting patterns of decline and stability in cognitive functions across adult life-span. It is well known that normal aging, even in absence of pathologies, is associated with a decrease in memory and in the cognitive resources available to process mental operations, in particular the capacity to execute tasks that involve the active maintenance and manipulation of multiple representations. The present research investigates the role of memory and executive functions in normal aging, amnesic mild cognitive impairment (a-MCI) and Alzheimer Disease (AD).

Participants and Methods: Young-old, Old-old healthy people, individuals with amnesic Mild Cognitive Impairment (a-MCI) and patients with Alzheimer Disease (AD) were administered Cognitive tasks involving memory and executive processes.

Results: Results indicate a decline in visuo-spatial tasks requiring memory and executive functions in healthy aging. The a-MCI group showed a deficit in episodic memory similar to the AD group, but in contrast, still showed preserved executive functions that may allow them to compensate for memory failures.

Conclusions: The results support the idea that aging and AD may not be a continuum of dysfunction but reflect the interconnection of at least two different processes. It is time for a new conceptualization of dementia and normal aging: dementia disorders are disease processes that are distinct from aging. 'Senility' implies only aging, whereas 'dementia' involves a syndrome or a state of ill health with a number of cognitive deficits. In-between these two conditions, a-MCI individuals show qualitative cognitive differences both from healthy people and AD patients. Correspondence: *Patrizia S. Bisiacchi, General Psychology, University of Padova, via Venezia 8, Padova 35122, Italy. E-mail: patrizia.bisiacchi@unipd.it*

M. BUTTARO, J. CHASMAN, N. CRAIG, B. SPRINGATE, R.F. KAPLAN & L. WOLFSON. Vascular Disease Risk Factors and Cognitive Functioning in Normal Elderly.

Objective: Vascular disease risk factors (VDRF) are common in the elderly and may be important predictors of cognitive impairment. This study examines the relative contribution of VDRF, demographic variables, and symptoms of pain and depression in predicting cognitive functioning and ability to perform activities of daily living in a sample of relatively healthy elderly.

Participants and Methods: Ninety-eight community-dwelling individuals aged 75-90 were interviewed about prior diagnosis of hypertension, hypercholesterolemia, diabetes mellitus, arrhythmia, coronary artery disease, congestive heart failure, transient ischemic attack, and stroke. Participants also completed a one-hour neuropsychological test battery and self-report questionnaires about levels of pain, symptoms of depression, and ability to perform instrumental activities of daily living (IADL).

Results: Sequential regression analyses revealed that number of vascular risk factors did not reliably predict performance on measures of verbal memory, attention/executive functioning, or visuospatial skills. Although demographic variables accounted for the greatest percentage of variance in the regression models (17% to 24%), pain was a significant predictor of visuospatial test scores ($\beta = -0.26, p = .01$), and symptoms of depression predicted performance on measures of attention/executive functioning ($\beta = -0.30, p < .01$). Logistic regression analysis revealed that only depressive symptoms predicted IADL performance ($OR = 1.12, p = .01$).

Conclusions: In this sample of healthy elderly individuals, vascular risk factor burden did not reliably contribute to cognitive functioning or ability to perform activities of daily living. However, the findings suggest that levels of pain and depression may play an important role in the cognitive vitality and independence of older adults.

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P.A. CERNIN, C. LYSACK & P.A. LICHTENBERG. Executive Functioning and Health Behaviors in African American Older Adults.

Objective: Executive functioning is related to instrumental activities of daily living in older adults, but its relationship to health behaviors is less clear. Research suggests that engaging in a healthy lifestyle is associated with better cognition (Hall et al., 2006); however, this relationship has not been examined in minority samples. This study examined the global and error scores on executive functioning and health behaviors in African American older adults.

Participants and Methods: Fifty-six ($N = 56$) urban community-dwelling, cognitively intact African American older adults without a his-

tory of stroke were included in the analyses. Executive functioning was measured using the Controlled Oral Word Association Test (COWAT) and Animal Naming verbal fluency measures and the Trail-Making Test B (TMT-B). Health behaviors of interest were sleep, diet, exercise, and smoking. Logistic regressions were conducted with dichotomously scored health behaviors as the outcome.

Results: After controlling for age, gender, and education, sleep was predicted by the total time ($p = .02$) and errors on the TMT-B ($p = .06$); diet ($p = .06$) and smoking ($p = .05$) were predicted by repetition errors on the COWAT; and exercise was predicted by the global score on Animal Naming ($p = .08$) and total time on the TMT-B ($p = .03$).

Conclusions: Both global and error scores on executive functioning measures are differentially related to health behaviors in older African Americans. The current findings support the ecological validity of executive functioning measures, and may point to new understandings in health disparities for African American older adults.

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P. CORNEY & M. CROSSLEY. Self-Rated and Objective Divided Attention Performance in Young and Older Adults.

Objective: Previous research has shown weak relationships between self-rated abilities and performance on tests assessing a range of cognitive abilities. The objectives of this study were:

(1) To compare self-ratings of divided attention ability in young and older adults.

(2) To investigate the relationships between self-ratings of divided attention, objective divided attention performance, and depressive symptoms in young and older adults.

Participants and Methods: Twenty-eight young adults (Mean age = 27.5 years, SD = 5.2) and 30 older adults (Mean Age = 76.3 years, SD = 6.9) completed two, newly developed objective divided attention tasks as well as questionnaires assessing self-rated divided attention abilities [Divided Attention Questionnaire (DAQ) difficulty ratings; Tun & Wingfield, 1995] and depressive symptoms [Center for Epidemiological Studies-Depression (CES-D); Radloff, 1977].

Results: Older adults' ratings of difficulty on the DAQ were significantly higher than those of younger adults ($p < .001$), indicating poorer self-ratings of divided attention ability. They also performed more poorly on the two objective divided attention tasks ($p < .05$). There was no significant difference in CES-D score. Correlational analyses demonstrated that total divided attention difficulty rating was not significantly related to objective performance in either young or older adults. In contrast, CES-D score was negatively correlated with self-rated divided attention among young adults ($p = .013$) but not among older adults.

Conclusions: Self-ratings of divided attention as measured by the DAQ were not related to performance on objective tests of divided attention in either young or older adults. Among young adults, depressive symptomatology was associated with lower self-ratings. Findings are consistent with previous research indicating that self-ratings are a poor predictor of objective cognitive performance, but are associated with depressive symptomatology, at least in young participants.

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R. CORREIA, M. SABUCEDO, D. FERREIRA, J. BARROSO & A. NIETO. Memory Impairment Pattern in Amnesic Mild Cognitive Impairment (aMCI).

Objective: Although mild memory impairment is a core criterion for the diagnostic of aMCI, there is no general consensus about the amnesic pat-

tern of this entity. Comprehensive memory assessments are needed to fully characterize memory impairment present in aMCI. In this work we compare aMCI and normal old adults' declarative and procedural learning abilities. Episodic declarative memory is assessed for both, verbal and visual, modalities.

Participants and Methods: Fourteen aMCI participants [$x(Sd)=69.00(5.14)$ y.o.] and 66 normal elders [$x(Sd)=70.06(5.09)$ y.o.] were compared in three learning tasks. aMCI were diagnosed following Petersen et al. 2001 (Texts and Draws subtests [WMS-III]) as objective measures of memory decline) and Normal subjects were selected by GP's referral (healthy, no memory complaints, no memory decline). The tasks used were a Spanish adaptation of the CVLT (TAVEC), a visuospatial task inspired in the 7/24 SRT (Rao et al. 1984) and the Tower of Hanoi.

Results: ANOVA results show significant differences between groups on every episodic task trial (TAVEC 1-5 trials: $p=.020$; $p=.000$; $p=.006$; $p=.006$; $p=.040$. Visuospatial task 1-5 trials: $p=.004$; $p=.002$; $p=.011$; $p=.018$; $p=.001$) including short (ST) and long-term (LT) recall ones (TAVEC ST $p=.003$; LT $p=.004$. Visuospatial task ST $p=.007$; $p=.005$). However, none of the differences between aMCI and normal participants' performance at the Tower of Hanoi reached significance.

Conclusions: Procedural learning seems well preserved in aMCI. By contrast, episodic memory is impaired for verbal and visual modalities. Considering memory as being not uniformly impaired in aMCI could be crucial when researching about its etiology and designing successful therapeutic approaches.

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A. DAUGHERTY & S.A. ROGERS. The Relationship between Educational Field and Cognitive Decline with Aging.

Objective: This study investigated the relationship between educational field and cognitive decline among older adults.

Participants and Methods: Thirty-one adults who were between 56 and 91 years of age and who had at least 12 years of formal education completed a neuropsychological battery. Decline from premorbid functioning was calculated for each domain by subtracting overall domain z-scores from the WAIS-III Information z-score. The International Standard Classification of Education (ISCED) was used to classify participants into five groups of educational field: humanities and arts (HA), education (ED), business and law (BL), non-engineering sciences (SCI), and health and welfare (HW).

Results: ANOVA results illustrated a significant difference between educational fields in executive function, verbal and nonverbal learning, and verbal and nonverbal memory. Post-hoc analyses indicated that the SCI group consistently demonstrated the greatest decline, followed by the HW group, with the ED group uniformly showing the least decline. There was no significant relationship between ISCED assignment and participant age, race, or sex.

Conclusions: These results suggest that the level of cognitive decline among older adults may depend on field of educational study. Those who studied in the field of education appear to exhibit the least decline from premorbid functioning in the domains of executive performance and verbal and nonverbal learning and memory. In contrast, greater decrements were observed in these domains among those with schooling in the non-engineering sciences and health and welfare fields. Some fields of educational study may therefore confer greater reserve and protection against cognitive decline, although alternative reasons for these differences will be explored.

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J.E. DEJONG, L.M. ERCOLI, P. SIDDARTH, P.M. THOMPSON, K.M. HAYASHI, K.J. MILLER & G.W. SMALL. **Changes in Cerebral Volumes and Memory in Individuals With and Without APOE-4: A Longitudinal Study.**

Objective: We studied longitudinal changes in brain volume and memory in persons with and without the apolipoprotein epsilon-4 (APOE-4) genetic risk for Alzheimer's disease (AD).

Participants and Methods: Non-demented participants (12 with APOE-4, 11 without APOE-4) underwent MRI and cognitive testing at baseline and 2-year follow-up. Cortical pattern matching evaluated change in brain shape and tissue distribution over time. An average model of the cortex for subject groups was compared on indices of gray matter (GM) and white matter (WM) and the ratio of GM:WM.

Results: The interaction of age and APOE-4 was significantly associated with a decrease in the GM:WM ratio; [$F(1,14) = 5.56, p = 0.03$]. In APOE-4 carriers, increasing age was associated with a significant decrease [slope = -0.01, $t(14) = -3.52, p = 0.003$] in the GM:WM ratio, corresponding to a 10% decrease in this ratio per decade. No significant group differences or interactions were found for change in GM or WM. Reduced left hemisphere GM volume at baseline predicted memory decline at 2 years [$F(5,8) = 4.65, p = 0.03$]. Other volumetric measures and APOE status were not associated with memory decline.

Conclusions: Persons with APOE-4 had greater 2-year decline in the GM:WM ratio, suggesting that APOE-4 may be associated with accelerated brain atrophy. The GM:WM decline differed from expected patterns at this life stage in healthy controls, and paralleled patterns of GM loss in AD. Regardless of APOE-4 status, reduced left hemisphere GM volumes at baseline were associated with future memory decline.

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S. DEVINE, R. AU, A. BEISER, Y. DU, H. DENISON, W. RINN, M. O'CONNOR, S. SESHADRI, P. WOLF & E. KAPLAN. **Clock To Command Drawing Errors In Aging: Norms From The Community-Based Framingham Heart Study Offspring.**

Objective: Provide normative data for Clock Drawing Test – Command condition (CDT-C) errors in a community based cohort.

Clinicians use notable errors on the CDT as indicators of brain pathology. To date, there has been no community-based normative study of CDT performance to examine the prevalence of these errors.

Participants and Methods: 427 women and 393 men in the dementia and stroke-free Framingham Offspring group were administered the CDT as part of a neuropsychological battery (mean age = 68.01 + 9.04). Expanding from the Freedman, Kaplan, et al. scoring protocol, we developed the Framingham Heart Study Clock Scoring protocol which includes 38 qualitative CDT features.

Results: While performance on most CDT-C features, as well as scores on the Overall, Outline, Numeral Placement, and Time-setting subscales, were heavily skewed to "normal," some individual items did not share this steeply skewed distribution. These errors included the length of the hour versus minute hands (28% incorrect) and center location on the horizontal axis (17% displaced to the left; 9% displaced to the right) and the vertical axis (42% displaced up; 4% displaced down). Classic signs of impairment were also observed in this "normal" sample: 9% did not draw a hand to the "2" to represent "ten after eleven," and 5% drew a hand to the "10" rather than the "2" when setting the time.

Conclusions: CDT-C errors were prevalent within a relatively young, community-based, cohort. Whether the observed CDT-C errors are common to aging, or are preclinical signs of dementia will require longitudinal study to clarify.

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M. DUX, J.L. WOODARD, J.E. CALAMARI, M. MESSINA, N. PONTARELLI, S. ARORA, H. CHIK & E. MITCHELL. **Physical Activity Moderates the Relationship between Age and Cognition in Healthy Older Adults.**

Objective: Physical activity appears not only to preserve, but may even enhance cognitive functioning in older adults. While 'cognitive reserve' (IQ, educational attainment and occupational status) seems to buffer the effects of age-related cognitive declines, such factors are not readily subject to change in late-life. However, physical activity holds considerable promise for maintaining or improving cognition. In this study, we examined whether physical activity in older adults moderated the relationship between age and cognitive functioning.

Participants and Methods: 170 healthy elderly participants (age, $M = 76.53$ years) were administered the Dementia Rating Scale- 2nd Edition (DRS-2) and the Rey Auditory Verbal Learning Test (AVLT) as well as self-report measures of physical activity and exercise. Continuous by continuous moderated regression analyses were performed and significant interactions were probed at $\pm 1 SD$ from the mean.

Results: In the first model, physical exercise interacted with age to predict general cognitive functioning (total score, DRS-2) [$F = 3.9, p = .05, R^2\Delta = .021$]. Simple slope analyses demonstrated that at a given age, high physical activity was associated with better performance on the DRS-2. In the second model, physical exercise interacted with age to predict recall across Trials 1-5 on the AVLT [$F = 4.6, p = .03, R^2\Delta = .026$]. Simple slope analyses showed that high physical activity was associated with increased scores on the AVLT.

Conclusions: These results suggest that physical activity exerts a positive influence on cognition in older adults. The potential role of physical activity as a cost-effective intervention for preserving cognitive abilities in older adults is discussed.

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V. ELDERKIN-THOMPSON, M. BALLMAIER, G. HELLEMANN & A. KUMAR. **Association Between Daily Functioning and Orbitofrontal Brain Morphology in Healthy and Depressed Community-Dwelling Elderly.**

Objective: Self-perceived emotional vitality, intact mood and social engagement are acknowledged as important indicators for lowered rates of morbidity and increased longevity in late-life but little is known about their underlying neural substrates. This study examined relationships between self-reported levels of general functioning and the combined volume of three integrated prefrontal structures associated with self-reflection and emotion.

Participants and Methods: Eighty-four elderly (43 depressed, 41 comparison subjects) underwent magnetic resonance imaging and completed the RAND Short-Form 36 Questionnaire, a self-report evaluation of daily functioning. Subscales used for analysis were Physical Function, Vitality, and General Health, which were not correlated with depression. MRI images were automatically segmented for gray and white matter volumes of orbitofrontal, anterior cingulate and gyrus rectus and then combined to form white matter and gray matter scales. Volumes were corrected for intracranial volume to control for different head sizes among men and women.

Results: White matter volumes were associated with self-perceptions of Vitality ($p = .01$) for healthy as well as depressed individuals, and gray matter volume was associated with General Health ($p = .04$). This latter association was strongest among patients with late-onset of depression, i.e., onset > age 60, although it appeared in all diagnostic groups. Men, when compared to women, showed an association between Physical Function and gray matter volumes ($p = .05$) as well as a marginally stronger association between gray matter and Vitality ($p = .06$).

Conclusions: Although mild to moderate atrophy is expected after senescence, the degree of atrophy appears to represent changes occurring in neuroanatomical substrates that are perceptible to both depressed and nondepressed persons. The changes have selective but negative implications for self-perceptions of enthusiasm, physical activity and general health.

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L.M. ERCOLI, P. SIDDARTH, V. KEPE, K.J. MILLER, S. HUANG, G.M. COLE, H. LAVRETSKY, S.Y. BOOKHEIMER, J. KIM, M.E. PHELPS, J.R. BARRIO & G.W. SMALL. Differential FDDNP PET Patterns in Non-demented Middle-aged and Older Adults.

Objective: We explored whether positron emission tomography (PET) with 2-(1-[6-[(2-[F-18]fluoroethyl)(methyl) amino]-2-naphthyl] ethylidene)malononitrile (FDDNP), a molecule that binds to plaques and tangles in vitro, might identify homogeneous subgroups of persons according to FDDNP signal in middle-aged and older persons with mild cognitive impairment (MCI) or normal cognition.

Participants and Methods: Sixty-one older adults (MCI, N = 34; normal cognition, N = 27) received FDDNP-PET scans and cognitive testing. Logan parametric images were produced using cerebellum as a reference region, and relative distribution volumes were obtained for regions of interest (ROIs) known to accumulate plaques and tangles in Alzheimer's disease (AD). Cluster analysis was performed to identify subgroups of subjects according to FDDNP signal distribution.

Results: The analysis identified three FDDNP signal clusters: high signal in all (temporal, parietal, frontal and posterior cingulate) ROIs (high global cluster, HG); low signal in all ROIs (low global cluster, LG); high frontal and parietal signal with intermediate temporal and posterior cingulate signal (HF/PA). Most MCI subjects belonged to the HG and HF/PA clusters, while most cognitively normal subjects fit in the LG cluster. On cognitive tests, the HG and HF/PA clusters performed significantly worse than LG; but did not significantly differ from each other.

Conclusions: These initial analyses suggest that the HG cluster may represent high AD risk, while the HF/PA cluster may represent a combination of etiologies, variants, or severities related to underlying amyloid or tau. Longitudinal follow-up is needed to determine the association of these subgroups with outcome.

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K. FINLEY, J.C. BOROD, S. MICHAEL, S. ASSURAS, S.J. HALL, L.H. PICK & M. SLIWINSKI. Facial, Prosodic, and Lexical Perception of Emotion across the Adult Life Span.

Objective: Whereas much research has examined cognitive and motoric functions across the life span, relatively less attention has focused on the study of emotion. Research to date has revealed a general decline in the processing of emotional stimuli with age, with most studies including a single modality. In the current study, we examined the effects of age on the perception of positive and negative stimuli across multiple channels (i.e., facial, prosodic/intonational, and lexical/verbal) in the same participants. Another special feature of this study was careful screening for cognitive and psychiatric functioning, and systematic control for non-emotional perceptual factors.

Participants and Methods: Participants were 103 healthy right-handed adults, grouped into six decades: 20-29, 30-39, 40-49, 50-59, 60-69, and 70-81. Age groups were matched for gender, ethnicity, years of education, occupational level, and general intellectual functioning. Participants were administered the emotional identification and discrimination tasks from the New York Emotion Battery (Borod, Welkowitz, & Obler, 1992), as well as a range of screening and control measures.

Results: There were significant age effects for both identification and discrimination tasks across channels and valences, with the most pronounced effects for the oldest age group. Sex differences did not emerge, except for prosodic identification, where women scored higher than men.

Conclusions: Overall, the oldest participants perceived emotional stimuli with less accuracy than did younger participants. These results emerged in individuals with equivalent levels of cognitive and perceptual functioning. Findings are discussed in terms of the dull hypothesis, right-hemisphere aging hypothesis, hemispheric asymmetry reduction model, and socioemotional selectivity theory.

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D.D. GARRETT, C.L. GRADY & L. HASHER. Covariates of Everyday Memory Compensation in Older Adults.

Objective: The potential for successful everyday memory compensation is highly relevant for older adults, many of whom experience declines in memory performance with age. Little is known regarding the covariates of everyday memory compensation, thus hindering knowledge of key factors that may precede or succeed such compensatory efforts. However, it is plausible that factors that impact memory performance may also influence the need for, and form of, everyday memory compensation.

Participants and Methods: Employing a sample of 60 older adults (mean age = 70.68 years), we examined the relation between the Memory Compensation Questionnaire (MCQ), a self-report questionnaire of various dimensions of everyday memory compensation, and four distinct clusters of predictors (demographics, subjective report measures, objective memory, and executive functioning) using general linear modeling and resampling statistics. Predictors included several measures and concepts not previously linked to compensation, but that are important predictors of successful memory performance with age (e.g., education, reading ability, biological age, life stress, self-reported memory concerns, executive functioning, fluid intelligence).

Results: Notably, we demonstrated that lower levels of education, better reading performance, and heightened life stress predicted higher MCQ scores (thus reflecting greater compensatory efforts); bootstrapped confidence intervals around model betas and standard errors provided further support for estimate reliability.

Conclusions: These important covariates should be considered in future research on the phenomenon of everyday memory compensation. Correspondence: *Douglas D. Garrett, M.A., Psychology, University of Toronto, Rotman Research Institute, Baycrest, 107-481 Rosewell Ave., Toronto, ON M4R 2J1, Canada. E-mail: d.garrett@utoronto.ca*

K.A. HAWS, J.H. KRAMER & C.E. PARSHALLE. Decline in Cognitive Processing Speed in Subjects with MCI.

Objective: Studies indicate that the most prominent feature of mild cognitive impairment (MCI) is a disproportionate memory deficit. There are few reports of deficits in cognitive processing speed. The objective of the current study was to compare processing speed rates between age-matched older normal controls and subjects with MCI.

Participants and Methods: We studied 35 MCI subjects (mean age=72.3; sd=6.9) and 19 normal controls (mean age=69.0; sd=8.4 was) with a computer based test of cognitive processing speed. The task measured response speed on seven cognitive tasks. Data were analyzed using Brinley plots that carefully controlled for potential differences in perceptual and motor speed.

Results: Comparison of the MCI subject to the older normal controls yielded a significant difference in slope ($p < .05$), with the MCI subjects showing disproportionate slowing relative to controls as the tasks became more complex.

Conclusions: MCI subjects showed a significant decline in cognitive processing speed when compared to older normal controls. Results indicate that MCI not only includes deficits in memory, but also deficits in processing speed that potentially have far-reaching consequences for multiple domains of cognitive functioning.

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R. HOLTZER & Y. GOLDIN. Validation of the Attention Network Test in older adults: results from the Einstein Aging Study.

Objective: The Attention Network Test (ANT) measures three attention networks (alerting, orienting and executive attention). The reliability and validity of attention networks have been established in children and adults (Posner & Rottbart, 2007) but not in aging. Herein, we aimed to determine the reliability and validity of the three networks in elders age 70 and older.

Participants and Methods: Participants were 32 non-demented individuals (mean age = 81 yrs; 68% female) enrolled in the Einstein Aging Study. In addition to the original ANT, a modified version that varied only in the height and luminance of the target stimuli was administered to address concerns that poor vision in aging may affect ANT performance. The original and modified versions were administered in alternating order with a 15-minute walking exercise between tasks.

Results: Attention networks calculation and validation were examined using previously established methods for the ANT (Fan et al., 2002). Accuracy was above 95% for the original and modified versions. Computation of the networks yielded significant effects for alerting, orienting and executive attention in both ANT versions. The non-significant correlations between the networks in the original and modified versions suggested that attention networks were independent. Network validity was examined by correlations with relevant neuropsychological tests. Stroop Interference was significantly correlated with executive attention on the original ($r = -.532$) and modified ($r = -.638$) ANT. However, visual-motor organization tests were correlated with orienting [Block Design ($r = -.445$), Complex figure copy ($r = -.484$)] only on modified ANT.

Conclusions: Attention networks estimating the effects of alerting, orienting and executive attention were identified in aging.

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R. HOLTZER & C.I. HIRSHSON. Longitudinal associations between cognitive functions and gait in aging are mediated by sex.

Objective: Cognitive functions (verbal IQ, Executive Attention and Memory) were related to gait velocity in non-demented older adults at cross-section (Holtzer, 2006). The aims of this study were two-fold: A) replicate our previous findings longitudinally B) Assess whether sex mediated the relationship between cognitive functions and gait.

Participants and Methods: Non-demented elders ($N = 357$, mean age = 78.9, female = 55%) enrolled in the Einstein Aging Study were administered neuropsychological tests as part of their yearly clinic visit. Gait velocity was assessed in single and dual-task (i.e., walking while talking) conditions one year after the neuropsychological testing. Empirically derived cognitive domains (Verbal IQ, Executive Attention, and Memory) served as predictors in two separate linear regressions with gait velocity in single and dual-task conditions serving as the outcome variable. The same regressions were re-executed stratified by sex. Analyses controlled for age, education, health status, and clinical gait abnormality.

Results: The longitudinal linear regression replicated our previous cross-sectional findings. The three cognitive domains predicted gait velocity in the single task condition but only Executive attention and Memory

predicted gait velocity in the dual-task condition. The analyses stratified by sex revealed that Executive Attention predicted gait velocity in single and dual-task conditions in both men and women. Whereas Memory but not Verbal IQ predicted gait velocity in both task conditions in women the opposite was true for men.

Conclusions: These findings suggest that women and men appear to rely on both shared and distinct neural substrate to facilitate walking. Correspondence: *Chari I. Hirshson, MA, Psychology, Yeshiva University, Albert Einstein School of Medicine, 1300 Morris Park Avenue, Bronx, NY 10461. E-mail: charicochen@gmail.com*

A.D. JACOBSON, E. GREEN, L. HAASE, B. CERF-DUCASTEL & C. MURPHY. Physiological States of Hunger and Satiety Affect Blood Oxygenation Level Dependent (BOLD) Response to Taste Stimuli in Older Adults.

Objective: Changes in appetite in older adults may result in weight loss and deficits in overall nutrition. The underlying neurological mechanisms involved in the initiation and cessation of food consumption in the elderly are largely unknown. Previous research has linked changes in patterns of the BOLD response in gustatory and motivation related brain regions to the physiological states of hunger and satiety in young adults.

Participants and Methods: The current study uses fMRI to examine brain activation of thirteen older adults ($M = 72.4$) in response to taste stimuli, in the states of hunger and satiety. In an event-related fMRI paradigm, participants were given .3ml of seven taste stimuli, 16 repetitions for each stimulus. Two sessions were completed, one fasted, and one after a nutritional preload. Image analysis was conducted with AFNI and 3Ddeconvolution contrasts were created examining the BOLD response to sucrose.

Results: Globally, group analysis showed greater activation in the hunger condition with a hunger minus satiety contrast. In the hunger contrast alone, increased activation was seen to sucrose in the insula, amygdala, hippocampus, right orbitofrontal cortex (BA 47) and thalamus in comparison to baseline activation to water. In the satiety contrast, decreased activation to sucrose in comparison to baseline was seen in these areas except the amygdala. The amygdala showed no significant activation in the satiated condition when compared to water.

Conclusions: Understanding the neurological response to taste stimuli under conditions of hunger and satiety may aid in understanding appetite and overall health in older adults.

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K. KOWALSKI, H. TUOKKO, E. STRAUSS & D. HULTSCH. Driving Restriction and Cessation in Older Adults with Mild Cognitive Impairment.

Objective: Older adults with cognitive impairment may be at increased risk of unsafe driving. Individuals with insight into their impairments may minimize their risk by restricting their driving or by stopping altogether. One question that is receiving increasing attention is whether older adults with mild cognitive impairment (MCI) restrict or stop driving. The study purpose was to examine the influence of MCI on driving status, driving restriction, and thoughts about driving restriction and cessation in the future.

Participants and Methods: Participants completed a cognitive battery and a driving questionnaire at the sixth year of a longitudinal study. Based on their performance on 5 cognitive tests, the participants were divided into three groups (intact, MCI-single, MCI-multiple) and compared on their driving habits and intentions.

Results: The cognitive groups differed significantly in driving status, but not in whether they reduced their driving frequency over the last year or preferred not to drive in/ restricted their driving to certain sit-

uations. Majority of current drivers were cognitively intact; while almost half of former drivers had MCI-multiple. Moreover, regardless of cognitive status, none of the non-restricting drivers were seriously thinking of restricting or quitting driving in the next 6 months. However, most reported conditions under which they might consider doing so in the future.

Conclusions: These results suggest that severity of cognitive impairment is related to changes in driving status in some people with MCI. It will be important to determine, in future research, how driving practices change over time and what factors influence decisions to stop or restrict driving for people with MCI.

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A.E. KRAYBILL, S.A. ROGERS & D.A. LOWE. Subtypes of Depression and Cognitive Functioning Among Older Adults.

Objective: This study examines the relationship between cognitive performance and the emotional, physical, and cognitive symptoms of depression, as well as differences in these subtypes between those with age-associated memory impairment (AAMI), mild cognitive impairment (MCI), and dementia.

Participants and Methods: 37 older adults (ages 57-94) completed a comprehensive neuropsychological battery. The Geriatric Depression Scale was coded into cognitive, physical, and emotional subscales by three raters (ICC = 0). Cronbach's alpha for the new subtests ranged from 0.61 - 0.73, and domain scores were created by averaging z-scores from all tests in each domain.

Results: The emotional, physical and cognitive subscales of depression were negatively correlated with attention, processing speed, executive performance, and visuospatial functioning, all $r_s(30) < -.38$, $p_s < .05$. Only the physical subscale was negatively correlated with verbal and visual memory, all $r_s(29) < -.38$, $p_s < .05$. Normal controls endorsed significantly fewer cognitive features of depression than those with AAMI, MCI, or dementia, and fewer physical features than those with MCI or dementia, all $F_s(3,26) > 3.45$, $p_s < .05$.

Conclusions: The relationship between depression and cognitive functioning may depend on the particular features of depression in question. Each type of depression is related to reduced attention, processing speed, executive skills, and visuospatial functioning, but the physical features of depression seem particularly related to memory difficulties. Moreover, it may not be emotional symptoms that distinguish between normals, AAMI, MCI, or dementia, but rather physical and cognitive symptoms that differentiate normal controls from those with abnormal cognitive changes (AAMI, MCI, and dementia). This encourages a more heterogeneous approach to depression and cognition.

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J.L. KUBIK, W.L. THORNTON & R.J. SHAPIRO. Everyday problem solving abilities in adults with comorbid chronic illnesses.

Objective: Reductions in everyday problem solving (EPS) are often reported with increasing age, although the underlying mechanisms remain unclear. One potential predictor of EPS is health status. Previous studies have reported that both specific illnesses (hypertension, chronic kidney disease, Thornton et al., 2006, Thornton et al., in press) and total number of chronic illnesses may predict everyday cognition in older adults (Whitfield et al., 2004). Our goal was to extend previous findings within a larger age range, while also controlling for verbal memory. It was expected that the presence of a higher number of chronic illnesses would predict lower scores on tests of everyday solving (EPS).

Participants and Methods: The sample consisted of 140 community-dwelling adults with a mean age of 64.06 years. Included in a hierarchical regression analysis were: EPS, total number of chronic illness diagnoses (osteoporosis, arthritis, high cholesterol, hypertension, diabetes, and chronic kidney disease), age, verbal memory (CVLT-2), depressive symptoms (CES-D) and education.

Results: As expected, increasing age, lower education, and poorer verbal memory were each significant independent predictors of poorer performance on the EPS measures, together accounting for 32.5% of the variance in EPS performance. Furthermore, a higher number of chronic illnesses significantly predicted lower EPS scores above and beyond demographic and other cognitive factors. Number of depressive symptoms was not a significant predictor of EPS performance.

Conclusions: Findings indicate that the presence of multiple chronic illnesses is a significant independent predictor of EPS performance in community dwelling adults. Tests of EPS have been shown to predict daily functioning above and beyond traditional cognitive measures; therefore, the current findings demonstrate the importance of physical health in the maintenance of everyday problem solving.

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D.A. LOWE, S.A. ROGERS & A.E. KRAYBILL. Depression and Interference in Verbal and Visual Memory of Older Adults.

Objective: Research has revealed age-related declines in verbal memory, as well as specific verbal memory deficits, associated with depression. However, few studies examine visual memory in depressed older adults or the nature of the relationship between depression and interference. This study examines depression as an interfering factor in the verbal and visual memory of older adults.

Participants and Methods: 37 older adults (ages 56-94) voluntarily completed a comprehensive neuropsychological battery. Interference in verbal memory was assessed using CVLT-II measures of primacy/recency recall, repetitions, intrusions, false positives, and list B interference. Intrusions and repetitions were coded on WMS-III Visual Reproduction (VR) 1 and 2 to assess interference in visual memory.

Results: Depression was negatively correlated with CVLT-II short-delay free recall, total words recalled from the trial 1 primacy region, and the middle region across all trials 1-5, $r_s(33) < -.35$, $p_s < .05$. Depression was positively correlated with intrusions on both VR 1 and 2, $r_s(33) > .37$, $p_s < .05$, as well as VR 2 repetitions, $r(33) = .39$, $p < .05$.

Conclusions: Depression seems to be associated with measures of interference among older adults. For verbal memory, depression may be linked to an increased susceptibility to proactive and retroactive interference, as well as a stronger primacy and recency effect. On measures of visual memory, depression may be linked to an increased tendency to commit errors of intrusion and repetition. Those with depression may therefore be predisposed to greater difficulties with verbal and visual interference, which may account for some of the effects of depression on memory among those over 50.

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J.S. MCGEE, E.A. KVALE, O.J. CLAY, L.A. ROSS, J.D. EDWARDS, F.W. UNVERZACT, C.S. RITCHIE & K.K. BALL. Processing Speed and Functional Decline in Older Cancer Survivors.

Objective: To investigate the effects of chemotherapy treatment on cognitive and functional outcomes in older adults.

Participants and Methods: Data was drawn from the no-contact control group of the Advanced Cognitive Training for Independent and Vital Elderly (ACTIVE), a multi-site, randomized, clinical study assessing impact of cognitive training on daily functioning (n=704).

Thirty-seven individuals who had received treatment for cancer were included in analysis and compared to 37 age, education, and gender-matched peers who had never received treatment. Participants completed baseline and annual follow-up assessments that included measures of processing speed (the Useful Field of View (UFOV®) and WAIS Digit Symbol Substitution subtest) and performance based functional ability (Timed Instrumental Activities of Daily Living (TIADL) and the Road Sign Test (RST)).

Results: Multivariate regression analysis revealed a trend toward worse performance for the chemotherapy group on the Everyday Speed Composite score ($F(1,68)=3.31, p=.07$), comprised of RST and TIADL scores. Analysis of the Cognitive Processing Speed Composite, comprised of subsets 2, 3, and 4 of the UFOV®, was not significant ($p=.49$). Analyses of reliable change in performance demonstrated that UFOV® performance declined for 5/35 (14%) of chemotherapy treated individuals compared to 3/34 (9%) non-treated individuals. Similar trends were shown for RST (24% vs. 17%), Digit Symbol (16% vs. 6%) and TIADL (24% vs. 17%). A larger percentage of chemotherapy treated individuals showed reliable declines in functional and processing speed domains as compared to untreated peers, although the odds ratio did not achieve statistical significance.

Conclusions: Findings from the current study suggest that chemotherapy treatment has a reliably negative impact on measures of cognitive processing speed in older adults and raises important questions about the relationship between chemotherapy associated cognitive decline and functional disability in older cancer survivors.

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P. MCLAUGHLIN & S. MURTHA. Improving Attention in Healthy Elderly and Individuals with Mild Cognitive Impairment through Exogenous Support.

Objective: To investigate whether attentional declines associated with normal aging and mild cognitive impairment (MCI) could be ameliorated with exogenous support.

Participants and Methods: A cued visual search paradigm was used to measure reaction time (RT) performance on a single and conjoined feature search task that manipulated array size (6, 12), target presence and cue (spread, clumped). Forty-three participants (ages 18-85) formed four groups: young adults, healthy elderly, amnesic MCI (aMCI) and amnesic MCI multiple domain (aMCI_{md}). On half of the trials a spatial cue was provided by clumping the test stimuli into one of twelve locations. The cue helped spatially focus attention, and minimized the scaling and overt shifting typically required during visual searches.

Results: A repeated measures ANOVA was completed on the median RT data. The spatial clumping cue significantly facilitated RT performance; however, improvements were dependent on task, array size, target presence and group. In general, the cue failed to help the young adults, and only benefited the healthy elderly on the most difficult condition. The MCI groups used the spatial cue more extensively; particularly the aMCI_{md} patients who showed a significant improvement on clumped trials across target and array conditions for the conjoined feature search task. The analysis also showed a significant age-related change in attention, with aMCI_{md} patients experiencing further declines in functioning relative to young adults, healthy elderly and aMCI patients.

Conclusions: The results indicate that age-related declines in attention, which are exacerbated in some MCI conditions, can improve when exogenous support is provided.

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L.A. MORROW, S. JUDITH, B. SNITZ, E. RODRIGUEZ, K. HUBER & L. CIMINO. Medical Co-Morbidity, Medication Use, Depression and Mild Cognitive Impairment in Primary Care Practice Settings.

Objective: This study examined cognitive function in non-demented elderly patients recruited from 10 primary care physician practices. This association between medical co-morbidity (number of medical problems listed in the chart), medication use (number of current medications), depression and cognitive domains of memory, executive function, spatial ability and language were assessed.

Participants and Methods: Participants were 207 persons age 65+ classified as Cognitively Normal (CN, $n=116$) or mild cognitive impairment (MCI; 1 to 2 SD below age-adjusted means, $n=80$) by consensus of three clinical neuropsychologists who reviewed cognitive test scores, subjective memory complaints, medical chart information and ADLs. Age and education were similar for the two groups (73&74 vs. 14&14, respectively).

Results: The CN group had significantly less medical co-morbidity and less depression than the MCI group. However, both groups took an average of eight medications/day. After controlling for age and education, medical co-morbidity, medication use and depression were entered in a hierarchical regression model to predict scores in each of the four cognitive domains. Regressions were run separately for each group. For the CN group, medical co-morbidity predicted scores in the memory domain ($p=.04$), while medication use predicted language scores ($p=.02$). In the MCI group, medication use predicted memory scores ($p=.01$), while both medical co-morbidity and medication use contributed to executive function scores ($p=.008$ and $.03$, respectively). Depression was not related to any of the cognitive domains in either group.

Conclusions: These findings suggest differential effects of medical co-morbidity and medication use on cognitive function in persons with normal cognition vs. those meeting criteria for MCI.

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G. NAVARRETE, R. CORREIA, J. BARROSO & A. NIETO. Use of Neural Networks and Feature Selection in MCI diagnosis.

Objective: Machine learning methods can be enormously useful for cognitive modeling, economic assessment, medical diagnosis and neuropsychological research amongst others. We have previously shown as a proof of concept how a Neural Network (NN) can navigate through a massive database selecting a set of variables for Mild Cognitive Impairment (MCI) diagnosis. In this work we use a significantly increased database to reach theoretical meaningful results for the diagnosis of MCI.

Participants and Methods: We use a Feed-forward Neural Network (FNN) using a database of 210 neuropsychological variables with 98 subjects. Through an automatic forward FS procedure, we select a small subset of variables that can predict MCI with high accuracy. The database is composed of 65 normal (n) and 32 MCI subjects (Petersen 2001)

Results: Our results are the average of 5 10-fold cross-validation. With a subset of 10 variables we can discriminate among groups with a mean accuracy of $91.11\% \pm 3.63\%$ (n : 92.22%, MCI: 90.37%). Selected variables are a short text long-term retrieval, confrontation naming, verb generation and complex grammar language comprehension, pre-motor functioning, complex reaction time and handedness.

Conclusions: This is a further step to assert the usefulness of machine learning methods and particularly nonlinear FS techniques for the neuropsychology field and specifically for the study of MCI. It allows us to claim this particular set of variables as relevant MCI predictors filtering out noisy and redundant data. Future work aims using this technique to differentiate MCI subtypes taking into account nonlinear interactions. Correspondence: *Gorka Navarrete, Psychology, Cognitive Psychology, Universidad de La Laguna, Campus de Guajara s/n, La Laguna 38205, Spain. E-mail: gnavarga@ull.es*

K.E. NUTTER-UPHAM, L.A. RABIN, A.J. NUTTER-UPHAM & A.J. SAYKIN. Novel Computer Tasks Developed for Use with Older Adults with Cognitive Complaints.

Objective: Research on the relation between memory perception and performance has utilized episodic instruments that assess recollection of previous events. Tasks that rely on metacognitive processes or prospective memory (i.e., memory for future events), however, may better elucidate the relationship between complaints and performance. We piloted two novel computerized tasks designed for future use in fMRI studies.

Participants and Methods: Participants were older adults with significant cognitive complaints (CC, $n = 15$) despite normal test performance and healthy controls (HC, $n = 15$) with no significant complaints or performance deficits. In the working memory task with a prospective memory (PM) load, participants responded 'match' or 'no-match' to each letter under 0, 1, and 2-back constraints. In the PM condition, participants pressed a new key if they saw a letter that was of a specified color (while engaged in the other task). The metacognitive task was framed within a visual "Judgment of Confidence" (JOC) paradigm and consisted of 75 general information questions with three degrees of difficulty. Participants answered each multiple choice question and immediately indicated how confident they were in their responses.

Results: PM components decreased accuracy in the more difficult N-back conditions for CCs but not for HCs ($p < .05$). The JOC task revealed equivalent overall accuracy and reaction times. However, a significant correlation was found for HCs but not CCs between confidence ratings and correct responses ($r = .73$, $p < .001$) in the medium difficulty level. Additionally, CCs were less confident in responses to medium difficulty questions ($p < .05$).

Conclusions: While performing normally on episodic tests, CCs may have deficiencies in aspects of metamemory and attentional processes that underlie PM. Findings have implications for the way cognitive complaints are conceptualized and assessed in older adults and may be useful in research addressing the neural basis of these complaints.

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N.A. PACHANA & G.J. BYRNE. Development and Use of the Geriatric Anxiety Inventory (GAI).

Objective: A brief measure of dimensional anxiety specifically designed for use in older adults has been lacking for many years. Yet anxiety symptoms and disorders are highly prevalent among older adults, including those with traumatic brain injury and mild cognitive impairment.

Participants and Methods: After piloting for phrasing and acceptability, the scale was tested with a community-dwelling sample of older adults ($N=452$) and a psychiatric outpatient sample ($N=46$).

Results: The final 20 item inventory showed good reliability in both normal community and psychiatric samples (Cronbach's alpha 0.91 and 0.93, respectively). Concurrent validity with other measures was high; inter-rater and test-retest reliability were excellent. The ability of the GAI to discriminate between patients with and without any anxiety disorder [$F(1,44) = 16.87$, $p = 0.0002$] was also excellent. Receiver operating characteristic (ROC) analysis indicated an optimum cut point of 8/9 to identify older patients with any anxiety disorder, correctly classifying 78% of patients (sensitivity 73%, specificity 80%).

Conclusions: The inventory proved easy to administer and interpret and was acceptable to older clinical populations, even those displaying mild cognitive deficits. The GAI is currently in use in five countries, with evidence of good pre-post utility in published validation and treatment studies on clinical and neurological populations.

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N. PARE, L.A. RABIN, R.M. ROTH, H.A. WISHART, R.S. SANTULLI & A.J. SAYKIN. Objective and Subjective Reports of Working Memory Difficulties in amnesic MCI.

Objective: Research on cognitive functioning in amnesic mild cognitive impairment (MCI) has focused on episodic memory, despite the fact that many patients report difficulties with executive functioning, particularly in the area of working memory (Rabin et al., 2007). Such difficulties have been linked to problems performing activities of daily living (ADL) and could signal a more imminent conversion to Alzheimer's disease. Unfortunately, standardized tests of working memory do not correlate reliably with self report of deficits in patients with MCI.

Participants and Methods: We developed a computerized test of divided attention (CTDA), a double task paradigm that taxes both visual and auditory sensory modalities. We also compared performance on standardized tests of working memory (WAIS-III Digit Span backward, D-KEFS Trails, Switching) with self reports of executive functioning (BRIEF-A) and ADL scale (NBF-ADL). Participants included older adults with MCI ($n = 28$) and demographically-matched healthy controls (HC, $n = 28$).

Results: MCI participants reported significantly more difficulty than HCs on the BRIEF-A Working Memory Scale and also endorsed significantly greater impairment on ADL items related to working memory. While MCI performed within normal limits on neuropsychological tests of working memory (< 1 SD below the mean of HCs), initial data suggest performance deficits on the CTDA. Additionally, whereas test scores did not correlate with working memory complaints on the BRIEF-A, performance on the CTDA (in a subset of participants) indicated correlations with the BRIEF-A Working Memory Scale and ADL scale items.

Conclusions: Initial data support the concurrent validity of the CTDA. Considering the controversy surrounding the existence of these deficits in MCI, our results encourage the use of dual task paradigms in conjunction with self report inventories to assess subtle deficits in a comprehensive and sensitive fashion.

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M. PREISS, D. STEINOVA, H. STEPANKOVA & J. LUKAVSKY. Memory Training in Healthy Adults – Subjective and Objective Changes.

Objective: Ageing and effect of ageing on independency, self-sufficiency and active involvement in family and social life are one of the important problems of developed societies. From psychological view, cognitive functions and their adequate functioning belong to the most significant questions. We expect that memory training effects performance in objective memory tests and will impact on statistical and clinically significant change when measured before and after the training. We then expect that tested persons subjectively and their close people objectively observe the positive changes in cognitive performance.

Participants and Methods: Participants ($N=130$) of a 10-week, 20 lessons, memory training course, were tested before (within 7 days before the course started), after (within 7 days after the training) and 6 months later. We examined the transfer effect of first order (memory tests), transfer effect of second order (other performance tests, like attention tests etc.), transfer effect of third order (daily life activities) and transfer effect of fourth order (proxy measures).

Results: The results are discussed with respect to changes in quality of life and possibility of sustaining of the training effect. Statistical and clinical significance of changes is examined, as well as mild cognitive deficit prevention possibilities.

Conclusions: Memory functions training may be a meaningful part of free-time activities in ageing population.

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L.A. RABIN, K.E. NUTTER-UPHAM, N. PARE, H.A. WISHART & A.J. SAYKIN. Self-Rated and Actual Prospective Memory Ability in Older Adults with Cognitive Complaints.

Objective: The inclusion of prospective memory tasks in evaluations of older adults is an alternative to exclusive reliance on retrospective instruments, which fail to correlate reliably with self report of memory ability. Prospective memory tests (i.e., memory for future intentions) may add valuable information and provide a sensitive criterion for assessing the relation between subjective and objective memory by virtue of their dependence on metacognitive activities and internal control mechanisms.

Participants and Methods: Participants ($n = 30$) were older adults with significant cognitive complaints (CC) despite normal test performance and healthy controls (HC) with no significant complaints or performance deficits. Participants underwent neuropsychological evaluation that included the Prospective and Retrospective Memory Questionnaire, Metamemory in Adulthood Questionnaire, and Cambridge Prospective Memory Test (CAMPROMPT).

Results: Consistent with prior research, both groups reported more prospective than retrospective memory complaints. Memory lapses for situations requiring self-cuing (e.g., remembering to carry out an action in a few minutes' time) were rated as significantly more frequent by CCs, with no group differences for situations involving environmental cues. Time-based prospective memory on the CAMPROMPT was correlated with knowledge and use of memory strategies in HCs only. CCs reported lower memory self-efficacy overall.

Conclusions: CCs appear to differ from HCs in terms of their perceived or actual ability to self-generate cues or initiate activity that relies more on internal than external retrieval processes for successful remembering. CCs also may rely less on strategies when performing prospective tasks or lack compensatory behaviors. Future work will utilize prospective and metacognitive tasks to clarify the degree to which memory complaints reflect factors other than actual declining abilities with the goal of applying practically-oriented cognitive interventions.

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E.C. RECKNOR, A.W. KASZNIAK, E.L. GLISKY & S.Z. RAPCSAK. False Facial Recognition: The Relationship Between False Alarms and Frontal Lobe Functioning in Older Adults.

Objective: Previous research has shown that older adults are more susceptible to false facial recognition than younger adults, possibly related to changes in the frontal cortices. We hypothesized that false recognition would be related to poorer performance on memory monitoring and decision-making tasks, and measures of "frontal" functioning.

Participants and Methods: Forty-one healthy older adults were classified as high or low frontal based on a composite of standard neuropsychological measures. Participants completed three tasks: 1) a face recognition memory task, 2) a Feeling of Knowing (FOK) task, and 3) a decision-making task, the Iowa Gambling Task (IGT).

Results: High and low frontal groups did not differ on any of the experimental tasks. There was a significant correlation between false alarm rates and response bias on the recognition memory test with a measure of bias on the FOK task ($p < .01$). High false-alarms had a more liberal response bias and tended to be overconfident in their memory predictions relative to low false-alarms. Participants who were more accurate in their predictions on the FOK task also performed more advantageously on the IGT ($p < .05$).

Conclusions: False positive errors in facial recognition may result when individuals rely on a general sense of familiarity rather than a specific memory trace when making recognition decisions or when predicting one's own memory. The lack of relationship to standard neuropsychological tests of frontal function may be due to their sensitivity to dorsolateral prefrontal functioning, while the FOK task and the IGT are related to ventromedial prefrontal functioning.

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C. RODRIGUEZ-ARANDA & M.K. JAKOBSEN. The importance of psychomotor slowing in performance of four verbal tasks among young and healthy elderly adults.

Objective: The present study aimed to evaluate to which extent the effect of psychomotor slowing due to aging contributes to age-related differences in performance of four verbal tasks.

Participants and Methods: To this purpose, phonemic and semantic verbal fluency tasks, as well as naming and reading tasks were selected to compare a group of young and elderly subjects. The sample consisted in 30 young adults under 40 years and 30 healthy elderly over 65 years. Proper cognitive screening for dementia was carried out by using MMSE prior to neuropsychological testing. In addition, the lexical level of the participants was determined by the Vocabulary subtest of the WAIS-R. All the verbal tasks were adapted to be presented on a computer screen allowing for a precise stimulus presentation. The subjects' speech was recorded during the execution of the verbal tasks. Subsequently, sound spectrography was used to evaluate motor parameters of word production on each verbal task. Reaction time (time to generate the first word after stimulus presentation) and in-between word latencies were analyzed. Moreover, it was possible to compare the way in which production of a same word was performed. Total duration of word articulation could be measured.

Results: Results confirm that age-related psychomotor decline measured in terms of word production speed is an important factor determining performance in verbal tasks.

Conclusions: Psychomotor slowing should be taken into account especially for the assessment of the elderly in clinical settings.

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Y. ROGALSKI, M. DIEUVIL, B.M. KLUGER & K.M. HEILMAN. Aging and Affect: Emotional Word and Picture Ratings in Older versus Younger Adults.

Objective: Socioemotional selectivity theory postulates that as adults age they maintain positive and reduce negative emotional responses, resulting in greater emotion regulation. This study examines whether older adults have different affective ratings for emotional words and pictures than do younger adults. Based on the above theory we predicted that both groups would have similar ratings for pleasant stimuli but older adults would differ from younger adults in their ratings of unpleasant stimuli.

Participants and Methods: Valence and arousal of pleasant, unpleasant, and neutral words and pictures were rated by 20 healthy older adults aged 57 to 90 years. Ratings were obtained using the 9-point Self-Assessment Manikin (SAM) scales in conjunction with word and picture stimuli selected from the Affective Norms for English Words (ANEW) and the International Affective Picture System (IAPS). Ratings from these older adults were compared with Lang and colleagues' data from 100 college-aged adults.

Results: Older adults rated pleasant words less positively and unpleasant words less negatively than did younger adults. A similar pattern was observed for arousal ratings of words. No differences were observed between younger and older adults' valence and arousal ratings of emotional pictures.

Conclusions: Results indicate age-related differences in affective ratings of words but not pictures. Contrary to the socioemotional selectivity theory, older adults in this study exhibited reduced affective ratings for both pleasant and unpleasant words. The reasons why aging influenced the affective judgments of words but not pictures and the reasons for the reduced affective ratings remain to be determined.

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C. SCHUTTE & R. SKEEL. Medication Adherence in the Elderly: Associations with Prospective Memory and Neuropsychological Functioning.

Objective: The purpose of the present study was to compare medication adherence to neuropsychological performance in elderly individuals using a model of prospective memory (PM), which included new learning, memory and executive functioning.

Participants and Methods: 30 community dwelling elderly individuals aged 60 and above completed a neuropsychological battery as part of a larger study. Neuropsychological measures included the Hopkins Verbal Learning Test revised (HVLT-R), Wechsler Adult Intelligence Test-III Digit Span (WAIS-III Digit Span), Delis Kaplan Executive Functioning System (D-KEFS) Color Word Interference Test and Tower Test, Trails A and B. Subsequent to completing the neuropsychological measures medication adherence was then tracked for two weeks using the Medication Event Monitoring System (MEMS, Apres Corporation). Neuropsychological measures were then correlated with medication adherence data and a stepwise regression was completed using measures that were significantly correlated with medication adherence.

Results: Four of the HVLT-R measures, including total words recalled, delayed free recall, retention percent and delay recognition, were significantly correlated with medication adherence ($p < .05$). None of the other cognitive measures were significantly correlated with medication adherence. A stepwise regression showed that delay recognition was the only measure retained in the model and accounted for approximately 32% of the variance in medication adherence.

Conclusions: This study suggests that medication adherence is significantly associated with new learning and recollection. Additionally, it appears that recognition of newly learned information accounts for most of the variance among these measures. Though other cognitive functions have been associated with PM and medication adherence, they were not significantly associated with adherence.

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M. SEIDENBERG, L. GUIDOTTI, K. NIELSON, J. WOODARD, S. DURGERIAN, Q. CHANG, A. CHANG, M. FRANZAK, P. AN-TUONO & S. RAO. Semantic Knowledge of Famous Names in Mild Cognitive Impairment.

Objective: Although episodic memory impairment is the cardinal feature of mild cognitive impairment (MCI), recent studies indicate semantic memory is also disrupted. We compared semantic knowledge for famous people across three time epochs; remote, recent, and enduring. We expected MCI subjects to provide less semantic knowledge across time epochs, but particularly for recent famous names.

Participants and Methods: 15 healthy controls and 15 MCI subjects of similar age and education were presented 60 stimuli: Recent-10 names of people who achieved public prominence in the 90's, Remote-10 names of persons who were prominent in the 50 -60's, and Enduring-names of people from the 50's that remain well-known, and 30 unfamiliar names. Participants indicated if the name was famous or unfamiliar. Response accuracy and reaction time was recorded. Subjects then completed a prearranged packet that probed for semantic knowledge about the previously presented famous names.

Results: Recognition accuracy was similar between groups across epochs, but group and time epoch differences emerged for recognition reaction time and semantic knowledge. Controls produced more semantic knowl-

edge than the MCI group for all three time epochs, but particularly for enduring names. Names from the enduring and remote period were recognized faster than recent names in both groups. Faster reaction time was associated with more semantic knowledge, and better episodic memory performance was related to increased semantic knowledge.

Conclusions: We suggest that the difficulty of MCI subjects in producing semantic knowledge for enduring famous names reflects their difficulties to update and integrate new information. These results extend the existing literature about semantic impairment in MCI to the category of person knowledge, and highlight the potential importance of memory age in person-identity retrieval.

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M.B. SPITZNAGEL, J. GUNSTAD, A. BENITEZ, E. GLICKMAN, T. ALEXANDER & J. JUVANCIC-HELTZEL. Serum Amyloid Beta is Associated with Reduced Cognitive Function in Healthy Older Adults.

Objective: Though increased amyloid beta ($A\beta$) deposition is associated with Alzheimer's disease (AD), recent evidence suggests $A\beta$ is elevated in healthy older adults prior to onset of clinical evidence for AD. No study has yet investigated whether reduced cognitive function is related to $A\beta$ elevation in healthy older adults.

Participants and Methods: Thirty-five healthy older adults from the community underwent neuropsychological testing and fasting blood draw with subsequent serum $A\beta$ 1-40 level quantification.

Results: Global cognition in the sample was within normal ranges (MMSE $M=27.74$, $SD=2.31$). Negative correlations between serum $A\beta$ and several aspects of cognitive performance, including global cognition ($r=-.41$, $p<.01$), delayed verbal recall ($r=-.42$, $p<.01$), delayed verbal recognition ($r=-0.34$, $p<.05$), semantic verbal fluency ($r=-.32$, $p<.05$), and confrontation naming ($r=-.32$, $p<.05$) were observed.

Conclusions: Findings suggest $A\beta$ level is associated with cognitive function in healthy older adults in a pattern similar to that seen in early AD. Further work investigating possible mechanisms is needed.

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C.Y. TARSHISH & L.S. LIBOW. The Cognitive Performance Scale: A Quantitative Comparison with the Clinical Dementia Rating in the Long-Term Care Setting.

Objective: To examine the diagnostic accuracy of the Cognitive Performance Scale (CPS) in assessing cognitive status in the long-term care (LTC) frail elderly population. We compare the diagnostic accuracy of this instrument, computed from the federally-mandated Resident Assessment Instrument (RAI), to the Clinical Dementia Rating (CDR), a widely-used comprehensive scale dependent on the assessment of multiple cognitive and behavioral domains.

Participants and Methods: We tested 233 long-term care frail elderly residents in a LTC setting. The average age was 85 ± 8 years with a mean education level of 12 ± 3 years. Subjects were administered the CDR which was matched to the most recent RAI evaluation. CPS scores were then computed and total scores on each instrument were compared.

Results: We observed a significant relationship between scale ratings ($r_{\text{Spearman}} = .70$, $p\leq .001$). Therefore, we dichotomized ratings into Non-Dementia (ND) and Dementia (DEM). Utilizing the CDR as the gold standard, we applied published cutoffs of 0-.5 and ≥ 1 . Initially, we dichotomized the CPS using published scores of 0-1 signifying normal cognitive function and scores ≥ 2 signifying dementia. We observed a

$r_{\text{Point Biserial}} = .56, p < .001$. We correctly identified 65% of the ND group and 90.2% of DEM. To improve specificity we modified the cutoffs to 0-2 and 3-6. Specificity increased to 73.3% with a cost to sensitivity which dropped to 85.5%. Subsequent cutoff values did not improve classification accuracies.

Conclusions: We find that the CPS provides good overall classification accuracy when used to assess the frail elderly in LTC. In addition, it is directly derived from existing resident records and does not require a lengthy interview which may be difficult in this population. However, the scale is sensitive to non-cognitive, physical, co-morbid conditions during the RAI assessment. This results in a bias to classify ND residents as DEM in this older frail population. Modifications are recommended to adjust for these conditions.

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S. VANDERHILL, D.F. HULTSCH, M.A. HUNTER & E. STRAUSS. Mild Cognitive Impairment: Enhanced Classification Procedures and Six-Year Outcome Data.

Objective: Evidence for the utility of the MCI classification as a predictor of impending dementia is somewhat limited. Although individuals with MCI show elevated rates of conversion to dementia at the group level, heterogeneity of outcomes is common at the individual level. Using data from a prospective six-year longitudinal investigation of cognitive change in older adults, this study was designed to (a) address key limitations in current MCI classification procedures which tend to rely on single occasion assessment, and (b) investigate the external validity of a proposed operational definition of MCI requiring evidence of persistent cognitive impairment over multiple testing sessions.

Participants and Methods: Community volunteers aged 64 to 92 who demonstrated persistent evidence of cognitive impairment across three repeated testing sessions were classified as persistent MCI ($n=53$). Those who demonstrated impairment on at least one, but not all testing sessions were categorized as Unstable ($n=84$) and those who demonstrated a persistent lack of impairment were Controls ($n=65$). Groups were compared on mean level and trajectory of change in cognitive and functional performance over six years.

Results: Prevalence of traditional (e.g. single session impairment) MCI markedly exceeded that of persistent MCI. The persistent MCI group showed lower mean level of cognitive performance and steeper trajectory of cognitive decline over six years compared to the Unstable and Control groups. This difference in trajectory persisted when age, education, and baseline cognitive status were taken into account.

Conclusions: Incorporating repeated assessment into classification procedures may enhance the utility of MCI classification as a predictor of impending dementia.

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P.J. YORK & S.A. ROGERS. Depression and Degree of Cognitive Decline Among Older Adults.

Objective: Research has consistently suggested a relationship between depression and cognitive decline among older adults. The specifics of that relationship, however, remain unclear.

The present study intends to further investigate this by examining the relationship between depression and the degree of cognitive decline from premorbid levels of cognitive functioning.

Participants and Methods: A battery of neuropsychological tests was administered to 17 older adults (mean age = 76.12, range = 62 - 94) in the Santa Barbara area. Tests covered domains of global cognitive

functioning, premorbid estimates, general intelligence, attention, executive, language, memory, visuospatial, and mood. Z-scores for each domain were subtracted from premorbid estimates to create decline scores. Participants were grouped into non-depressed and mildly depressed groups according to their score on the GDS.

Results: Significant differences between depression groups were found between decline scores in verbal IQ ($t[14] = -2.15, p < .05$). When controlling for age, a significant difference was found between scores in the executive domain ($F[1,14] = 5.52, p < .05$). Post-hoc analyses within executive decline scores showed significant differences between scores on Letter-Number Sequencing ($t[15] = 3.30, p < .01$). Trails B was also approaching significance ($t[15] = 1.96, p = .071$).

Conclusions: These findings bolster previous research suggesting that the detriments associated with depression are most closely related to the executive domain, particularly working memory. Further, the degree of decline from premorbid levels is related to depression regardless of current levels of cognitive functioning. Suggestions for future research will be given.

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Endocrine Disorders/Hormones

J. BENGE, N.D. PERRIER, P. MASSMAN & J.S. WEFEL. Neurocognitive Sequelae of Primary Hyperparathyroidism and their Response to Parathyroidectomy.

Objective: Neurocognitive and psychiatric complaints are commonly reported in patients with primary hyperparathyroidism. However, the pattern and extent of impairments as well as their response to parathyroidectomy has not been fully documented. The current study sought to clarify the nature and extent of neuropsychological impairments in PHPT as well as document response to surgical management of this disorder.

Participants and Methods: One-hundred thirty nine persons with PHPT underwent neuropsychological evaluation prior to parathyroidectomy with 99 returning for a post-surgical evaluation and 40 patients returning for a third evaluation.

Results: Results revealed a pattern of cognitive slowing, reductions in psychomotor speed, memory impairment, and depression that in a subset of patients that was both clinically significant and statistically unlikely to have occurred by chance. Baseline intact parathyroid hormone (PTH) levels were found to be a significant predictor of some but not all aspects of cognitive functioning. Degree of hypercalcemia was not a predictor. Post-surgical evaluations revealed a trend for improvements in terms of speeded measures and depression but a decline in memory. Age was a significant predictor of improvement following surgery, with older patients responding less well to surgical intervention. Results from long-term follow-up evaluations suggests that memory deficits do improve, albeit more slowly and less completely than other cognitive domains following parathyroidectomy.

Conclusions: Implications and the need for future studies to evaluate the impact of other surgical and biochemical factors on surgical outcomes are discussed.

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B.L. FISCHER, W. WHARTON, M. DOWLING, D. BAKER, N. YASUI, S. ASTHANA & C. GLEASON. Hormone Therapy Facilitates Performance on Executive Functioning and Visuospatial Tasks.

Objective: Findings from studies of the cognitive effects of hormone therapy (HT) have been equivocal, with results showing minor decre-

ments in global cognition contrasting with others revealing improved performance on specific cognitive tasks. Our objective was to investigate the influence of HT initiated for clinical purposes on specific cognitive domains, as well as to examine the relationship between longer exposure to estrogen, endogenous or as HT, and cognitive performance. This is especially relevant since evidence shows that HT usage has decreased since publication of WHI data.

Participants and Methods: Subjects were 198 women, aged 65 and older, recruited for the Midwest Initiative for Dementia Screening (MINDS) program of the Wisconsin Comprehensive Memory Program. Participants were asked to complete a survey detailing, among other variables, their use of HT. Seventy five women had taken HT, while 76 were naïve to HT. We administered a comprehensive neuropsychological battery to all women, 99% of whom were cognitively healthy.

Results: Results revealed significant positive correlations between performance on executive functioning ($p=.05$), attention ($p=.036$), construction ($p=.039$), and HT. In addition, we found significant positive correlations between the age at which women transitioned into menopause, and their performance on visuospatial and executive functioning tests.

Conclusions: Clinical use of HT was positively correlated with improved performance on executive functioning and visuospatial skills in menopausal women. Greater exposure to endogenous estrogen, as measured by later age at menopause, appears neuroprotective of intellectual functioning in cognitively healthy women. Our findings support the clinical use of HT for cognitively healthy women.

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M. MEAGER, M. LACY, S. MOHILE & L. DICK. Cognitive Status of Men with Prostate Cancer: Before and After Androgen Ablation Therapy.

Objective: Over twenty thousand men receive hormonal therapy each year for prostate cancer. One third of all men are diagnosed with prostate cancer at some point their life. Research has suggested that cognition is vulnerable to changes in sexual hormones. There have been only few studies examining cognition in this population.

Participants and Methods: Thirty one patients with recently diagnosed prostate cancer completed a baseline assessment of their cognition, prior to androgen ablation therapy. Twenty one patients were tested again six months later. A standard neuropsychological battery for dementia was administered.

Results: The average age was 69 with 14 years of education. At baseline, 42% displayed significant memory impairment ($HVLT > -1.5$ sd) to meet criteria for mild cognitive impairment (MCI) prior to initiation of treatment. Further exploration determined that 19% met criteria for dementia, with a profile of memory and executive deficits. Depression and anxiety did not account for this finding. Paired T-tests revealed no significant change across time.

Conclusions: The current study suggests that almost 20 percent of these highly educated men presenting for treatment for prostate cancer met diagnostic criteria for dementia, significantly higher than the general population. Almost half of the sample presented with memory deficits suggestive of a risk for developing dementia. Six months post androgen replacement treatment there was no significant change in cognition. This finding of initial deficits may reflect hormonal dysregulation and/or co-existing medical conditions. Longer studies will provide etiological and prognostic clarification. Implications for clinically ethical practice, along with limitations of the study will be discussed.

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K. MORDECAI, L.H. RUBIN & P.M. MAKI. Effects of Oral Contraceptive Use and Anxiety on Verbal Memory.

Objective: Oral contraceptive (OC) users show blunted salivary free cortisol responses to laboratory stressors. Further, a recent study by Kuhlmann and Wolf (2005) found that cortisol administration led to verbal memory declines in naturally cycling women, whereas OC users were protected against such declines. The purpose of this investigation was to examine the effects of OC use, menstrual cycle phase and anxiety on verbal memory in healthy young women.

Participants and Methods: Twenty women currently taking estrogen-based OCs (users) and 16 naturally menstruating women (nonusers) completed the California Verbal Learning Test as part of a larger neuropsychological battery. An anxiety composite score was created from self-report items on the Positive and Negative Affect Schedule. All participants were assessed twice: nonusers during the early follicular (Days 2-4) and midluteal (Days 20-22) phases of the menstrual cycle and users on the same cycle days which corresponded to inactive and active pill phases, respectively.

Results: We predicted that anxiety would have a greater negative impact on verbal memory in nonusers compared to users irrespective of cycle phase. Contrary to predictions, verbal memory performance decreased with heightened anxiety in users, whereas anxiety did not impact verbal memory in nonusers across the cycle. Anxiety did not significantly differ between users and nonusers.

Conclusions: These results suggest that the potential protective effect of OCs on verbal memory in response to significant laboratory stress does not generalize to everyday levels of anxiety.

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J.B. RICH, J.V. HILBORN & P.M. MAKI. The Effect of Estrogen-Replacement Therapy on Implicit Memory in Postmenopausal Women.

Objective: Some studies find protective effects of estrogen on cognition, whereas others report detrimental effects. In a previous study in premenopausal women, we found enhanced conceptual implicit memory and verbal fluency when estrogen was high compared to when estrogen was low. In the present study, we examined the same tasks in postmenopausal women with or without estrogen therapy (ET) and predicted that ET would enhance performance on both tasks.

Participants and Methods: Postmenopausal women completed measures of perceptual (fragmented object identification) and conceptual (category-exemplar generation) implicit memory, and several sexually dimorphic tasks. Nonusers ($n=20$) had never used hormone therapy (M age=66.8); the ET group ($n=17$) was taking estrogen (M age=62.5).

Results: Contrary to predictions, nonusers demonstrated greater priming than the ET group, whether compared to a within-subject, $t=2.42$, $p=.021$, or between-subject, $F=4.25$, $p=.047$, baseline. Nonusers also had higher MMSE scores ($M=29.35$) than ET participants ($M=28.29$), $t=2.33$, $p=.026$, and superior rhyme fluency, $p=.032$. The ET group outperformed the nonusers on HVLT percent retained, $t=2.43$, $p=.021$, and showed a trend for better Digit Symbol performance. Perceptual implicit memory was equivalent between groups.

Conclusions: In contrast to previous findings in young women, in postmenopausal women high levels of estrogen were associated with decreased performance on two prefrontally mediated tasks (conceptual implicit memory and verbal fluency) and increased performance on a hippocampally mediated task (verbal memory retention). These findings support the view that effects of estrogen on cognitive test performance are age-dependent.

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P.P. THILERS, S. MACDONALD, L. NILSSON & A. HERLITZ. Cognition and Endogenous Estrogen in Menopause: A Longitudinal Study.

Objective: Although some recent findings indicate a positive role of estrogen on cognitive performance, such patterns are less pronounced following natural menopause. The reported non-significant trends imply that menopause exerts little influence on cognition, but could also reflect methodological limitations (e.g., a limited range of cognitive tasks) that mask potential associations. We addressed previous limitations by including a continuum of cognitive measures, collecting data at 3 time points, and sampling women in earlier as well as later stages of the menopause transition.

Participants and Methods: Multilevel modeling was used to model change in cognitive performance as a function of two separate time metrics: chronological age and years post-menopause. Spanning up to 10 years, we investigated post-menopausal change for 10 cognitive outcomes. Two primary models were computed: a full model including both pre- and post-menopausal women ($n = 301$), and a reduced model examining only postmenopausal women ($n = 193$) to circumvent the natural confound between age and menopause status.

Results: Full model results controlling for age and education show that, relative to premenopausal women, postmenopausal women display a diminished practice effect on verbal fluency tasks and a more rapid decline on visuospatial performance. Results for the reduced model with only postmenopausal women show similar patterns with diminished practice effects for fluency and incidental episodic memory following menopause onset.

Conclusions: The current findings imply that post-menopausal declines in endogenous estrogen influences but a few cognitive tasks, and even then exert only a modest effect.

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A. YOSHIMURA, H. KANAI, S. JINDE, A. MASUI, M. OKAWA, N. KATO & N. YAMADA. Influence of age or circadian time on bcl-family gene expression in the hippocampus after corticosterone exposure.

Objective: A temporal elevation in the level of endogenous corticosterone (CORT) functions in the stress response associated with the hypothalamus-pituitary-adrenal axis, and it has been well documented that high levels of CORT are toxic to neurons. The circadian rhythm and aging possibly affect CORT sensitivity, but their endogenous modifications in CORT-mediated events remain unclear. To explore the influence of age or circadian time on hippocampal vulnerability to excess CORT, we examined the mRNA expression of bcl-2 and bax in the subfields of the rat hippocampus after acute CORT administration using in situ RT-PCR.

Participants and Methods: Male rats aged 10 weeks (young) or 6 months (adult) were treated with CORT at 0800 or 2000 hours.

Results: The bcl-2 / bax mRNA ratio in the dentate gyrus was significantly decreased 2 h after CORT exposure in the young rats treated at 0800 or 2000 hours. In the adult rats, the treatment with CORT at 0800 hours significantly decreased the bcl-2 to bax ratio, whereas the treatment at 2000 hours was ineffective; the discrepancy between the treatment time points was apparent in adult rats, but not in young rats.

Conclusions: Our results emphasize the importance of circadian time and age as factors influencing the stress paradigm.

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H. ADAMS, J. KWON, R. JORDAN, F.J. MARSHALL, P.G. ROTHBERG, A. VIERHILE, E.A. DEBLIECK, D.A. PEARCE & J.W. MINK. Genotype-Phenotype Associations in Juvenile Ceroid Neuronal Lipofuscinosis (JNCL; CLN3).

Objective: Juvenile neuronal ceroid lipofuscinosis (JNCL) is an inherited pediatric-onset neurodegenerative disease caused by a 1.02 kb deletion in the CLN3 gene (p12.1 region of chromosome 16) which removes exons 7 and 8, accounting for 80-85% of known mutations. Most other individuals are compound heterozygotes with one copy of the 1.02kb deletion. Limited data suggests differential progression among compound heterozygotes. The purpose of this investigation was to examine genotype – clinical phenotype differences in homozygous vs. compound heterozygous JNCL patients.

Participants and Methods: We evaluated 49 JNCL individuals with confirmatory genotyping. Participants were evaluated with standardized neuropsychological measures and the Unified Batten Disease Rating Scale (UBDRS), a JNCL-specific neurologic exam.

Results: Anxiety symptoms were significantly worse among patients homozygous for the 1.02kb deletion, on both the UBDRS and an independent, externally validated measure of child mood problems used in the neurobehavioral test battery. Motor function did not differ by genotype, although homozygous subjects had more variable motor function in comparison to compound heterozygotes over the course of the disease.

Conclusions: Homozygous participants had greater mood dysfunction and more variable motor function compared to compound heterozygotes. These data are consistent with earlier reports of a milder clinical phenotype among compound heterozygotes. Identification of genotype-phenotypic patterns associated with CLN3 mutations may help further our understanding of genomic and biochemical correlates or modifiers of clinical disease, provide a focus for targeted interventions to anticipate and manage symptoms, and to improve models for future clinical trials.

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C.S. BLOSS, D.C. DELIS, M.W. BONDI & N.J. SCHORK. Profiles of RCFT Copy Performance Differ as a Function of APOE Genotype in School-Aged Children: Multivariate Item Analysis Using Methods Borrowed from Gene Expression Studies.

Objective: A recent study found evidence suggesting that the alleles of the apolipoprotein E (APOE) gene may be associated with differences in cortical morphology as early as childhood, which raises the possibility that APOE genotype may also be associated with cognitive functioning in early life. To explore this question, the relationship between performance on the copy condition of the Rey Complex Figure Test (RCFT) and APOE genotype was assessed in a sample of school-aged children.

Participants and Methods: Participants ($N=145$) were administered the RCFT Copy in a group setting and underwent buccal swab testing to determine their APOE genotype. Multivariate distance matrix regression (MDMR), an analytic method traditionally applied to high-dimensional genomic data, was used to examine the extent to which similarity in performance profiles across the individual items of the RCFT was associated with APOE genotype.

Results: APOE genotype group differences in RCFT Copy total mean standard scores were observed with e2-positive children (96.7) performing worse relative to e3/3-positive (101.8) and e4-positive children (103.2; $p<.05$). Notably, MDMR analyses also revealed that age ($p<.05$), as well as APOE genotype ($p<.05$), accounted for significant variance in performance profiles across the individual items of the RCFT.

Conclusions: These findings suggest that APOE genotype may be associated with subtle differences in visuospatial perception and/or construction among school-aged children. Furthermore, this study highlights the utility of an analytic method, previously used within the context of gene expression studies, for examination of relationships between performance profiles across the individual items of a cognitive test and other variables of interest.

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C. CHABERNAUD, D. SIRINELLI, L. BARANTIN, J. COTTIER, G. DESEILLE-TURLOTTE, C. SEMBELY, B. GIRAUDEAU, C. BARBIER & P. CASTELNAU. Basal ganglia T2-Hyperintensities in children with neurofibromatosis type 1: relationship to cognitive functioning.

Objective: Neurofibromatosis type 1 (NF1) affected patients present learning disabilities which represent the main disease complication in childhood. Approximately 60% of the patients exhibit hyperintensities on brain MRI which relationship with the cognitive troubles remain unclear. This study aimed to analyse the impact of the hyperintensities located in the basal ganglia on the cognitive disturbances.

Participants and Methods: We prospectively included 39 NF1 affected children (6 to 15 years) without cerebral hyperintensities (n=13) and with such signals (n=24) including the basal ganglia location (n=19). Neuropsychological tests were performed and the cognitive scores were compared according to several hyperintensity features.

Results: The cognitive scores of the children without hyperintensities were normal whereas Full IQ, Verbal IQ, Perceptual Organization Index and Rey Osterrieth Figure (ROF) were lower in the hyperintensities group ($p < 0.05$). Compared to the remaining population, the children with basal ganglia hyperintensities had even lower scores for all IQ indices and ROF ($p < 0.05$). Because the hyperintensities never respect the nuclei anatomical limits the impact of a particular nucleus within the basal ganglia could not be studied.

Conclusions: NF1 children presented a cognitive profile comparable to the general population whereas NF1 patients carrying hyperintensities showed decreased IQ and visuo-spatial performances. From this perspective, the basal ganglia correspond to the location which has the highest impact. Many studies showed basal ganglia involvement in cognitive functions and substantial evidences also demonstrated how basal ganglia constitute an interconnected network in which all the nuclei share a large overlap of functions. We discuss a global network approach to better understand the basal ganglia involvement in NF1 cognitive disabilities.

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L. HARDER & S. CAUDLE. Neuropsychological Profile of Pendred Syndrome: A Longitudinal Case Study.

Objective: Pendred Syndrome, first described in 1896, is associated with sensorineural hearing loss and goiter (i.e., thyroid enlargement). Little to no information regarding the specific neurocognitive manifestation of the syndrome has been published. Therefore, this longitudinal case study aims to describe the developmental history, neuropsychological profile, and behavioral observations of a female patient diagnosed with the syndrome.

Participants and Methods: A longitudinal case study of a female patient diagnosed with Pendred Syndrome, who was evaluated at 2, 3, 5, 7, and 8 years of age, is presented. To address hearing loss associated with the syndrome, the patient underwent cochlear implantation.

Results: Across evaluations, this patient has exhibited average to above average nonverbal cognitive abilities. Consistent with the patient's di-

agnosed hearing impairment, she exhibited impaired language development initially; however, following cochlear implantation, notable improvements have been observed in expressive and receptive language skills. Results were consistent across evaluations for reduced performance on measures of attention and impulse control. Adaptive skill development was variable across evaluations. Fine motor skills emerged as an area of weakness. Behaviorally, the patient has been described as socially immature.

Conclusions: With little to no information published on the neuropsychological sequelae of Pendred Syndrome, it is difficult to provide families and medical teams with information regarding the functional impact of the cognitive and behavioral manifestations of the syndrome. Additional research is warranted within this population to inform intervention to address the specific needs of these patients.

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A.P. KEY, S.M. WILLIAMS & E. DYKENS. Evidence of Global Precedence in Adults With Williams Syndrome.

Objective: Williams syndrome (WS) is a genetic disorder characterized in part by deficits in visuo-spatial processing, including apparent focus predominantly on local features of complex stimuli. The current study examined brain activity associated with processing of hierarchical stimuli in adults with WS.

Participants and Methods: Visual ERPs were recorded from 22 adults with WS (18-52 yrs) and age-matched controls in response to Navon-like letter stimuli presented in an oddball paradigm for 250 ms each. Participants were asked to search for any letter 'H' without specific instructions regarding the local vs. global level. The target appeared equally often as a local element or a global structure on a total of 30% of the trials.

Results: Similar to the controls, 81% (18/22) of the participants with WS demonstrated the global precedence effect (high accuracy and shorter RT) and concurrent larger posterior N2 and parietal P3 amplitudes for global targets compared to standard stimuli. The remaining 4 participants showed local precedence in RT while their ERPs included a similarly enhanced N2 in response to global targets and no significant effects for local targets.

Conclusions: The results reflect substantial heterogeneity in behavioral markers of local-global processing in the presence of overall tendency for global precedence at the brain level. Thus, difficulties in tasks involving hierarchical stimuli (e.g., block design) in persons with WS may be due to insufficient attentional resources needed to initiate and complete both levels of analysis and/or challenges with switching between the levels.

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L. KRIVITZKY, M. BERL, J. MAYO & M. BATSHAW. Neuropsychological Functioning in Individuals with Urea Cycle Disorders.

Objective: Urea Cycle Disorders (UCD) refers to a group of genetic disorders in which there is a deficiency of one of the enzymes in the urea cycle, which is responsible for removing ammonia (a highly toxic substance) from the blood stream. Previous research samples have been small and noted a range of cognitive outcomes. The goal of this study is to present our site's preliminary data that is part of a larger, longitudinal, multi-site study of individuals with UCD.

Participants and Methods: 22 subjects completed a developmental or neuropsychological evaluation in addition to medical aspects at a baseline visit. All test scores were converted into Z scores and collapsed into 11 core domains described below.

Results: Subjects were divided into three groups, Group 1 (23%): those with mental retardation, Group 2 (18%): < 3 years of age and developmentally on track, and Group 3 (59%): > age 3 and without mental retardation. For Group 3, t-tests were run for each domain versus a Z score of 0. Results indicated significant differences at $p < .05$ for the visual-spatial/construction and adaptive skill domains and at $p < .01$ for the simple attention, complex attention/executive functions, motor skills, emotional functioning, and social skills domains. A trend toward significance ($p = .09$) was noted for nonverbal memory. No significant differences from the normative mean were noted for the intellectual functioning, language, academics, or verbal memory domains.

Conclusions: Within this small sample, approximately one quarter presented with mental retardation. In the remaining group, the neuropsychological profile suggested evidence of intact skills in the area of verbal skills/crystallized knowledge. In contrast, relative weaknesses were noted in nonverbal, complex and integrative skills. These results suggest possible dysfunction in the right-hemisphere and/or white matter pathways. Further research is warranted to study more individuals with UCD and to examine the relationship between markers of disease severity and cognitive functioning.

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S.J. LLANES & R. PEREZ. MELAS: A Neuropsychological and Radiological Follow-Up Case Study.

Objective: We report on serial neuropsychological testing and neuroimaging in a 46-year-old male with Mitochondrial encephalomyopathy, lactic acidosis and stroke-like episodes (MELAS).

Background: Few neuropsychological reports of MELAS exist, and fewer provide serial testing and neuroimaging. Documented impairments range from (1) distinct deficits associated with focal pathology to (2) global decline and dementia.

Participants and Methods: We completed detailed testing at a post-stroke "baseline", 6-month and 1 1/2 -year follow up in a young man with high premorbid functions, and examined MRI results from "baseline" to one year.

Results: At initial testing, we found global impairments in attention, processing speed, memory, language, and executive functions. Visual-spatial skills were borderline impaired. Follow-up testing revealed generally stable global impairment, with relative improvement in some aspects of language and a decline in visual-spatial skills. Consistent with previous reports, psychiatric dysfunction was present (paranoia and bizarre delusions), and symptoms were generally stable over time, with episodic worsening. Initial MRI showed left temporal lobe involvement. Follow up scans showed progression to bilateral temporal lobes and eventually to bilateral parietal lobe involvement.

Conclusions: Similar to some reports, we conclude that MELAS is characterized by global cognitive deterioration. Although the specific cognitive profile likely varies in association with location and extent of neuropathology, disease characteristics and projection patterns are also considered. Cognitive dysfunction in MELAS is also complicated by associated medical problems (e.g., seizures). Long-term follow up will be useful to identify the neuropsychologic profile and prognosis of MELAS. Correspondence: *Seoni J. Llanes, Ph.D., Memory Clinic, Kaiser Permanente, 1325 Kansas Street, San Francisco, CA 94107. E-mail: seonillanes@yahoo.com*

E.G. SHAPIRO, K. THOMAS, K. BJORAKER, K. DELANEY & L. CHARNAS. Neuropsychological function and neuroimaging in severe and attenuated Mucopolysaccharidosis Type I.

Objective: α -L-iduronidase deficiency causes Mucopolysaccharidosis Type I (MPS I), categorized as severe (MPSIsev) or attenuated (MPSIatt), based upon age of onset, cognitive involvement, joint and organ

disease. MPSIsev, called Hurler syndrome, is treated with hematopoietic stem cell transplant (HSCT), reversing somatic disease, providing enzyme to brain, arresting mental decline, improving survival. MPSIatt is moderate or mild, reported to have mild or no cognitive impact, respectively. MPSIatt patients receive enzyme replacement therapy, which does not reach the brain. We hypothesized that hippocampal abnormality, identified in animal and human pathology, underlies much of the cognitive disability and would be selectively impaired in MPSIatt due to no brain treatment.

Participants and Methods: 7 individuals with MPSIsev treated with HSCT, matched for IQ, were compared to 7 with MPSIatt (5 moderate, 2 mild) using WASI, CVLT, TOVA, JLO, and selected CANTAB subtests, and 3T volumetric MRI and DTI.

Results: 1) In MPSIatt, IQ, CVLT Recognition Memory, and Spatial Working Memory (controlled for IQ) correlated with age with older patients more impaired; 2) JLO and Pattern Recognition, correlated with age in MPSIsev demonstrating loss of visual acuity from corneal and retinal disease; 3) MPSIatt were more impaired than MPSIsev on CVLT and Spatial Working Memory, while MPSIsev were more impaired than MPSIatt on JLO, Pattern Recognition, and visual TOVA Omissions; 4) MPSI is associated with smaller hippocampal volumes and abnormal patterns of DTI.

Conclusions: Attenuated MPSI patients were shown to have significant cognitive and brain abnormalities. The hippocampus may be a major target for aspects of cognitive dysfunction of MPSI. The anterior visual pathway disease is a selective site for cognitive dysfunction in MPSIsev. Correspondence: *Elsa G. Shapiro, Ph.D., Pediatrics, University of Minnesota, MMC486, 420 Delaware St. S.E., Minneapolis, MN 55455. E-mail: shapi004@umn.edu*

K.S. WALSH, M.N. SCOTT & M.M. BERL. Neuropsychological Profile in a Case of Maple Syrup Urine Disease.

Objective: Maple Syrup Urine Disease (MSUD) is a metabolic disease with associated enzyme deficiency and an inability to break down amino acids. Neurotoxic levels can occur resulting in neurological sequelae. Information regarding cognitive functions has suggested better developed verbal than visual-spatial abilities. Specific neuropsychological functions have not been studied. The objective of this study is to examine the neuropsychological profile in MSUD.

Participants and Methods: This is a case study of a seven-year-old, African American female who was diagnosed with MSUD and treatment was initiated within the first eight days of life. She has imaging findings common in the disease (edema, white matter abnormalities), and metabolic control has been poor, with numerous crises.

Results: Basic language skills and verbal memory were below average, while nonverbal skills and visual memory were consistently impaired. Fine motor coordination was impaired although graphomotor control was adequate. Significant impairments in attention and executive functioning were identified. Executive dysfunction was found to exacerbate visual-motor impairments, but did not fully explain the difficulties with such tasks.

Conclusions: The findings in this case identified particular susceptibility to visual-motor, fine motor, attention, and executive function systems. Visual memory was significantly impaired, and although verbal memory was below age expectations, it was a better modality for learning. While language has generally been described as unimpaired in the literature, specific weakness with verbal expression were identified in this case. These findings are generally consistent with the literature, although the role of age diagnosed, neonatal course, leucine levels, and metabolic control in neuropsychological outcomes remains unclear, which should be the focus of future research. Brain-based associations (e.g., white matter, right hemisphere) are discussed.

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Normal Aging

V. ELDERKIN-THOMPSON, M. BALLMAIER, G. HELLEMANN, D. PHAM & A. KUMAR. Executive Function and MRI Prefrontal Volumes Among Health Elderly.

Objective: Age-related brain atrophy and cognitive decline, particularly executive functioning and speed of information processing, occur during late-life but the relationship between the two processes is not clear.

Participants and Methods: Magnetic resonance images of the prefrontal cortex from 23 healthy elderly were manually masked and automatically segmented. Total white/gray matter of the orbitofrontal, anterior cingulate and gyri recti/medial orbitofrontal regions were computed as a ratio of intracranial volume. Ratios eliminated differences resulting from initial head size and provided an estimate of the degree of brain tissue constriction and/or atrophy. A neuropsychological battery of five commonly-administered clinical tests of executive function was administered. Performance and error scores were computed.

Results: Better performance on a response inhibition task was associated with larger anterior cingulate volume; better performance on a non-verbal inductive reasoning task was associated with larger gyri recti volume. In contrast, larger orbitofrontal volumes were associated with less verbal and nonverbal generative output. An aggregated error index from four executive tests correlated negatively with a regional composite volume scale.

Conclusions: In conclusion, some executive abilities correlate with volumes of specific prefrontal subregions despite robust neural interconnectedness between the subregions. Sometimes a region appears to increase performance and at other times decrease performance probably by restraining error commission. Both error commission and spontaneous generation were less among individuals with larger prefrontal volume. The morphometric differences across individuals may represent underlying neuroanatomical or biochemical changes associated with aging processes that have implications for cognitive stability in late adulthood. Correspondence: *Virginia Elderkin-Thompson, Ph.D., Geriatric Psychiatry, UCLA Semel Institute for Neuroscience, 760 Westwood Plaza, Los Angeles, CA 90024-1759. E-mail: velderkin@mednet.ucla.edu*

R.A. GAVETT, A. STODDARD, B. HARTY, J. DUNN & S. WEINTRAUB. Complex Activities of Daily Living and Cognitive Function in Non-Demented Older Women.

Objective: Increasing evidence points to a connection between subtle changes in everyday function and age-related cognitive impairment. Standard activities of daily living (ADL) scales measure the impact of dementia on functional capacity and are insensitive to subtle changes in complex activities. This study used the Adelaide Activities Profile (AAP), a measure designed to sample complex ADL in healthy elderly, to compare activity levels in a longitudinal cohort made up of individuals who showed no cognitive change, minor cognitive change, and major cognitive change over a three-year interval.

Participants and Methods: Community-dwelling, post-menopausal women (N=481) in the Cognitive Change in Women (CCW) study an observational ancillary study of the Women's Health Initiative, were tested with a neuropsychological battery and the AAP at baseline and three years later. They were divided into three groups based on their change in global neuropsychological test scores over the period of follow up: Minor decliners (<.5 SD, N=245); Major decliners (\geq .5 SD, N=37); and Stable/Improved (N=199). AAP scores were compared between the groups at baseline and follow-up, and change in AAP score were examined for each group.

Results: The AAP score was significantly lower for the Major group compared to the other two groups at both the baseline and follow-up

visit ($p < .05$). In addition, there was a significant decline in AAP score for the Major group between the two testing sessions ($p < .05$). The Minor group and the Stable/Improved group did not differ in AAP score at either visit and did not show a statistically significant decline in AAP score between visits.

Conclusions: Changes in everyday function are associated with changes in cognitive function in community-dwelling post-menopausal women. Future research could explore the causal direction of the relationship between changes in everyday function and cognitive function.

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A. JOUK & S. WOOD. The Risky Business of Losing: Skin Conductance Response Examines Loss Aversion across the Lifespan.

Objective: This study investigated how the behavioral and physiological correlates of risk taking change with age, specifically in terms of how older and younger adults react to financial losses in two experiments. Loss aversion, the tendency to weigh losses more heavily than gains, may be expected to decrease with age, which is consistent with current work on emotion.

Participants and Methods: A modified version of the Shiv (2005) investment game was used. Experiment 1 examined the investment behavior of 20 older adults (ages 67-91), 9 middle-aged adults (ages 28-61), and 20 younger adults (ages 18-22) as they made 20 risky investment decisions, while measuring their physiological response with skin conductance response (SCR). Experiment 2 focused on the behavior of 10 older adults (ages 70-83) and 10 younger adults (ages 19-25) during the investment game as the monetary stakes of the game increased.

Results: For both Experiment 1 and 2, both older and younger adults were relatively risk-seeking, and demonstrated equivalent risk taking behavior. In Experiment 1, investment behavior throughout the game did not vary among the three age groups but physiological responses and playing strategies suggest older adults rely more on emotional cues when making decisions ($p = .002$). It was also found that increased monetary incentives (studied in Experiment 2) do not impact risk taking behavior across the lifespan. However, older adults reported relying more on their emotions compared to younger adults ($p = .010$), supporting the findings from Experiment 1.

Conclusions: The results suggest that risk taking behavior does not change across the lifespan, although older adults may rely more on affective or somatic reactions when making risky decisions.

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G.J. LEE, K.J. MILLER, J. KIM, J.H. MOON & G.W. SMALL. Hormone Replacement Therapy and Cognitive Decline in Healthy Postmenopausal Women: A Longitudinal Study.

Objective: Estrogen has an important role in cognitive functioning, particularly in postmenopausal women. The goal of the present study is to examine the longitudinal effect of Hormone Replacement Therapy (HRT) use in postmenopausal women by comparing the relative decline in cognitive functioning of HRT users and non-users across time.

Participants and Methods: A total of 41 nondemented participants (23 women; M age = 63.50, SD = 11.49) completed neuropsychological evaluations at baseline and follow-up. Participants were divided into three groups: postmenopausal women who have never used HRT (n=9), postmenopausal women who reported at least 1 year of HRT (n=14), and a control group of age-matched males (n=18). The three groups were compared in terms of their relative difference between scores at baseline and follow-up.

Results: Significant group differences were seen on measures of semantic fluency (Animals, $F(2, 33) = 3.87, p < .05$) and verbal memory (WMS-III Logical Memory I, $F(2, 26) = 4.05, p < .05$). HRT users' performance on Animals improved over time, compared to the relatively stable performance of non-users and the relative decline in performance of males. HRT users also showed improved performance at follow-up on the immediate recall of short stories (Logical Memory I), while both non-users and males demonstrated a decline in scores at follow-up.

Conclusions: These results suggest that HRT use may provide a beneficial effect on select aspects of cognitive functioning (semantic fluency and verbal memory) in postmenopausal women. Furthermore, HRT use may not only prevent cognitive decline, but may actually help enhance cognitive functioning across time.

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K.M. MCGREGOR, M. BENJAMIN, Y. CHANG, Z. ZLATAR, C. RACKELMAN, M. GAIEFSKY, I. LEVY, K.D. WHITE & B.A. CROSSON. Age Group Comparisons in Category Member Generation Tasks: Effect of Stimulus Design.

Objective: Optimal stimulus presentation in functional magnetic resonance imaging (fMRI) continues to be vital to experimental design particularly in the study of language processes. Event related and block paradigms have the potential to exhibit different activation patterns during the execution of similar linguistic tasks. As such, it remains critically important to evaluate designs of each type in language investigations, particularly those potentially describing group differences. The present study investigates activation differences in word retrieval (category member generation) between older and younger adults using both event related and block design fMRI.

Participants and Methods: Twenty-two older (>65 years old) and 22 younger (18-35 years old) participants completed block and event-related fMRI paradigms (Block: silent category exemplar generation for 17 seconds/category for 16 categories; Event-related: overt, single category exemplar generation for 44 categories). fMRI data was analyzed using AFNI 3dANOVA and subsequent t-tests ($p < .005$).

Results: In both paradigms, older adults exhibited significantly greater activation than younger adults in overall activation comparisons. However, regional activation differences between groups varied greatly between paradigms as block design exhibited significantly greater activation volume in older adults. Event-related design comparisons showed greater activation in older as compared to younger groups in left (L) and right (R) superior temporal gyrus along with R thalamus, parietal, and sensorimotor areas. Block design demonstrated age group differences (Older>Younger) in R middle frontal and posterior perisylvian regions, along with L striatocapsular gray matter, inferior frontal, precentral, sensorimotor, and medial frontal areas.

Conclusions: Neuroimaging task selection implications will be discussed. Correspondence: *Keith M. McGregor, University of Florida, 3815 nw 14th pl, Gainesville, FL 32605. E-mail: kmcgrego@ufl.edu*

S. MUSIL, S. WEINTRAUB & M. MESULAM. "Super Aging": Pathways to High Maintenance of Functioning in Old Age.

Objective: There are many trajectories of aging at age 80 and above. Some individuals experience mild decline in cognition and, although they may remain actively engaged in life, their mental abilities are not as good as they were when younger. This trajectory is typically referred to as "normal aging". Others experience dementia, with accelerated cognitive decline and severe restrictions in daily functioning. This is referred to as "pathological aging". However, some individuals experience little or no age-related cognitive decline, remain highly functional in their later years, and continue to be actively engaged in life well into very old age. This aging trajectory can be referred to as

"super aging". There is much information on genetic and lifestyle risk factors for dementia of the Alzheimer's type and other diseases and a number of longitudinal studies have focused on the normal aging trajectory. However, the determinants of "super aging" are relatively unexplored. The goal of this study is to identify a group of superagers and investigate cognition, psychosocial factors, genetics, and brain structure.

Participants and Methods: Data presented here were taken from 4 subjects who were part of a pilot study for a larger longitudinal study of super aging. Subjects over 80 were administered a full battery of neuropsychological tests. The NEO-R was used to assess personality traits and questionnaires were administered to assess active engagement in life, coping skills, and resilience, among other constructs. Results will be presented as case studies.

Results: The data indicate remarkable heterogeneity. Some subjects demonstrate superior cognitive strengths while others demonstrate strong personality and psychosocial characteristics, such as openness to experience and resilience.

Conclusions: Understanding factors that influence maintenance of cognitive function and active life engagement into the 9th decade is an important step in preventing debilitating age-related cognitive impairment.

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T. SCHULTE, E.M. MULLER-OEHRING, S. VINCO, A. PFEFFERBAUM & E.V. SULLIVAN. Neural Correlates of Redundancy Effects in Visual Parallel Processing in Younger and Older Women: A Functional Magnetic Resonance Imaging Study.

Objective: Multiple target stimuli presented simultaneously typically result in faster responses than those to single targets, a manifestation of the redundant targets effect (RTE). This experiment investigated redundancy effects in behavioral and functional imaging (fMRI) data in young and elderly women.

Participants and Methods: While in a 3T-MRI system, 9 right-handed young (19-28yrs) and 7 elderly (62-85yrs) healthy women viewed interleaved blocks of single targets presented in one visual hemifield and paired targets presented in two hemifields, one to each cerebral hemisphere, and pressed a response button upon target detection. Two runs were presented, one with the right and one with the left as the response hand, and each comprised 4 blocks of 10 trials for each condition (single left, single right, paired left-right).

Results: Young and older women did not differ in overall reaction time, errors, or fixation accuracy. Both groups showed faster reaction times to paired than single stimuli, evidence for the RTE (young: 9ms; old: 6ms). Despite similar RTEs in the two age groups ($p = .82$), patterns of brain activations differed in the paired>single stimulus contrast: relative to older women, the younger activated bilateral extrastriate and posterior parietal cortices. The elderly in contrast to the young engaged bilateral motor and premotor cortices and subcortical regions.

Conclusions: Our data confirm previous findings indicating that in young subjects the primary processing level of response facilitation, observed as the RTE, is perceptual. In the elderly, however, recruitment of a subcortical-motor network may reflect effective adaptation of functional networks in the aging brain in high performing elderly.

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M. SHIKHMAN, G. BRUDER, J. KEILP & W. FARRELL. Demographic Influences on Working Memory Tasks in Early to Middle Adulthood.

Objective: Demographical influences on working memory ability in early to middle adulthood have received limited attention in the literature. This study investigates relative contributions of age, gender, estimated intelligence and education to the performance on a comprehensive battery of working memory measures varying in cognitive demands. **Participants and Methods:** 403 normal adults aged 18 - 55 were tested using a battery of four working memory tests – Word Serial Position Test, N-Back test, Letter-Number Sequencing Test and Spatial Delayed Response Test. Intelligence was estimated using the Vocabulary subtest of WAIS-III.

Results: Principle component analysis was utilized to extract a single working memory factor (eigenvalue = 2.214, 55.4% variance accounted for) from the accuracy scores of working memory tests. For each test and for the working memory factor, relative influences of age, gender, intelligence and educational level, as well as selected interactions, were examined using hierarchical linear regressions. Estimated intelligence ($B = 0.147 - 0.387$; $p < 0.01$) and age ($B = -0.198 - -0.353$; $p < 0.01$) both emerged as significant predictors of working memory performance. A significant interaction was also observed between age and intelligence ($B = 0.138$; $p < 0.05$) for the N-Back test, such that in persons with higher estimated intelligence performance on this measure showed less decline with age. Education emerged as a significant predictor of scores on the working memory factor ($B = 0.109$; $p < 0.05$) and on the N-Back test ($B = 0.238$; $p < 0.05$). Gender emerged as a significant predictor of performance on the SDR test ($B = 0.106$; $p < 0.05$), with males performing better than females, but not on any other tests.

Conclusions: Demographic variables affect working memory, and age effects are evident even within early to middle adult years. Varying types of working memory are differentially affected by these demographic variables.

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B. SPRINGATE, E. PREEN, R.F. KAPLAN & L. WOLFSON. Reaction Time and Level of Processing in the Normal Elderly.

Objective: A large body of research suggests that processing speed and reaction time steadily decline with age. However, many of the existing norms for these tests do not provide normative data for older adults. This study provides normative data for healthy older adults, stratified by age, on the California Computerized Assessment Package (CalCAP), a computerized test of simple reaction time (RT), choice RT which adds the element of memory, and sequential RT which has a working memory component.

Participants and Methods: A sample of 104 healthy older adults between the ages of 75 and 90 ($M = 82.13$, $SD = 4.06$) completed a neuropsychological battery that included administration of the CalCAP.

Results: Age was correlated with median sequential reaction time ($r = 0.327$, $p = 0.001$) but not with median simple RT or median choice RT. Education and gender did not account for a significant level of variance in CalCAP performance, so normative data were stratified by age groups (75-79, 80-84, 85-90). Significant differences emerged between these age groups only for median sequential RT ($F(2,99) = 4.718$, $p = 0.011$).

Conclusions: Differences between age groups were found only on a reaction time measure requiring working memory, suggesting that declines in reaction time in the elderly may be related to task demands rather than motor slowing.

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J.C. TOLENTINO, E. PIROGOVSKY, C.K. TONER, A.J. JAK, M.W. BONDI & P.E. GILBERT. Temporal Order Memory in Nondemented Older Adults at Risk for Alzheimer's Disease.

Objective: Disruption of temporal order memory may result in impaired goal directed behavior across various cognitive domains including episodic memory and executive function. Regions of the temporal and frontal lobes affected by aging and Alzheimer's disease (AD) play a critical role in temporal order memory. Therefore, temporal sequence tasks may be a powerful tool for the early detection of cognitive dysfunction.

Participants and Methods: Ten young adults and 10 nondemented older adults with and 10 without the apolipoprotein E epsilon 4 allele (E4) were tested on a visuospatial temporal order memory task. Parametric manipulations of the temporal metric were accomplished by systematically manipulating the temporal separation between two choice items in a sequence of spatial locations on a computerized radial 8-arm maze.

Results: The performance of participants increased as a function of increased temporal separation between the two choice items. Older adults showed significant impairments compared to young adults across proximal and moderate temporal separations but improved on distal separations. Older adults with the E4 allele showed significant impairments compared to older adults without the E4 allele as a function of temporal separation.

Conclusions: Thus, temporal order memory may be a fundamental processing deficit in older adults and particularly those genetically at risk for AD. The identification of a key mnemonic processing deficit in temporal order memory may result in behavioral interventions that structure daily living tasks to mitigate interference in the temporal domains. Deficits in temporal order memory also may serve as an early behavioral indicator of cognitive impairment in individuals at risk for dementing disease.

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S. WARKENTIN, K. NILSSON, U. PASSANT, S. JANCIAUSKIENE & C. ERIKSON. Information processing speed is associated with folate in ApoE4+ but not in ApoE4- healthy elderly.

Objective: Decreased information processing speed is related to folate in the elderly (Lancet, Jan 20, 2007). While the ApoE4-genotype (a genetic risk factor for dementia) also has been associated with decreased processing speed, it is still unknown whether the observed relation between processing speed and folate is specifically associated with this risk factor.

Participants and Methods: Fifty-four healthy elderly (mean age 72.4, $SD = 7.4$) performed a processing speed naming task (simple color and form naming). Simultaneous voice-recordings of their verbal response were analyzed by calculating the mean articulation and pause times. Fasting plasma folate levels were obtained in the morning before the test session, and apolipoprotein E (ApoE) genotype was determined for each individual.

Results: Spearman rank correlations and regression analyses showed that naming speed and folate was significantly related in ApoE4 carriers (ApoE4+, $n = 16$), but not in non-carriers (ApoE4-, $n = 38$). Thus, a longer mean duration of the pause time was associated with elevated folate levels (corr. coeff. 0.910, $p < 0.0001$) in ApoE4+, while this was not seen in ApoE4-. The mean articulation time was negatively associated with folate ($p < 0.0001$), suggesting that fast naming of the stimuli is associated with lower levels of plasma folate. Several indexes of the speech and articulation times were highly significant in the ApoE4 carrier group. Importantly, the correlation coefficients were significantly different ($p < 0.01$ to $p < 0.0001$) between the ApoE4+/-subgroups, substantiating the specificity of an association between processing speed and folate in the ApoE4 carriers.

Conclusions: Here we show for the first time that the association between elevated folate levels and decreased processing speed in the aging brain differs between ApoE4 carriers and non-carriers. Our findings strongly suggest that ApoE4 carriers are highly folate-dependent in order to maintain adequate processing speed, while non-carriers are not. Correspondence: Siegbert Warkentin, PhD, Dpt of Clinical Sciences, Lund University, Lund 22200, Sweden. E-mail: siegbert.warkentin@med.lu.se

M.A. WIEGAND, K.J. MURPHY & A.K. TROYER. Change in Everyday Memory Ability of Healthy Older Adults through a Practical Memory Training Program.

Objective: Little is known about the practical effects of many memory training programs, due to the low ecological validity of some outcome measures. Baycrest's Memory and Aging Program (MAP) focuses on improving memory in everyday life, teaching participants about practical memory strategies and discussing lifestyle changes that can improve memory abilities. The purpose of this research was to evaluate the effectiveness of the MAP using measures more reflective of everyday situations.

Participants and Methods: Twenty-six healthy older adults were randomly assigned to either the intervention (n=11) or waitlist control (n=15) group. Participants were recruited through a newspaper and a database of healthy subjects. Testing occurred on three occasions for each group: before the intervention group began the program, immediately following the last session, and one month later. Outcome measures included objective memory tests, subjective mood, memory, and health questionnaires, and tests of memory knowledge and strategies.

Results: Participants receiving the intervention showed a significant improvement on an everyday memory task requiring recall of facts, where controls did not differ in performance. The intervention group also showed an improvement in mood and an increase in lifestyle changes that positively affect memory compared to controls. Those in the intervention condition showed a significant increase in their knowledge of memory and memory strategies, where controls showed no differences.

Conclusions: Results suggest that the MAP is an effective tool for improving everyday memory function in healthy older adults and shows the benefits of teaching practical strategies and discussing lifestyle issues in memory training programs.

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Other

G. COOKE, N. CORREIA, S. MULLALLY, M. FITZGIBBON, J. GIBNEY & S. O'MARA. The Impact Of Hypothyroidism On Neurocognitive Functioning: A Model Of Neuroplasticity In The Mature Adult Human Brain.

Objective: Hypothyroidism (HYPO) has been shown to interfere with cognitive function; the extent of this dysfunction, particularly mild hypothyroidism (SCH), varies considerably. It is hypothesised that specific memory deficits associated with hypothyroidism will be resolved following treatment with L-thyroxine.

Participants and Methods: To address these questions we performed a battery of neuropsychological tests to investigate differences of HYPO and SCH patients, and compare this to age-matched controls at baseline and 3 months. The tasks specifically examine learning and memory, attention and general intelligence; focusing particularly on the assessment of executive functions (primarily PFC-mediated) and memory function (primarily HF-mediated).

Results: Verbal memory deficits are evident between the groups on the CVLT at baseline where both SCH and HYPO participants are signifi-

cantly different from the controls. Significant differences are also seen in associative memory using the Face-Name task. In addition spatial memory deficits were evident in the Rey Figure ($p < 0.05$). However in the working memory tasks, there were no differences found using the Stroop task and the N-Back task. Depression scores were also significantly different between the groups using the BDI ($p < 0.05$). For the HYPO, many of these tests do not return to within the normal range by the 3 month follow-up, although the SCH seem to normalize by 3 months.

Conclusions: The results would suggest that deficits seen at baseline in Hypothyroidism are not problems with working memory. They suggest that there is a more specific deficit associated with this disease.

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C. CUTTLER & P. GRAF. Baby Brain: Neuropsychological Deficits in Pregnant Women.

Objective: "Baby brain" is a commonly used label to describe the cognitive impairments that pregnant women experience. The empirical evidence to support this label is equivocal. It may be that pregnant women's self-perception of a cognitive impairment is due to impaired prospective memory; the ability to follow through with plans, promises and intentions. To date, only one study has examined the influence of pregnancy on prospective memory and it employed only one measure of this ability.

Participants and Methods: We recruited women in each trimester of pregnancy and a non pregnant control group. Three prospective memory tasks were embedded within a larger battery of neuropsychological tests. One of the prospective memory tasks required participants to press a designated key on the keyboard when they saw specific target stimuli. Another task required participants to remind the experimenter to reconnect her phone. Finally participants had to remember to make two separate calls to the laboratory. The battery of neuropsychological tests included the Rey-Auditory Verbal Learning Test, the Trail Making Test A and B, the Digit Span Backwards test, the Digit Symbol Substitution Test and the North American Adult Reading Test.

Results: We will report the results of group comparisons on all of these tests.

Conclusions: While we are continuing to collect data from the non pregnant control group we expect to find that pregnant women will perform worse on the prospective memory tasks. Such a finding would suggest that pregnant women could benefit from the use of prospective memory aiding strategies in their daily lives.

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D.F. STROTHER, M.L. CLEMENTS, D.K. BUCKWALTER & T.M. GOODWIN. Pregnancy and Cognition: Effects of Nausea and Mood.

Objective: The current study examined objective cognitive functioning and self-ratings of nausea and mood in pregnant women.

Participants and Methods: This study of nausea and cognition in pregnancy among a diverse sample of pregnant women in California ($N = 52$) is part of a larger NIH-funded project to investigate factors related to nausea and vomiting of pregnancy. The current study examined objective cognitive functioning and self-ratings of nausea and mood in pregnant women, using a longitudinal, repeated measures design across the three trimesters of pregnancy and post-partum.

Results: Depression scores were largely unrelated to cognitive performance after the effects of somatic symptoms were removed. More nausea was associated with better Digit Span scores ($r = .33, p < .05$); otherwise, nausea was unrelated to cognition. HLM analyses were conducted: significant positive linear effects of time were observed with Boston Naming ($\beta_T = 0.31, p < .01$) and Digit Span ($\beta_T = 0.58, p <$

.05). A significant acceleration was observed with CVLT Long Delay Free Recall ($\beta_{27} = 0.22, p < .01$), while a significant deceleration was observed with Letter-Number Sequencing ($\beta_{27} = 0.50, p < .01$). The point of inflection for both the acceleration and deceleration was between the second and third trimesters. No significant effects of time were observed for FAS, Animals, CVLT 1-5 Total, Judgment of Line Orientation, or CVLT Short Delay Free Recall.

Conclusions: Nausea and cognitive symptoms of depression were largely unrelated to cognition during pregnancy. HLM analyses suggest that conditions and/or factors of pregnancy contribute to cognitive changes over time, but that neither the presence nor direction of changes were consistent across cognitive domains. Comparisons between observed change over time and expected change over time for the various measures are discussed.

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M. WEBER & M. MAPSTONE. Cognitive Function and Depressive Symptoms through the Menopausal Transition.

Objective: We have previously reported that perimenopausal is not associated with absolute impairment on neuropsychological tests. However, we found that memory complaints were associated with decreased performance on an encoding task, which in turn was associated with depressive symptoms in these women. In the present study, we followed the original cohort for a one-year period to determine if and how these relationships change over time.

Participants and Methods: 24 perimenopausal women (12 early to mid, 12 late) were evaluated 3 times over a one-year period. Comprehensive neuropsychological, psychological, and psychosocial assessments were conducted and serum estradiol (E2) and follicle stimulating hormone (FSH) levels were obtained at each visit.

Results: Analysis of variance revealed small but significant differences in working memory, verbal fluency, and visuospatial organization between the two groups. Regression models revealed that depressive symptoms, but not memory complaints, decreased over time.

Conclusions: Taken together, these data suggest that late-perimenopause may be characterized by relative declines in specific areas of cognitive functioning that are not accounted for by depression alone.

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H.A. WISHART, N. KOVEN, R. ROTH, A. SAYKIN, C.H. RHODES, G. TSONGALIS, L. RABIN, L. FLASHMAN, H. PIXLEY, J. MOORE & T. MCALLISTER. COMT Val158Met Genotype Predicts Normal Variation in Cognitive Flexibility in Healthy Adults.

Objective: The Val158Met polymorphism of the catechol O-methyltransferase (COMT) gene appears to be related to normal variations in executive functioning in humans, likely via modulation of prefrontal dopamine availability. However, the available studies are somewhat contradictory, and have not consistently accounted for effects of other genes that affect cognition. We hypothesized that COMT met allele homozygosity, which is associated with slower dopamine metabolism and perhaps higher levels of synaptic dopamine, would predict better executive function, even after accounting for effects of other candidate genes.

Participants and Methods: Participants were 95 healthy, cognitively intact, right-handed adults who completed genotyping and neuropsychological testing, including the Trail-Making Test (TMT; Reitan or Delis-Kaplan) as a measure of executive function.

Results: Participants' COMT genotypes were met/met (n=26), met/val (n=46) and val/val (n=23). Thirty participants were APOE E4 carriers, 33 were BDNF met positive, and 34 had the ANKK1 T allele. Genotype was unrelated to age, sex, or education. There was an overall ef-

fect of COMT genotype on the Switching condition of the TMT ($F(2,94)=5.2, p=.007$), even after accounting for demographics, test form, and APOE, BDNF and ANKK1 (DRD2) genotype. COMT met homozygotes performed better than val/met ($p=.002$) and val/val individuals ($p=.04$), who did not differ from each other ($p > .05$). There were no significant gene-gene interactions, and COMT genotype was unrelated to simple sequencing.

Conclusions: COMT met homozygotes show better cognitive flexibility than val carriers on neuropsychological testing of executive function. This effect appears to be independent of age, sex, education, and APOE, BDNF, and ANKK1 (DRD2) genotype.

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Sex Differences/Sex Hormones

A.M. CLEMENTS-STEPHENS, T.M. LEVINE, K. YOUNG & L.E. CUTTING. Sex-based Differences in the Relative Contributions of Verbal, Visuospatial, and Motor Processing to Task Performance.

Objective: Sex-based differences in cognition are of interest, with studies focusing on distinctions between sexes in verbal and/or visuospatial processing. However, understanding the relative contributions of verbal and visuospatial processing to tasks tapping both domains is important, as this analysis could serve as a proxy for assessment of distinct sex-based strategies used for task completion.

Participants and Methods: Sex-based differences in the relative contributions of verbal, visuospatial, and motor abilities to predicting performance on the Hooper Visual Organization Test (HVOT) and Object Assembly (OA) were examined; both tasks include these elements, suggesting that some combination could be used for task completion. The Boston Naming (BNT) measured verbal ability; visuospatial ability was measured using Position in Space (PS) and Benton's Judgment of Line Orientation (JLO); the PANESS measured motor abilities. Participants included 21 females/20 males (matched on age, IQ, and HVOT/OA performance), ages 7–15.

Results: Results of multiple regression analyses indicated that for females, the BNT accounted for the majority of the variance for both the HVOT and OA (71% and 28%, respectively); the PANESS explained additional significant variance for the HVOT. For males, PS explained the majority of variance for both OA and HVOT (42% and 50%, respectively), while the PANESS accounted for additional significant variance for OA.

Conclusions: Results suggest that females utilized a verbal strategy while males utilized a visuospatial strategy during task completion; additionally, motoric skills contributed differentially. Findings support the idea that the sexes may use different cognitive processes to complete tasks that are performed at the same level of proficiency.

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J.G. FINE, M. SEMRUD-CLIKEMAN, D. ZHU & J. BLEDSOE. Gender Differences in Activation to Happy and Sad Human Faces.

Objective: Research has suggested sexual dimorphism in brain development. Although photos have been used to evaluate perception of emotions, gender differences have not been emphasized. Social perception has been found to affect learning, social development, and long-term psychiatric outcome, and gender differences should be included our

understanding of social abilities in both genders. The current study examined BOLD activation to happy and sad photos as part of a larger social perception study. We hypothesized differential activation based on gender, focusing on previously identified emotion and face processing regions: amygdala, fusiform gyrus, inferior frontal gyrus, and temporal gyrus.

Participants and Methods: Participants: 20 healthy right-handed undergraduates (10 males), age range 19-26 yrs. No group differences on WASI FSIQ. All brain scans were read as normal.

Methods: Echo planar and structural images were obtained on a GE Excite 3T short bore scanner. Spatial alignment/normalization, data deconvolution and cluster analysis were performed in AFNI. Activation above fixation was calculated based on $p \leq 0.005$ with minimum 7 voxels per cluster. Participants were exposed to four runs including blocks (17.5s) of 3 happy and 3 sad sets of human facial photos, and fixation blocks (15s).

Results: Females showed significantly stronger activation compared to males for sad photos in the right fusiform gyrus and the right middle temporal gyrus. Males showed significantly stronger activation compared to females for happy photos in the middle and superior temporal gyri. Activations for the inferior frontal gyrus and amygdala were not significant.

Conclusions: These findings suggest gender differences in brain activation to positive and negative emotions in human faces for typically developed persons.

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K.R. MOHN, M. SAKAMOTO, E. ABRIGO, M. CARSON, J. KOUNIOS & M. SPIERS. Cortical Activation and Cognition in Long-Term Oral Contraceptive Users.

Objective: The literature suggests that sex hormone fluctuations in young women may be associated with neurophysiological and cognitive changes, although the nature of these changes has not been fully characterized. Additionally, little is known about the potential affects that oral contraceptives may have on brain functioning given their impact on the normal hormonal milieu. We aimed to explore potential group differences between regularly menstruating women (Non-OC women) and women who had been using oral contraceptive medications for six months or longer (OC women).

Participants and Methods: Between group comparisons (Non-OC women vs. OC women) were made for EEG alpha power, performance on two computerized tests, and salivary estradiol and testosterone for 13 women (6 OC women and 7 Non-OC women) during the midluteal phase. Participant ages ranged from 22 to 35 years of age.

Results: Significantly greater overall cortical activation (less alpha power density) was demonstrated among Non-OC women across baseline and task conditions when compared with OC women ($p < 0.01$). Reaction time and accuracy on the computerized cognitive tasks did not differ, however. Estradiol and testosterone levels were positively correlated with cortical activation.

Conclusions: These results suggest long-term oral contraceptive use may be associated with neurophysiological changes, although it is unclear whether these differences translate into meaningful changes in cognitive functioning. Small sample size and test sensitivity are potential study limitations.

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S.C. MUELLER, C.P. JACKSON & R. SKELTON. Gender Differences in Eye Movements during Spatial Navigation in Virtual Environments.

Objective: Gender differences in human and animal spatial cognition are well documented, with more recent human research being enhanced through the use of computer-generated virtual environments. It has been suggested that men prefer allocentric, cognitive mapping strategies that rely on distal landmarks to establish cardinal directions, and women prefer egocentric, stimulus-response strategies based on proximal landmarks. However, no one to date has published eye-movement tracking to examine which stimuli are actually used during navigation.

Participants and Methods: In the present study we tested 12 women and 12 men (average age 24 years) in a virtual Morris Water Maze in which they were trained with a visible platform and then required to find an invisible platform. At the start of all but the first trial, participants were given a 3-sec period to orient themselves and eye-movements were recorded.

Results: Behavioural results replicated previous findings that men find the invisible platform significantly faster than women but the differences in eye movements were more subtle. During early trials, men visually explored the environment more broadly than women, suggesting they were seeking greater overall familiarity. Although men and women spent equal amounts of time gazing at proximal and distal environmental features, both genders tended to focus on allocentric landmarks in later trials. However, women gazed longer at the environmental features than the men did.

Conclusions: These data demonstrate the feasibility of using eye movements to investigate cognitive processes involved in spatial cognition and the difference between the way that men and women navigate.

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W. WHARTON, E. HIRSHMAN, C. GLEASON & P. MERRITT. Oral Contraceptives and Androgenicity: Influences on Visuospatial Task Performance.

Objective: The current study investigated whether the androgenic activity of oral contraceptives (OC) mediates performance on sexually dimorphic cognitive tasks in younger individuals.

Participants and Methods: 155 participants were categorized by hormonal contraceptive use (user vs. non-user) and the androgenic activity of each OC (OC generation). OC generation was determined based on previous research in which users are grouped based on the type of progestin contained in each OC. Cognitive tasks included the Mental Rotation Task and recognition memory task. Additionally, we examined the correlates of both menstrual cycle phase and OC use, such as mood, premenstrual syndrome, depression and body fat using standardized measures.

Results: The main result was that OC androgenicity influenced MRT performance. Second generation OCs are the most androgenic. Thus, MRT performance was best in these OC users as compared to 3rd generation users, Yasmin users and non-users. On the other hand, Yasmin contains an 'anti-androgenic' progestin, drospirenone. Yasmin users not only performed more poorly on the MRT in comparison to 2nd and 3rd generation pill users, but they performed worse than OC non-users. Results show that the androgenic activity in OCs influences MRT performance in the presence of static estrogen levels.

Conclusions: Overall, the resulting pattern is consistent with a broad range of results demonstrating that visuospatial performance may be enhanced in females who are exposed to androgenic treatments. Furthermore, visuospatial performance is hindered with the introduction of 'anti-androgenic' preparations. One possible explanation concerning task mediation by androgenic activity is neural lateralization.

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FRIDAY AFTERNOON, FEBRUARY 8, 2008

Poster Session 8: Intervention, Executive Abilities

12:45–2:15 p.m.

Cognitive Intervention/Rehabilitation

S. BOUWENS, C. VAN HEUGTEN, P. SCHOLTE & F. VERHEY. Do Demented Patients Benefit from Rehabilitation for their Everyday Problems?

Objective: The present study examined whether personal goals were attained after cognitive training based on restorative and compensatory strategies using goal attainment scaling (GAS) as primary measure.

Participants and Methods: Participants were 7 patients (4 male) with mild to moderate vascular dementia (N=2) or Alzheimer's disease (N=5) (mean age 74.4 years, SD 7.7) and their caregivers. GAS, CSDD (depression) and DEMQOL (quality of life) were administered at baseline, after treatment (week 9) and at follow-up (week 14). The trainer and caregiver gave the cognitive training once a week for a period of 8 weeks.

Results: Univariate general linear model analysis with repeated measures showed overall improvement detected by GAS ($F=60.61$, $p<.05$), improvements between baseline and post treatment ($p<.05$), and baseline and follow-up ($p<.05$), but no improvement between post treatment and follow-up ($p>.05$). Both the levels of the secondary measures assessing depression and quality of life showed improvement too (CSDD: $F=2.72$, $p<.05$; DEMQOL: $F=8.28$, $p<.05$). GAS was easy to use and appreciated by the patient and caregivers.

Conclusions: Patients with mild to moderate dementia benefit from cognitive rehabilitation when the training goal is tailored to their personal needs. Clinicians who want a sensitive and client-centered method should use GAS.

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A.S. CHAN, M. CHEUNG, Y. CHAN, D.K. YEUNG & W. LAM. Bilateral Frontal Activation Associated with Cutaneous Stimulation of Elixir Field: An fMRI Study.

Objective: Elixir Field, or Dan Tian, is the area where energy is stored and nourished in the body according to traditional Chinese medicine (TCM). Although Dan Tian stimulation is a major concept in Qigong healing and has been practiced for thousands of years, and while there are some recent empirical evidence of its effect, its neurophysiological basis remains unknown.

Participants and Methods: We used functional magnetic resonance imaging (fMRI) to study brain activations associated with external stimulation of the lower Elixir Field in ten normal subjects, and compared the results with the stimulation of their right hands.

Results: While right-hand stimulation resulted in left postcentral gyrus activation, stimulation of the lower Elixir Field resulted in bilateral activations including the medial and superior frontal gyrus, middle and superior temporal gyrus, thalamus, insula, and cingulate gyrus.

Conclusions: These findings suggest that stimulation of the Elixir Field is not only associated with activation of the sensory motor cortex but also with cortical regions that mediate planning, attention, and memory.

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M. CHEUNG, A.S. CHAN, S.L. SZE & W.W. LEUNG. Cutaneous Stimulation Improves Language and Social Interaction of Children with Autistic Spectrum Disorders (ASD).

Objective: This study aimed to evaluate the effect of cutaneous stimulation treatment on children with ASD.

Participants and Methods: This is a randomized controlled trial. Thirty-two children with ASD were assigned randomly into the treatment and control group. Children in the treatment group underwent 30 sessions of stimulation over 6 weeks, while children in the control group received no treatment during this period. They were on the waiting list to receive cutaneous stimulation afterwards. Intervention consisted of a treatment regime comprising 30 sessions of cutaneous stimulation, delivered over 6 weeks. Each session lasted 5 to 10 minutes, during when children in the treatment group were stimulated on the front and back sides of their body and the head, using the seven-star needles.

Results: The change in the children's behavior was evaluated by parents' report as well as neurophysiological changes as measured by quantitative EEG. Results showed that children in the treatment group demonstrated significant improvement in language and social interaction, but not stereotyped behavior, compared with those in the control group. The quantitative EEG spectral amplitudes of the treatment, but not control group, also reduced significantly.

Conclusions: This study suggested that cutaneous stimulation might be an effective intervention to improve language and social functioning of children with Autistic Spectrum Disorders.

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S.L. SZE, A.S. CHAN & M. CHEUNG. Effect of Mind/body Training on Children with Behavioral and Learning Problems: A Randomized Controlled Study.

Objective: To evaluate the effect of mind/body training on low-achieving children with behavioral problems and poor academic performance.

Participants and Methods: Sixty children, of whom twenty-eight were low-achievers, were randomly assigned to the experimental (i.e., mind/body training) and control groups (i.e., tutorial class). For each group, a total of forty 30-minute sessions were conducted after formal school curriculum. The children's behavioral and emotional problems, academic performance, and cognitive functioning were measured before and after the program. Behavioral and emotional problems were evaluated by the school teachers who were blinded to the experimental design with Chinese version of the Teacher's Report Form (TRF) of the Child Behavior Checklist (CBCL). Students' academic performance was measured by their grade point averages, and their cognitive functioning was assessed with some neuropsychological tests.

Results: Children in the experimental group showed significant reduction in some behavioral problems including withdrawn behaviors, somatic complaints and attention problems, and improvement on cognitive functioning including learning and memory. Regarding the academic performance, while the maximum improvement of grade point average for the low-achieving children in the tutorial group was 2.87, 42% of the low-achieving children in the experimental group showed improvement above this level. This distribution was statistically significant.

Conclusions: The present results support the notion that mind/body training is an effective intervention for children, particularly with behavioral problems and poor academic performance.

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Y.M. HAN & A.S. CHAN. Electroencephalographic (EEG) Measurements of Mindfulness-based Triarchic Body-Pathway Relaxation Technique.

Objective: The “Triarchic body-pathway relaxation technique” is a form of ancient Chinese mindfulness-based meditation professed to give rise to the positive feeling of bliss, and designed to guide the mind and body to attain a specific consciousness state in which deep relaxation and focused internalized attention coexist. The purpose of this study was to examine the EEG pattern generated during the practice of this mindfulness exercise and whether this pattern differs from the music comparison condition.

Participants and Methods: Nineteen college students (aged 19 to 22 years) were recruited for the study. Given that positive blissful state has been reported to be related to greater left-sided anterior activation and internalized attention to increased frontal midline theta activity, alpha asymmetry index was used to differentiate positive emotion, while EEG spectral power and LORETA analysis were used to characterize and localize the changes in theta activity during the mindfulness exercise and music comparison states.

Results: It was shown that increased left-sided activation, a pattern associated with positive emotion, was found during both mindfulness exercise and music comparison conditions. However, only the mindfulness exercise was shown to exhibit both increased left-sided activation as well as greater frontal midline theta power.

Conclusions: These results provided evidence to support the therapeutic effects of the ancient “Triarchic body-pathway relaxation technique”, in which positive emotional experience is accompanied by focused internalized attention.

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B.M. HAMPSTEAD, K. SATHIAN, C.A. NALISNICK, A.B. MOORE, F. GOLDSTEIN & A.Y. STRINGER. Behavioral effects of cognitive rehabilitation in patients with mild cognitive impairment.

Objective: Despite the abundance of research in the area of memory, relatively few studies have examined the use of cognitive rehabilitation techniques and most of this research has focused on static processes (TBI, stroke) rather than potentially progressive illnesses, like mild cognitive impairment (MCI). Learning and memory of face-name associations is dependent on the medial temporal lobes, the commonest brain region affected by MCI. Thus, we investigated the effectiveness of a strategy-based cognitive rehabilitation program (Ecologically-Oriented Neurorehabilitation of Memory) for learning face-name associations in patients with MCI.

Participants and Methods: Eight patients with multi-domain MCI underwent three training sessions in which they learned a total of 45 face-name pairs. Patients were taught to identify a facial feature, to develop a “nickname” using that feature, and finally to link the nickname with the actual name. Memory for the trained and 45 untrained stimuli was assessed both before and after training using a 4-choice recognition memory test.

Results: During training, both recollection of the facial feature ($p=.04$) and the nickname ($p=.004$) were significant predictors of memory for the name; however, memory of the nickname explained more of the variance in this performance. Overall, patients demonstrated significant improvement with training ($F(1,7)=54.86, p<.001$). Although greater for the trained stimuli ($t(7)=12.02, p<.001$), improvement was also demonstrated on the untrained stimuli ($t(7)=3.98, p=.005$), suggesting some generalization of the techniques.

Conclusions: Although preliminary, the marked improvement in performance suggests that strategy-based cognitive rehabilitation is beneficial in patients with MCI.

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B.M. HAMPSTEAD, A.Y. STRINGER, R.F. STILLA, A.B. MOORE & K. SATHIAN. Functional neuroimaging changes following cognitive rehabilitation in patients with mild cognitive impairment.

Objective: Relatively few studies have examined the use of cognitive rehabilitation techniques, especially for patients with potentially progressive illnesses like mild cognitive impairment (MCI). We know of no studies that have examined the neural mechanisms underlying such training. Here we used functional magnetic resonance imaging (fMRI) to investigate the neural substrates of a strategy-based cognitive rehabilitation program (Ecologically-Oriented Neurorehabilitation of Memory) in MCI patients.

Participants and Methods: Since learning and memory of face-name associations is dependent on the medial temporal lobes, the commonest brain region affected by MCI, we used a face-name association task. Six patients with multi-domain MCI underwent baseline fMRI scans, during which they were instructed to view and remember 90 face-name pairs. Patients completed a 4-choice recognition memory test immediately following the scan. They were then trained to use cognitive rehabilitation strategies for 45 pairs during three training sessions. Finally, all patients underwent another fMRI scan and subsequent memory test.

Results: The interaction between stimulus set (trained vs. untrained) and scan session (pre-training vs. post-training) was used to assess training-specific effects. Compared with untrained stimuli, exposure to trained stimuli resulted in significant, left hemisphere- predominant activation within medial parietal, temporo-parietal, middle temporal, anterior cingulate, insular and frontal opercular cortex. In these regions, the differences in activation magnitude for trained and untrained stimuli were significantly correlated with the corresponding differences in memory test performance.

Conclusions: Although preliminary, our findings delineate a distributed neural system that underlies effective strategy-based cognitive rehabilitation in MCI patients.

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Y. HASHIMOTO, K. SAWADA & M. MARUISHI. Cognitive-Behavioral Group Therapy for the Treatment of Psychosocial Issues Following Brain Injury.

Objective: Brain injury such as the cerebrovascular accidents and head injuries causes serious sequelae to cognition and behavior. These are associated with emotional and adjustment problems and have a great impact on rehabilitation. Although previous researches suggest that psychotherapy techniques including cognitive behavioral therapy (CBT) may improve outcomes following brain injury, there are few reports on group interventions. It is important to accumulate clinical evidence on group intervention for psychological disorder on patients with brain injury. We investigate the effectiveness of CBT in group.

Participants and Methods: Five out patients who has problem with emotional adjustment participated in program. Three patients out of five were traumatic brain injury and other patients were the cerebrovascular accident. The program was 12-session, which ran for 80 minutes once a week, over a period of 12 weeks. Two psychologists from Hiroshima higher brain function center facilitated the program. Before the program started, each patient evaluate four different questionnaires; self-esteem, self-disclosure, social skill, and State-Trait Anger Expression Inventory.

The program focused on introducing the relationship between thought and feelings and behavior, improving self-monitoring skills, and acquiring coping skills. Written handouts and homework exercises were used to develop individual understanding.

Results: Paired t-test was conducted to test the significance change of pre and post test of each score. Only self-esteem showed significant improvement ($p=0.021$). No other scores were remarkably changed.

Conclusions: The result of the questionnaires taken before after whole program showed that the program improves participant's self-esteem, but not other scales. The results support previous studies. It is necessary to execute it to a wide-ranging participant who has various characteristics to generalize this result to other patients following brain injury.

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E. JANSIEWICZ & R. MORRIS. The Relationship Between Executive Functions and Metacognitive Strategy Learning and Application.

Objective: This project examined whether executive functions, as assessed by neuropsychological testing, could be used as predictors of the successful learning and application of metacognitive strategies, a common modality of treatment in cognitive disorders. Specifically, this project examined how the executive functions of set maintenance and shifting correlated with the ability to apply two metacognitive strategies during eye tracking tasks.

Participants and Methods: Thirty-eight undergraduate students were recruited from a large public university in the Southeastern United States. Participants completed a variety of measures of executive functions and attention, as well as a questionnaire assessing metacognitive reading comprehension strategy use, and an eye tracking task which assessed their ability to apply several metacognitive strategies that were taught. Measures of executive functions were correlated with performance on the metacognitive strategy questionnaire and the eye tracking tasks.

Results: There was some evidence that executive functions were correlated with metacognitive strategy use, as assessed by the questionnaire and the eye tracking texts. One of the more interesting findings was that participants were more likely to use an appropriate strategy when they were given a choice of strategies and when the text was structured to pull for the use of a particular strategy, as compared to being told to use a particular strategy for a text.

Conclusions: These results provide some evidence of a relationship between executive functions and metacognitive strategy use, but were likely limited by differences between the texts used in the eye tracking portion of the experiment. The finding of improved performance with different text structures and choice provides a basis for future research on the components of effective metacognitive strategy teaching techniques.

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S. KESLER. Cognitive Intervention and Neuroplasticity in Children with Neurodevelopmentally Based Executive Function Deficits.

Objective: To examine the efficacy of a practical, home-based cognitive intervention program for young children with non-acquired executive function impairments using both neuropsychological and neuroimaging metrics.

Participants and Methods: Seven females with Turner syndrome (TS), a neurogenetic disorder characterized by spatial executive dysfunction, age 7-12 completed a 4 week cognitive intervention program. The intervention program involved 1 session of in-person skills training followed by 20 minutes of daily, at-home skills practice utilizing computerized exercises. Cognitive exercises were designed based on neuroimaging

and cognitive rehabilitation research. They involved graded skills practice as well as metacognitive reinforcement in the form of error detection and correction. Pre- and post-intervention neuropsychological testing and functional magnetic resonance imaging (fMRI) data were acquired for all subjects.

Results: Within-group repeated measures ANOVA of pre- and post-intervention data indicated significantly improved spatial planning and processing speed as well as significantly increased neural activation in frontal-parietal and superior temporal regions. Subjects also demonstrated significantly improved frontal-parietal functional connectivity following the intervention.

Conclusions: Cognitive impairments associated with non-acquired, neurodevelopmental syndromes can be improved with traditional cognitive rehabilitation methods using practical, accessible treatment approaches. Improved neuropsychological functioning is associated with measurable neuroplastic changes following the intervention program.

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S. KIM, C. STASIO, L. SPINA, D.E. TINKER & H.W. MAHNCKE. Effects on Health-Related Quality of Life in Individuals with "Chemobrain" Using a Brain-Plasticity-Based Training Program.

Objective: Despite evidence that declines in cognitive function have been documented in up to 75% of breast cancer survivors, few studies of treatment options have been performed. This trial evaluated the effects of a brain-plasticity based, computerized cognitive training program (Brain Fitness Program, Posit Science) in patients suffering from "chemobrain." It employs adaptive exercises targeting auditory/language systems that are designed to drive generalized improvements in cognition by improving the speed/accuracy of information processing and engaging neuromodulatory systems.

Participants and Methods: In this single-site, open-label study, 18 patients [mean age 48.9 (35-65), education 15.6 yrs] self-reporting cognitive deficits since diagnosis underwent training 1 hour/day, 5 days/week for ~40 hours. All participants had undergone chemotherapy within 5 years of consent. While in training, 2 participants were actively undergoing chemotherapy treatment, and 15 were receiving trastuzumab or hormone treatment. Patients completed cognitive function (CSRQ 25 & 64), perceived stress (PSS-14) and health related quality of life (SF-36) questionnaires pre- and post-training.

Results: Significant improvements occurred in all measures. The SF-36 demonstrated improvement in both Physical ($p=0.017$) and Mental Component Scores ($p=0.008$) with a Response Consistency Index of 0. The largest improvements were seen on the vitality (+10.3 points), physical (+3.26) and emotional (+7.30) role limitation subscales. Significant improvement was evidenced in the Perceived Stress Scale ($p=0.002$) and in cognitive function surveys, (both $p<0.001$).

Conclusions: The brain-plasticity-based training program produced statistically significant improvements in participant perception of health related QoL, stress levels, and cognitive function, suggesting that participants experience broad-ranging benefits generalizing beyond the specifics of the training exercises.

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M. KRAFT, P. STEADMAN-WOOD, A. CHAMBERLAIN, L. GRANDE & R. MCGLINCHEY. Preliminary Results of a Psychoeducational Group on Age-Related Cognitive Changes.

Objective: Concern about memory loss is a common cause of worry and stress for many older adults. Behind this concern may lie a lack of knowledge and understanding about the normal changes in cognitive abilities that occur as one ages. The purpose of this study was to evaluate the impact of a 12-week cognitive education and rehabilitation group offered to non-demented older adults with subjective cognitive complaints.

Participants and Methods: A total of 12 participants (two groups) completed the course. The group was designed to provide participants with information about cognitive functioning, normal vs. abnormal changes in cognitive abilities, and the role that thoughts, feelings, and lifestyle behaviors can play in cognitive functioning. The latter half of the group was spent learning skills and compensatory techniques that can be used to improve memory and overall cognition. Participants were asked to complete a self-report questionnaire before and after the group. Qualitative data was also collected at the end of the group.

Results: Comparison of pre- and post-group self-report data revealed that participants did not experience a noticeable improvement in their cognitive abilities, however they did report an increase in their knowledge of brain (and memory) changes associated with normal aging, as well as a decrease in level of concern about potential memory problems. Additional groups are currently being conducted at other sites and include collection of quantitative data pre- and post-participation.

Conclusions: Groups such as this may be an effective way to alleviate stress associated with cognitive changes that occur as part of the normal aging process.

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D.E. LOCKE, J.H. CERHAN, P.D. BROWN, J.F. MALEC, M.M. CLARK, T.A. RUMMANS & W. WU. A Combined Cognitive Rehabilitation and Problem-Solving Focused Intervention to Improve Quality of Life in Patients with Primary Brain Tumors: A Pilot Study.

Objective: In a survey of caregivers of brain tumor patients, cognitive impairment was the most frequently cited problem; physical impairment was least frequently cited. Only one published study has examined a cognitive rehabilitation intervention for brain tumor patients and results showed positive impact on independence and quality of life. The primary aim of this study was to determine the feasibility and tolerability of a combined cognitive rehabilitation and problem-solving therapy intervention in a sample of brain tumor patients.

Participants and Methods: Nineteen patients were enrolled and randomized (12 intervention; 7 standard medical care) and 13 completed the entire trial (8 intervention; 5 standard medical care).

Results: After receiving the intervention, 88% of patients were using the study-specific strategies a minimum of several times per week and a maximum of several times per day. 88% described the study intervention as somewhat helpful to very helpful. 50% found the cognitive rehabilitation component most helpful, 25% found the problem solving therapy component most helpful, and 25% thought both were equally helpful. There were no statistically significant changes on formal measures of quality of life or emotional distress with the intervention, but 88% would recommend the treatment to another person diagnosed with a brain tumor.

Conclusions: This intervention was well received by patients. These results have informed our next trial, which will be an early educational intervention aimed to improve brain-tumor patients' understanding and management of cognitive changes if they arise, and thus enhance their quality of life and functional status.

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T. LUBINSKY, N.D. ANDERSON & J.B. RICH. Cognitive Mechanisms Supporting Errorless Learning in Healthy Controls and Individuals with Amnesic Mild Cognitive Impairment.

Objective: Errorless learning is a technique where individuals are prevented from making errors when acquiring information. Although the gains using this technique have been demonstrated, the cognitive mechanisms supporting the effect are debated, in particular whether the errorless learning advantage is driven by implicit or explicit memory.

Participants and Methods: Twenty healthy older adults (M age = 74.35) and 19 individuals with amnesic mild cognitive impairment (aMCI; M age = 76.95) explicitly learned and recalled five lists of 12 words. The words represented the crossing of errorless / errorful learning and self-generated / experimenter-provided learning. Twenty minutes later, participants were administered a word stem completion (implicit memory) task, which contained 60 target stems studied during the experimental phase and 60 new, nonstudied target stems. Participants were asked to complete word stems with the first word that came to mind.

Results: For both groups, errorless learning led to greater priming of target words than did errorful learning. Healthy older adults showed no priming for prior errors, whether they were self-generated or experimenter-provided; however, individuals with aMCI showed significantly more priming for self-generated than experimenter-provided errors.

Conclusions: Both groups equally demonstrated greater priming for target words encoded under errorless than errorful learning supporting the contention that errorless learning is mediated by implicit memory given that implicit memory is spared in these groups. Errorless learning also led to lower priming of errors for individuals with reduced explicit memory capacity. These results are particularly important in relation to the efficacy of memory training principles that can be applied in age-related memory decline and in memory-impaired populations including aMCI.

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K.J. MILLER, P. SIDDARTH, J. GAINES, J. PARRISH, L. ERCOLI, K. MARX, J. RONCH, B. PILGRAM, K. BURKE, N. BARCZAK, B. BABCOCK & G. SMALL. The Memory Fitness Study: Healthy Lifestyle Choices Improve Memory.

Objective: Age-related memory decline affects approximately 40% of older adults and is characterized by self-perception of memory loss and decline in memory performance. Lifestyle choices may contribute to brain health. The purpose of the study was to determine if a six-week program of memory training, physical activity, stress reduction, and diet information improved memory in older adults.

Participants and Methods: A convenience sample of 62 participants (mean age 81) was recruited from two retirement communities. The intervention consisted of 60-minute classes held twice weekly, with testing at baseline and post-intervention.

Results: A MANOVA of post-pre change scores was used to determine if subjects improved in objective and subjective memory performance. Both memory domains showed significant improvement (objective: $F(3,59) = 16.31, p < 0.0001$; subjective: $F(5,50) = 4.40, p < 0.002$). Within the objective memory domain, subjects showed significant improvement on all aspects of the verbal pairs task (WMS-III), namely immediate recall (change: $3.85(4.5), p < 0.0001$), delayed recall ($0.48(1.6), p < 0.01$), and recognition ($3.21(8.7), p < 0.005$). For subjective memory domain, subjects showed significant improvement in two factors, the seriousness of forgetting (change: $4.44(16.8), p < 0.04$), retrospective functioning ($2.50(4.3), p < 0.0001$), as well as the MFQ total score ($8.00(31.8), p < 0.05$). No significant improvement was noted for language tasks following the intervention.

Conclusions: This study demonstrated significant improvement in memory, along with participants reporting fewer difficulties with their memory after completing the program. A bi-weekly class teaching healthy aging lifestyle techniques appears to enhance memory in the short term. Correspondence: *Karen J. Miller, Ph.D., NPI, UCLA Medical Center, Suite 5S-201, 760 Westwood Plaza, Los Angeles, CA 90024. E-mail: kmiller@mednet.ucla.edu*

T. NOVAKOVIC-AGOPIAN, S. ROME, M. BRITTON, M. D'ESPOSITO & A. CHEN. Rehabilitation of Executive Functioning with Goal Self Management Training: Pilot neuropsychological, functional and fMRI data.

Objective: This pilot study evaluated behavioral and neural effects of the cognitive rehabilitation treatment, Goal-based Self Management (GSM) training, in rehabilitation of executive dysfunction in individuals with chronic mild acquired brain injury.

Participants and Methods: Three individuals with chronic (1+ yrs) acquired brain injury, ages 56-60, participated in a 5 week GSM training program consisting of: 20 hours of group training, 3 hours of individual training, as well as approximately 20 hours of home practice. The training focused on (a) mindfulness-based attention and self-regulation and (b) goal management strategies with application to participant-defined goals. Participants identified feasible goals for a group project and an individual project. They were trained in applying GSM strategies on goal-relevant tasks. Effects were evaluated pre- and post- training on clinical measures (neuropsychological and functional assessment) and neural measures (fMRI assessment of functional connectivity between frontal and posterior brain regions).

Results: On neuropsychological assessment all participants significantly improved ($>1SD$ from baseline) on measures of auditory working memory, and vigilance. Two out of three participants also significantly improved ($>1SD$ from baseline) in their ability to inhibit an automatic response, and on verbal and nonverbal measures of mental flexibility, and a third showed a trend in the same direction. There was no change in performance on measures of verbal and visual memory. All patients reported improvements in their ability to perform tasks in daily life.

Conclusions: These preliminary results suggest that participants were able to apply the trained strategies to cognitively challenging tasks and real world situations. We will discuss the training protocol and additional results from this ongoing study. The study will be discussed in the context of a neural-cognitive framework for goal-directed behavior as well as current research on rehabilitation of executive dysfunction.
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M. SCHMITTER-EDGECOMBE, S. PAVAWALLA, L. HOWELL, J. HOWARD & A. RUEDA. Efficacy of a Memory Notebook Intervention for Persons with Early-Stage Dementia.

Objective: This study examined the efficacy of a group memory notebook intervention for individuals with early-stage dementia.

Participants and Methods: Participants were five individuals with early-stage dementia and four significant others who served as coaches. In a total of 14 group treatment sessions (two per week), therapists used educational strategies and activities learning packets to assist coaches and dementia patients in learning how to use a memory notebook. Measures of memory, everyday functioning, and psychological adjustment were administered at pre-treatment and post-treatment.

Results: At post-treatment, all four coaches reported experiencing fewer symptoms of depression, $t(3) = 39.00$, $p < .001$, and all five early-stage dementia participants reported better coping strategies, $t(4) = -2.88$, $p < .05$. Modified laboratory memory testing, which allowed note taking, revealed that all five participants improved their post-treatment memory scores due to increased note taking behavior and more frequent referencing of their notes, $t(4) = -5.01$, $p < .01$. On questionnaire measures, coaches endorsed more frequent use of everyday memory strategies by the participant at post-treatment, $t(3) = -3.54$, $p < .05$. However, the increased use of everyday memory strategies did not translate into the reporting of fewer overall memory failures or greater independence in everyday activities.

Conclusions: This study showed that early-stage dementia patients can be taught to use a memory notebook in their everyday lives and this intervention can have positive effects on family members. Future research should determine whether this type of intervention can successfully decrease everyday memory lapses and improve the everyday functional independence of dementia patients.

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M. SHIOZAWA, K. OZAWA, A. YOSHIMURA, K. TSUNEMASU & S. KATSURAGI. A principle of wide application for rehabilitation concerning of cognitive dysfunction of frontal lobe.

Objective: Patients with cognitive dysfunction of frontal lobe (CDF) show aggressiveness, disinhibition, stereotypy and so on. In addition, they also present disability of thinking of abstractive contents and justice. These symptoms involve frontal lesion. Kawashima proposed the learning therapy but patients with these symptoms cannot attend to it, because of their stereotypy and few recognition of sense even when their aggressiveness are controlled on medications. In present study, we attempted to establish a principle of wide application for rehabilitation concerning of CDF. We hypothesized that frontal cognitive functions related to work operations, which are thinking of meanings, making a plan to move and proceeding motion, could be grouped into two functions: abstractive ability (AA) and executive function (EF) for work operations.

Participants and Methods: We analyzed the processes of every task of cognitive rehabilitation according to occupational therapy theory and divided work operations into AA or EF. Then we designed tasks program and provided a feedback to patients' abstractive achievement. Seven patients (with corticobasal degeneration, Alzheimer's disease, semantic dementia, frontal lobar degeneration and frontal vascular lesion) enrolled in our trial study.

Results: We present seven cases that could follow our rehabilitation program and could take satisfactory clinical course maintaining AA for more than eight months, although patients suffered from diseases with progressive cognitive deterioration. And the improvement of their behaviors and a decrease in frequency of stereotypy were availed by our feedback. The other cognitive function was also improved such as memory.

Conclusions: This feedback for rehabilitation was effective for behavioral change of CDF. And our standpoint that focuses on AA and EF is different point on frontal cognition in previous reports expects wide application for CDF in any conditions of frontal lobe.

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C. VAN HEUGTEN, I. WINKENS, L. FASOTTI & D. WADE. Efficacy of Time Pressure Management (TPM) in stroke patients with slowed information processing.

Objective: Slowness of information processing, or mental slowness, is a common complaint after stroke and may lead to many problems in the daily life of stroke patients. A possible approach towards coping with mental slowness is Time Pressure Management (TPM). The goal of the present study is to compare the efficacy of TPM training to cognitive training (care as usual) in stroke patients with mental slowness.

Participants and Methods: An RCT in which 40 stroke patients were randomised to either TPM or care as usual. Each patient received 10 hours of training (1 or 2 hours per week) at a rehabilitation centre according to a training protocol. Outcome measures were done before, after training, and at three months follow up. Main outcome measures were performance on trained and non-trained daily life tasks involving time pressure, subjective complaints after training. In addition, long term performance and quality of life were determined.

Results: After training, both groups use more strategies, in favour of the TPM group ($p=0.45$). At follow up this improvement disappears.

The TPM group can perform daily life tasks quicker than the control group. However, in terms of performance on daily life tasks and subjective complaints the two groups both improve, but do not differ significantly after training. At follow up, the experimental group shows a higher quality of life.

Conclusions: The preliminary results (n=25) suggest a small but favourable effect of TPM training over care as usual. Patients experience a higher quality of life in the long term.

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J.C. WERTHEIMER, J. SMITH, R. KRAMER, J. WHERRY, M. TUCHMAN, C. WALTON & V. TREPATSCHKO. Differential Impact of Coping Styles on Quality of life for Individuals with Parkinson's Disease.

Objective: This study examines differential coping strategies in individuals with Parkinson's disease (PD) who have and have not undergone deep brain stimulation (DBS). The relationship between coping strategies, quality of life, and certain patient variables was investigated. It was hypothesized that more active approaches to coping and/or positive attitude will result in a report of higher quality of life than those who use passive approaches and/or have a negative or pessimistic attitude.

Participants and Methods: Participants included 175 individuals with PD, 85 with DBS and 90 without DBS. A self-report, survey-based methodology was used. Instruments included a demographics questionnaire, the Coping with Health Injuries and Problems (CHIP), and the Parkinson's Disease Questionnaire-39 (PDQ-39).

Results: There were no significant differences in coping styles between the groups. The Non-DBS group reported higher levels of quality of life than the DBS group as it related to communication and mobility. The type of coping strategy had a differential impact on quality of life in individuals with PD. More active strategies, such as using distraction techniques, being problem-solving focused, and maintaining a positive attitude lead to higher ratings of quality of life than those who approach coping through being emotionally pre-occupied, using a palliative approach, or having a negative or pessimistic attitude. Significant gender differences were found in coping strategies and quality of life.

Conclusions: Understanding patients' coping strategies can be instrumental in helping them improve their quality of life. Implications include using the CHIP serially to assist in facilitating intervention that helps the patients adapt to their illness.

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Executive Abilities/Frontal System

N. ABE, T. FUJII, K. HIRAYAMA, A. TAKEDA, Y. HOSOKAI, T. ISHIOKA, K. SUZUKI, Y. NISHIO, Y. ITOYAMA, S. TAKAHASHI, H. FUKUDA & E. MORI. Neural basis of human deceptive behavior: Evidence from Parkinson's disease.

Objective: Although there is considerable neuroimaging evidence that the prefrontal cortex is associated with deception, there is no neuropsychological evidence that prefrontal cortex is necessary for human deceptive behavior. Parkinson's disease (PD) is a neurodegenerative disorder showing not only the motor symptoms but also the cognitive deficits such as executive dysfunction. In the present study, we tested the hypothesis that patients with Parkinson's disease have difficulty telling lies due to dysfunction of the prefrontal executive system.

Participants and Methods: We tested idiopathic PD patients and healthy controls matched for age, sex, and scores on the Mini-Mental

State Examination. First, participants viewed 48 study stimuli. To have the participants attend the stimuli, they were instructed to verbally indicate whether each stimulus represents animate or inanimate one. Then, a total of 48 studied and 48 unstudied stimuli were presented by the four actors. The participants were asked to verbally answer whether the stimulus is familiar, and were also requested to tell a lie in response to one of the four actors (Lie condition), and to tell a truth in response to the other actors (Truth condition). We also used 18F-fluorodeoxyglucose positron emission tomography to analyze the correlation between the ability to tell a lie and the metabolic rate of prefrontal cortex.

Results: PD patients had difficulty making deceptive responses relative to healthy controls. Furthermore, the patients' task performance was significantly correlated with the hypometabolism in the prefrontal cortex.

Conclusions: These results first provide direct neuropsychological evidence that prefrontal cortex is crucial for human deceptive behavior.

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L.J. ALTMANN, L.J. LOMBARDINO, A. MYRICK & J. GINSBURG. N-Back in Three Modalities: What Are We Measuring?

Objective: Recently, n-back tests have grown in favor as behavioral measures of working memory and executive function. However, methods for administering the task have proliferated in a variety of modalities, and scores have been reported in various ways, e.g., accuracy or RTs on all or only critical trials. It is not clear that all versions and scoring methods are equivalent. This study compares performance on 0-, 1-, and 2-back versions of a self-paced n-back task in 3 modalities: orthographic (ORTH), auditory (AUD) and nonverbal (NONV), and compared scores to offline measures of executive function.

Participants and Methods: Participants: 25 adults aged 18-30.

OFFLINE TASKS: Trails A and B, Symbol-Digit, Stroop color Xs and color words.

N-BACK:

100 trials with 15 critical trials and a 1500 ms ISI.

0-back: YES if the stimulus matched a target pattern.

1-back: YES if the stimulus matched the immediately preceding stimulus.

2-back: YES if the stimulus matched the stimulus 2 presentations before.

STIMULI:

ORTH: Capital letters in 28 point Arial font.

AUD: digital recordings of 9 letters.

NONV: 9 distinct 3 by 3 grids, each with 2 adjacent black dots.

Results: Accuracy in filler trials was uniformly high. Responses in AUD were slower and more accurate than in NONV and ORTH, which did not differ. RTs for each level of NONV and ORTH correlated. Accuracy in NONV and ORTH 0- and 1-back did not correlate; although accuracy in the ORTH 2-back correlated with NONV 0- and 2-back scores. Only ORTH 2-back accuracy, ORTH 1-back RTs, and NONV 0-back RTs correlated with offline scores.

Conclusions: Auditory n-back tasks differ substantially from n-back tasks in other modalities. Not all modalities and all levels of n-back tasks tap executive function. N-back accuracy and RTs may be tapping different abilities. Results support theories of working memory and executive function with separable modality specific and modality general capacities.

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A.S. BARLOW & B.N. AXELROD. The Relationship Between Executive Functioning and Memory Performance as a Function Of Cognitive Reserve.

Objective: Current research has purported that executive function impairment contributes to memory deficits in temporal lobe epilepsy,

amnesic Mild Cognitive Impairment, and Traumatic Brain Injury. However, these studies do not take into account the effect of intelligence on neuropsychological test performance. In this context, intelligence serves as an indicator for cognitive reserve. The present study explored the impact of intelligence as an estimate of cognitive reserve on the relationship between executive system functioning and memory performance.

Participants and Methods: Participants were identified from an archival review of individuals referred for neuropsychological assessment at an urban Midwestern DVAMC. A sample of 278 male African American and Caucasian participants was matched for age and separated into groups based on executive function performance (no impairment, mild impairment, moderate impairment and severe impairment). Multivariate analysis of covariance evaluated the impact of executive function impairment on measures of general memory (WMS - III Immediate recall, General memory, and Auditory Recognition Delayed), verbal memory (RAVLT Immediate recall, Delayed recall, and Recognition), and visual memory (RCFT Immediate recall, Delayed recall, and Recognition), while controlling for Full Scale IQ.

Results: Executive function and intelligence were significantly correlated with all memory measures (correlations range from 0.134 to 0.634, $p < .05$). However, MANCOVA's revealed no significant group differences in memory test performance attributable to executive functioning after controlling for FSIQ.

Conclusions: The present study failed to demonstrate a consistent and independent association between executive functions and memory performance. Rather, the relationship between executive functioning and memory performance appears largely attributable to cognitive reserve. Correspondence: *Alycia S. Barlow, Ph.D., Mental Health Clinic, Northern California Health Care System, Martinez, 150 Muir Rd, 116B, Martinez, CA 94553. E-mail: alycia.barlow@va.gov*

A.S. BARLOW, A. SCHAFFER-JOHNSON & B.N. AXELROD. Mediation Effects of Cognitive Reserve on the Relationship Between Executive Function and Memory.

Objective: The relationship between executive function and memory has become of increasing interest in current literature. However, there has been less focus on the effect of premorbid functioning, i.e., the cognitive reserve, on this relationship. Global intellectual functioning has long been demonstrated to impact both executive functions and memory. The present study evaluated the mediational effect of cognitive reserve on the relationship between executive functioning and memory.

Participants and Methods: Participants were identified from an archival review of individuals referred for neuropsychological assessment at an urban Midwestern DVAMC. A sample of 278 male African American and Caucasian participants was obtained. A stepwise linear regression and an exploratory mediation analysis with Sobel's test for significance (Holmbeck, 2002) were employed to determine the effect of cognitive reserve (WAIS-III FSIQ) as a mediator of the influence of executive functioning on memory measures (WMS - III Immediate recall, General memory, and Auditory Recognition Delayed; RAVLT Immediate recall, Delayed recall, and Recognition; RCFT Immediate recall, Delayed recall, and Recognition).

Results: Executive function and intelligence were significantly correlated with all memory measures and one another (correlations ranging from $r = .145 - .910$, $p < .01$). Stepwise linear regression resulted in a single factor model with executive functioning excluded ($R^2 = .356$, $p = .000$). Sobel's test of mediation demonstrates a partial mediation ($z = 4.71$, $p = .000$) with 80% of the variance in memory performance explained by executive functioning accounted for by cognitive reserve.

Conclusions: present study demonstrates the mediational effect of cognitive reserve on the relationship between executive functions and memory performance. The findings underscore the importance of including a measure of cognitive reserve in studies evaluating the relationship between executive functions and memory.

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A.A. BERBERIAN, A.G. CAPOVILLA & B.T. TREVISAN. Executive Functions Assessment in Schizophrenic Patients and their First-Degree Relatives.

Objective: Many studies have shown that schizophrenic patients display an extensive range of cognitive deficits. Empirical findings have suggested that executive functions are declined. These deficits are present also in first-degree relatives of schizophrenic patients, probably related to a familial loading for schizophrenia. This study aimed to assess executive function in schizophrenic patients and their first-degree relatives with a set of tests comprising the specific components of executive function.

Participants and Methods: Seventeen outpatients were recruited from a Brazilian particular psychiatric clinic. All patients met the DSM-IV criteria for schizophrenia and were on typical antipsychotic medications. Seventeen siblings and seventeen healthy control subjects participated, all nonpsychotic according to DSM-IV criteria. All participants were assessed using Computerized Visual and Auditory Working Memory, Computerized Stroop Test, Computerized Semantic Generation Test, Trail Making Test - Form B, Tower of London Test and FAS Verbal Fluency Test. It was carried out two sessions of administration of the tests during the regular period of treatment.

Results: Significant differences were found between performances of schizophrenic and control groups in auditory working memory, selective attention, and planning. The first-degree relatives reached a medium average between patients with schizophrenia and healthy control subjects.

Conclusions: These findings show executive impairments in schizophrenic patients and suggest that siblings also display some cognitive impairment, but not so severe. These findings corroborate literature's studies and might be useful for a better understanding of the cognitive problems which occur in schizophrenia, future genetic dissection of schizophrenia and more effective strategies for the treatment of this disorder. Correspondence: *Alessandra G. Capovilla, Doctor, Psychological assessment, University of San Francisco, Rua Nicolau Pereira Lima, 535, Sao Paulo 05539000, Brazil. E-mail: acapovil@usp.br*

B.D. BRIGIDI, D. SMITH, L. HUGHES, L. FORNNARINO, H.S. FRIEDMAN & R.H. RAYNOR. Executive and Memory Dysfunction in Depressed Individuals with Frontal High Grade Glioma.

Objective: Frontal lobe tumor location is a strong predictor of depression in patients with high grade glioma (HGG). Depressed frontal lobe tumor patients show increased deficits in verbal working memory (vWM) and treated adult HGG patients tend to show either primarily frontal-executive or moderate-severe verbal learning deficits. What is not known, and was the objective of this study, is whether executive function mediates verbal learning deficits as a possible "downstream" effect of frontostriatal compromise in vWM in treated HGG patients.

Participants and Methods: Data for 291 adults with HGG who had undergone radiation and chemotherapy were reviewed. All patients completed the BDI-II, HVLT-R, and VSAT (speed of processing and errors) as part of a comprehensive neuropsychological assessment. Multiple regression was used to test the potential mediating effect of vWM on the association between depression and verbal learning.

Results: Depression score was a significant predictor of total verbal learning (HVLT-R Trials 1-3) after accounting for the influence of gender ($\beta = -.21$, S.E. = .01, $p = .0001$). When vWM speed of processing was entered into the model, the association between depression and learning was significantly attenuated, ($\beta = -.126$, S.E. = .01, $p = .048$). This finding was not replicated using the vWM errors index.

Conclusions: Results show that vWM, particularly the timing or latency of this function, mediates a depression-verbal learning pathway in individuals with HGG. Further study is necessary to better understand the timing aspect of vWM as well as other executive functions as potential mediators of this relationship in HGG.

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E. DAWSON, P.K. SHEAR, J. BURCIAGA, M.P. DELBELLO, C. ADLER & S.M. STRAKOWSKI. Self-Reported Executive Dysfunction in Bipolar Disorder Greater in Patients with Mixed than Manic Mood State.

Objective: Although many cognitive studies include combined groups of manic and mixed patients with bipolar disorder, there is evidence that these two mood states may have differential impact on certain cognitive abilities. The current study examined whether self-reported executive functioning differs between patients experiencing a manic or mixed mood episode.

Participants and Methods: The Behavior Rating Inventory of Executive Function – Adult Version (BRIEF – A), a 75-item self-report questionnaire of executive functioning, was administered to 28 patients with bipolar I disorder who were experiencing either manic ($n = 15$) or mixed ($n = 13$) mood episodes.

Results: Manic and mixed groups were comparable in terms of age, education, and mania severity, but the mixed group had significantly higher depression severity scores and a higher percentage of women. While substantial proportions of those in both groups scored in the clinically impaired range on the BRIEF-A, significantly more mixed than manic participants had clinically elevated

Conclusions: These findings suggest that both manic and mixed patients with bipolar disorder report substantial executive dysfunction; however, mixed mood episodes are associated with more pronounced self-reported executive dysfunction than are manic episodes.

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A. EASTVOLD, Y. SUCHY & M. KRAYBILL. Deconstructing reaction time: Utility for neuropsychological research.

Objective: Reaction time (RT) tasks have been successfully used to demonstrate cognitive deficits associated with brain injury and age-related changes. However, RT consists of two discrete components: Decision Time (DT; time between stimulus onset and initiation of movement) and Movement Time (MT; time between initiation and completion of movement). These two components have been shown to have different properties. For example, MT, but not DT, is related to gender; and DT, but not MT, is related to fluid IQ. Unfortunately, these two aspects of RT are typically not examined separately in studies of neurologically compromised populations, perhaps because not enough is known about how they relate to neuropsychological test performance. The objective of this study was to examine whether DT and MT differentially relate to executive, intellectual, and motor abilities as assessed by standard neuropsychological measures.

Participants and Methods: 44 individuals age 60-85 completed the Choice Reaction Time and Finger Tapping (FT) tasks from the Behavioral Dyscontrol Scale-Electronic Version (BDS-EV), the Delis Kaplan Executive Function System (DKEFS), and the Information subtest from the WAIS-III.

Results: Analyses revealed that (1) overall RT correlated significantly with both executive functions (r 's = .26 to .59) and FT ($r = .51$), but not Information ($r = .20$); (2) DT correlated only with executive functions (r 's = .39 to .58); and (3) MT correlated only with FT ($r = .59$).

Conclusions: This suggests that RT consists of both motor speed and fluid intelligence, but is unrelated to crystallized intelligence. Future studies that use RTs with neurologically compromised individuals should examine DT and MT separately.

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L. ELLENBERG, G. GIOIA, A. MERTENS, R. PACKER, S. DONALDSON, Y. YASUI, N. KADAN-LOTTICK & L. ZELTER. Executive Functioning in Long-Term Survivors of Childhood Brain Tumors.

Objective: To assess executive functioning in long term survivors of childhood brain tumors.

Participants and Methods: As part of the Childhood Cancer Survivor Study (CCSS), 881 survivors of childhood Central Nervous System (CNS) cancers, 6265 survivors of other childhood cancers, 393 siblings and 909 controls completed a 15 item version of the Behavior Rating Inventory of Executive Function—Adult version (BRIEF-A), whose Scale and Index scores correlated well with those of the larger BRIEF-A.

Results: Survivors of CNS tumors showed substantially increased BRIEF Index and Scale scores compared to other cancer survivors, siblings and the normative group ($p < .001$). Within the CNS tumor group, multiple linear regression indicated that cranial radiation therapy predicted higher BRIEF Total, Metacognitive Index and Working Memory Scale scores ($p < .001$), the placement of a ventriculoperitoneal shunt at any time as well as ongoing sensory and motor complications predicted higher scores on all BRIEF measures ($p = .033$ to $p < .001$) and female gender specifically predicted higher scores on the Emotional Control Scale ($p < .001$). In CNS tumor survivors, higher BRIEF scores predicted lower educational attainment, income and level of satisfaction on the SF-36, a Quality of Life questionnaire.

Conclusions: Survivors of childhood CNS tumors are at significant risk for impairment in executive functioning in adulthood, particularly if they have received cranial radiation, had a VP shunt placed or are left with impairments in sensory and/or motor functions. These deficits impact substantially on attainment of adult academic and occupational goals as well as life satisfaction.

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E.M. FINE, D.C. DELIS, D. DEAN, V. BECKMAN, B.L. MILLER & J.H. KRAMER. Magnetic Resonance Imaging Predictors of D-KEFS Sorting Task Performance.

Objective: The D-KEFS Sorting Task (DST; Delis et al., 2001) requires the ability to identify rules governing the relationship among stimuli (i.e. problem-solving) and to implement and describe these rules. Although such cognitive abilities are thought to involve the frontal and temporal lobes, no study has examined specifically the neural basis of performance on the DST. Therefore, we employed quantitative MRI to examine the contributions of multiple brain regions to performance on the DST and hypothesized that measures of frontal and temporal lobe volumes would significantly predict DST performance.

Participants and Methods: Ninety-eight subjects, including 23 patients with probable Alzheimer's disease (AD), 25 patients with frontotemporal dementia (FTD), 17 patients with semantic dementia (SD), 12 patients with primary progressive aphasia (PPA), 11 patients with progressive supranuclear palsy (PSP), and 10 normal controls underwent MRI brain scans and were administered an abbreviated form of the DST. The DST requires participants to sort cards into piles based on specific stimulus attributes. Additionally, the DST requires participants to explain the reasoning behind the selection of their sorting strategies (total free description score; TFDS).

Results: We used BRAINS2 software to generate volumes of the right and left frontal, temporal, and parietal lobes. Multiple regression analyses showed that, after controlling for Mini-Mental State Examination, overall brain volume, age, and education, only the left frontal and left temporal lobe significantly predicted performance on the DST.

Conclusions: These findings are consistent with the extant neuropsychological and neuroimaging literature indicating integral contributions from the temporal and frontal lobes to problem-solving, categorization, and rule implementation.

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E. FOSTER, G. REPOVS, P. WEAVER & T. HERSHEY. The Relationship Between Executive Dysfunction and Activity Participation in Non-demented Persons with Parkinson's Disease (PD): Connecting the Lab to Everyday Life.

Objective: Non-demented persons with PD demonstrate working memory dysfunction on clinical and laboratory measures compared to controls, but the impact of these deficits on real-world functioning remains untested. The aim of this study was to examine the relationships between laboratory measures of working memory, everyday executive functioning and activity participation in non-demented persons with mild PD.

Participants and Methods: Study participants were 22 PD (age: $M=59.0$, $SD=7.5$) and 28 control (age: $M=59.6$, $SD=7.9$) volunteers. They performed an experimental working memory task (WM) and rated their everyday executive dysfunction (DEXs), activity participation (AP) and depressive symptoms. PD participants also had motor dysfunction and proxy DEX (DEXp) ratings.

Results: Groups had equivalent demographic characteristics and DEXs scores ($p > 0.36$). The PD group had significantly worse WM, more depressive symptoms, and lower AP than the control group ($p < 0.05$). Within the PD group, worse WM was associated with worse DEXp scores, which was associated with lower AP ($p < 0.02$). Within the PD group, DEXp accounted for 22% of variance in AP after accounting for the effects of depressive and motor signs ($p = 0.01$). The overall model accounted for 52% of the variance in AP ($p = 0.003$). There were no significant correlations within the control group ($p > 0.20$).

Conclusions: In non-demented persons with PD, poorer objectively-measured working memory relates to decreased everyday executive function which, in turn, is independently associated with decreased activity participation. Executive dysfunction measured in the lab helps predict functional outcomes in early PD.

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J. FRAZER & K.A. KERNS. Unexpected All-or-None Processing Utilized by Executive Control Systems When Working Memory and Inhibitory Control Demands are Increased.

Objective: To examine the "All-or-None Hypothesis (ANH)" (Diamond, 2005; 2006), positing that executive systems are developmentally 'hard-wired' to process information and respond to the environment using global heuristics, versus a more piecemeal approach. Examining this hypothesis will contribute to the understanding of executive control and cognitive monitoring functions of the frontal lobes. We also examined the effects of Working Memory (WM) and Inhibitory Control (IC) demands on performance, as well as their impact on the ANH.

Participants and Methods: 104 adults were tested on two novel paradigms designed to uniquely test the ANH, while manipulating WM and IC demands independently. Participants' executive 'processing' – monitoring conflict and executing control – was inferred from trial-to-trial changes in reaction times and accuracy data (termed "switch costs").

Results: Performance on both paradigms supported the ANH. However, this effect was greater when participants exerted executive-type inhibition, versus motor-type inhibition. Interestingly, analyses also revealed that increasing the WM load exacerbated the ANH trend, while varying the IC requirements had little effect on this trend. Furthermore, the ANH trend was more evident in accuracy data than in reaction times.

Conclusions: To our knowledge this is the first direct test of Diamond's ANH; which not only supported its unexpected predictions, but extended its specificity in terms of WM and IC demands. Evidence for a possible distinction between motor- and executive-type inhibitions was also found. These findings will be discussed in terms of the impact of such processing heuristics on frontal lobe functioning, especially in terms of the role of WM demands.

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M. GORAL, K. MARTON, A. SPIRO III, M. CLARK-COTTON, L. OBLER & M. ALBERT. Executive Functions Predict Comprehension at Both Ends of the Lifespan.

Objective: Both children with specific language impairment (SLI) and older adults show difficulty comprehending spoken language. Variables that have been proposed to account for these difficulties include working memory, age, vocabulary, among others. Despite their potential role, executive functions (EFs) have virtually not been associated with language comprehension. In this study, we assessed the contribution of EFs to spoken sentence comprehension in two different populations.

Participants and Methods: Fifty children (8-10) and 137 older adults (55-90) were included in the analyses. Each participant completed sentence comprehension tests and the following neuropsychological tests: the Wisconsin Card Sorting Test (WCST), the Stroop test, and the Trails Making test. ANOVAs and regression analyses were conducted to examine the relation between the EF measures and accuracy on the comprehension tests.

Results: Children who performed better on the EF tests showed superior comprehension of sentences varying in syntactic complexity. By contrast, children who had marked difficulty comprehending the sentences (simple and complex) had more perseveration errors, rule violations, and slower response times on the EF measures than the children with the better comprehension skills. A similar pattern emerged for the older adults. Accuracy on the comprehension tests was predicted by the number of perseverative errors on the WCST and the time to complete the Trails tests.

Conclusions: This study demonstrates that selective EFs (such as inhibition control, task switching) predict variability in spoken language comprehension. Further research could identify preserved and impaired EF abilities and their relations to language comprehension across the lifespan.

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D. JOVANOVSKI, K.K. ZAKZANIS, A. TREBLE & Z. CAMPBELL. Ecologically Valid Assessment of Executive Functioning in the (Virtual) Real World: the Multitasking in the City Test.

Objective: Executive functioning is fundamental to independent, purposeful, and self-serving behaviour. Traditional neuropsychological tests of executive functioning have been criticized for lacking ecological validity. Through the use of virtual reality (VR) technology, assessment measures may be developed that hold the potential to enhance the generalization of neuropsychological test performance to real world function. The present study reports findings from a pilot investigation of a novel VR planning test—the Multitasking in the City Test (MCT)—a computerized "errand running" measure designed with ecological validity in mind.

Participants and Methods: A neuropsychological test battery composed of the MCT along with other executive function tests (Trail Making Test B, Tower of London, Behavioural Assessment of the Dysexecutive Syndrome – Modified Six Elements Test) and measures of various cognitive functions (Wechsler Test of Adult Reading, Trail Making Test A, Judgment of Line Orientation, Star Cancellation, and Rivermead Behavioural Memory Test - Story subtest) was administered to 30 normal participants in order to characterize MCT performance and determine associations between the VR test and other tests of executive functioning.

Results: The main finding was that there were no significant correlations between the MCT and most other executive measures, which in turn were found to be correlated ($p < .05$) with each other.

Conclusions: One possible interpretation for these findings is that many current executive tests measure component executive function processes (or the “building blocks”), while MCT performance requires the ability to initiate these component processes, monitor one’s performance, and use this information to adjust behaviour.

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L. KONG, E. GLISKY, A. KASZNAK, L. BIELIAUSKAS & S. RAPCSAK. Source Memory and Executive Functioning in Parkinson’s Disease.

Objective: The aim of this study was to examine how source memory and executive functioning are affected by Parkinson’s Disease (PD). Individuals with PD were tested both on and off medication to further examine the effects that medication may have on these processes.

Participants and Methods: Twenty-four non-demented individuals with PD participated in the study (15 males, 9 females) while both on and off dopaminergic medication. Twenty-four matched control participants were also included. All participants completed an item and source memory task, and various neuropsychological tests thought to measure executive functioning and planning. The PD group completed all neuropsychological tests while in the off-medication state and completed the memory tests while both on and off medication. Composite executive functioning and planning scores were obtained for each subject based on the averaged scores from the tests.

Results: Between-subjects comparisons indicated that the PD group showed significantly impaired performance on the source memory test but not item memory test. Executive functioning and planning composite scores were also significantly lower in the PD group compared to their matched controls. Source memory performance and executive functioning scores were positively correlated. Within-subject comparisons indicated that medication status affected motor symptoms in the PD group but did not significantly impact memory performance.

Conclusions: The findings suggest that source memory and executive functioning are negatively impacted in individuals with PD. Dopaminergic medication had no significant effect on cognitive performance.

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M. KRABILL, Y. SUCHY & E. FRANCHOW. Branching improves ecological validity of executive measures: prediction of functional independence.

Objective: Branching refers to activities in which a person performs one task while monitoring additional task-irrelevant information for signs that a switch to another task is needed (Koechlin, et al. 1999). Although branching inherently relies on executive abilities, not all executive tasks require branching.

Executive abilities are known to be related to functional independence, but there is limited research on the specific role of branching in this relationship. The aim of this study was to compare branching and non-branching executive tasks in their ability to predict functional independence.

Participants and Methods: 56 elderly participants (ages 60 to 85) were administered branching and non-branching executive tasks from 1) the Delis-Kaplan Executive Function System (D-KEFS) and 2) the Behavioral Dyscontrol Scale – electronic version (BDS-ev). Participants were also given the Timed Instrumental Activities of Daily Living Scale (TIADL) as a measure of functional independence.

Results: Receiver Operating Characteristic (ROC) analyses were used to identify which tasks were useful in differentiating participants who made errors on the TIADL task from those who did not. The most useful tasks were those with a branching component: D-KEFS Verbal Fluency Switching (AUC=.702, $p < .05$), D-KEFS Design Fluency Switching (AUC=0.741, $p < .01$), D-KEFS Color-Word Inhibition Switching (AUC=0.758, $p < .01$), and the BDS-ev Branching task (AUC=0.752, $p < .01$).

Conclusions: Branching tasks were more useful as predictors of TIADL performance than non-branching executive tasks. This suggests that branching tasks tap a component of executive skills that is particularly relevant to every-day functioning and as such may have greater ecologic validity than more traditional executive measures.

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J.C. LARSON, Y. SUCHY & M.L. KRABILL. Motor Planning Contributions to Design Fluency Performance: Replication and Extension.

Objective: Design/figural Fluency (DF) is a non-verbal measure of executive functions and is traditionally viewed as a measure of right frontal integrity. However, lesion, imaging and behavioral studies have demonstrated a considerable reliance on left frontal lobe. This may be due to substantial motor planning (MP) demands during DF performance (Krabill et al., 2006). The present study sought to replicate and extend prior findings on MP contributions to DF performance.

Participants and Methods: 50 healthy participants, ages 60-85 years, were administered the following: (1) three DF conditions (Filled Dots, Empty Dots, Switching) from the Delis-Kaplan Executive Function Scale (D-KEFS), (2) two D-KEFS Trail-Making conditions (Motor Speed, Visual Scanning), and (3) MP from the Behavioral Dyscontrol Scale-Electronic Version (BDS-EV; Suchy et al., 2005).

Results: Partialling of variance using hierarchical regressions indicates that MP is the best predictor of DF performance across Filled Dots (24% of variance, $p = .002$), Empty Dots (26% of variance, $p = .016$), and Switching (31% of variance, $p = .014$). However, for Switching, visual scanning also contributed a significant amount of unique variance (21%, $p = .005$). Interestingly, as the conditions increase in difficulty (i.e., interference and switching), visual scanning increasingly contributes to DF performance (Filled Dots: 7%, $p = .330$; Empty Dots: 16%, $p = .055$; Switching: 21%, $p = .005$).

Conclusions: These findings suggest that MP plays an integral role in DF performance across all three conditions, while visual scanning seems to play a lesser role and only contributes with complexity of the task.

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M.W. LEWIS, D.R. BABBA & J.M. LEATHEM. Putting the “Function” back into Executive Functioning.

Objective: It is generally assumed that the cognitive processes necessary in performing neuropsychological tests are the same as those nec-

essary for performing everyday activities. This is despite correlations between neuropsychological tests and everyday behaviors being modest. The current study aimed to develop an ecologically valid measure of executive functioning, using systematic behavioral observation of a functional “real-life” activity.

Participants and Methods: Participants all had sustained a traumatic brain injury. They were each asked to bake chocolate brownies and make a drink, following a recipe provided. Participants were allowed to use any compensatory strategy they had learned during rehabilitation. The task was directly observed by an examiner and videotaped for subsequent inter-rater reliability. Nine components of executive functioning were assessed by two independent raters. Observed performance was compared to scores on two formal measures of executive functioning and to self- and caregiver-reports.

Results: An initial series of trials identified aspects of the scoring procedures that were potentially unclear. These were clarified, with modifications to examiner manuals and procedures improving inter-rater reliability. Final inter-rater reliability of the main study indicated the approach had merit. Correlations with traditional measures of executive functioning and questionnaires support the validity of this approach.

Conclusions: Assessment of a person’s functional performance on everyday tasks after a TBI is routinely undertaken. However, there are few neuropsychological measures that focus on the cognitive aspects of everyday functioning. This study applies structured behavioral assessment techniques to obtain fine-grained information about a person’s cognitive functioning. This approach enables the functional outworking of executive impairment to be documented.

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S. LINDQVIST & L. THORELL. Manipulation of Task Difficulty in Three Inhibitory Control Paradigms.

Objective: Knowledge about how to manipulate degree of difficulty in inhibition tasks is important for at least two reasons. First, it makes it possible to use the same tasks in a wider age range. Second, it is only when using an appropriate level of difficulty that cognitive tasks can be used in clinical practice to distinguish between children with neurodevelopmental disorders and controls.

Participants and Methods: Eighty-six children aged 4-6 years participated in the study. Difficulty was manipulated on two parameters each on three inhibition task paradigms; the go/no-go task, the stop-signal task and the flanker task. The children were matched on sex and age, and then randomly assigned to one condition of each task.

Results: The results showed that difficulty can be manipulated in the stop-signal task by increasing the number of go-stimuli and/or the stop-signal delay. Significant effects were also found on the flanker task, with the children performing more poorly when the number of distractors was high and/or the target stimulus was large. However, no effects on performance were found on the go/no-go task when increasing the number of go-stimuli and/or lowering the inter-stimulus interval.

Conclusions: The present study presents ways in how difficulty can be manipulated in the stop-signal and flanker tasks. The lack of significant effects on task manipulation in the go/no-go task could be a result of differences with regard to the temporal order in which the three types of inhibition develop, with systems related to inhibition of prepotent responses developing earlier than systems related to perseverance and interference. Correspondence: *Sofia Lindqvist, Department of Psychology, Uppsala University, P.O. Box 1225, Uppsala SE-751 42, Sweden. E-mail: sofia.lindqvist@psyk.uu.se*

K.L. LOKKEN & A.G. BOEKA. Prefrontal Systems Involvement in Eating Behavior.

Objective: Evidence from neuroimaging studies support the notion that aberrant eating behavior is associated with dysfunction of prefrontal

systems. Binge eating behavior is defined as the perceived lack of control over eating, marked by periodic dysregulation of eating behavior. It is speculated that prefrontal structures play a pivotal role in the phenomenon of chronic uncontrolled overeating. This study examined the relationship between neurobehavioral traits and binge eating in a sample of morbidly obese individuals.

Participants and Methods: Thirty-eight (81.6% female) obese individuals with a mean Body Mass Index (BMI) of 52.64 were administered the Frontal Systems Behavior Scale (FrSBe) and the Binge Eating Scale (BES) as part of a pre-surgical evaluation for bariatric surgery. The FrSBe is a self-rating scale designed to measure neurobehavioral traits associated with the three primary regions of the prefrontal cortex: 1) the medial prefrontal cortex, measured by the subscale “Apathy”; 2) the orbitofrontal cortex, measured by the subscale “Disinhibition”; and 3) the dorsolateral prefrontal cortex, measured by the subscale “Executive Dysfunction”. The original version of the FrSBe was adapted for use in this study, in that participants were asked only for one global self-rating per item (versus pre- and post-injury ratings).

Results: Results indicated that total score of the BES was significantly correlated with the FrSBe Total Score ($r=.619$, $p<.01$) and with all three subscales of the instrument, FrSBe Apathy ($r=.597$, $p<.01$), FrSBe Disinhibition ($r=.508$, $p<.01$), and FrSBe Executive Dysfunction ($r=.554$, $p<.01$).

Conclusions: Such findings provide further support for the role of prefrontal systems in the regulation of eating behavior.

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E. LUBOYESKI, S. HAN, A.E. LANSING & D.C. DELIS. Developmental Trajectories of Executive Functioning from Childhood through Early Adulthood: Effects of Age and Gender.

Objective: This study examines age and gender effects on executive functioning development from childhood into early adulthood. Previous research suggests that there are specific ages in childhood at which adult level executive skill performance is reached; however these results are limited by restricted age ranges. Furthermore, it is unclear how these trajectories differ by gender.

Participants and Methods: The sample of 649 individuals (53% female), ages 8-30, was drawn from the Delis-Kaplan Executive Function System (DKEFS) standardization study. Participants completed the Wechsler Abbreviated Intelligence Scale and 5 D-KEFS tests: Trail Making, Design Fluency, Verbal Fluency, Color Word and Sorting. A multi-stage forced entry regression procedure was used to determine the amount of variance attributed to age and gender.

Results: Age significantly predicted performance on Sorting Test ($p<.001$) after controlling for IQ and on Trail Making ($p<.001$), Design Fluency ($p<.001$), Verbal Fluency ($p<.001$), and Color Word ($p<.001$) after controlling for IQ and component tasks. There was also a main effect for gender on Sorting ($p<.01$) after controlling for IQ and on Trail Making ($p<.05$), Design Fluency ($p<.05$), and Verbal Fluency ($p<.001$) after controlling for IQ and component tasks. After accounting for IQ, component tasks, age and gender main effects, there were significant gender by age interactions for Design Fluency ($p<.001$) and Verbal Fluency tasks ($p<.001$).

Conclusions: The current study provides evidence for generally increased, but variable ability on executive switching tasks from childhood into early adulthood. With respect to Design Fluency and Verbal Fluency switching tasks, females tended to show more rapid improvements than do their male counterparts.

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M.J. MARQUINE, K. WALTHER, E. GLISKY & S. RAPCSAK. Impaired Self-Knowledge, but Preserved Other-Person Knowledge in a Case of Confabulation.

Objective: The main purpose of the present study was to explore trait self-knowledge in confabulation. Previous studies have shown that different memory disorders might affect an individual's sense of self in varied ways, and that self-knowledge might be spared in at least some memory-impaired individuals.

Participants and Methods: A patient exhibiting a confabulatory syndrome following rupture of an anterior communicating artery aneurysm (JS) participated in the study. JS showed impaired memory and frontal function performance on neuropsychological testing, and significant ventromedial frontal damage on a CT scan. A patient with probable Alzheimer's Disease (EC), who showed a comparable memory deficit to JS, but intact frontal functioning, was recruited to serve as control. We also had six normal controls, and a group of eight informants for patients and controls. Participants completed personality trait questionnaires on two occasions to assess reliability and validity of self- and other-person knowledge.

Results: Pearson product-moment correlation coefficients between personality traits ratings, showed that patient JS was inconsistent in rating himself. However, he was able to consistently and accurately rate his informant, whom he had met after the onset of the confabulatory syndrome. Patient EC and normal controls showed consistent and accurate self- and other-person knowledge.

Conclusions: Trait self-knowledge appears to be impaired in a case of confabulation, in the face of preserved other-person knowledge. These results are consistent with imaging research findings, which implicate ventromedial prefrontal brain areas in the processing of self-relevant information. Furthermore, results from the present study may have important implications for motivational theories of confabulation.

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M. MARTEL, L. PIERCE, J. NIGG, J. JESTER, M. WONG, A. BUU, L. PUTTLER, H. FITZGERALD & R. ZUCKER. Developmental Changes in Executive Function.

Objective: Executive function (EF) has been defined as cognitive operations that permit problem-solving toward goal-directed behavior (Pennington & Ozonoff, 1996). This study examined developmental change in the latent construct of EF during adolescence in a longitudinal sample of adolescents at risk for alcoholism.

Participants and Methods: Participants were 676 children (488 boys, 188 girls) from 322 families who completed at least one wave of data collection of a multi-wave study (Zucker et al., 2000). EF measures were collected during early (ages 12-14) and late (ages 15-17) adolescence, and consisted of response inhibition (Stop task), set-shifting (Trail-making Test), interference control (Stroop Test), planning (Tower of Hanoi), and speed (Symbol Digit Modalities Test).

Results: A single factor EF model was estimated separately during early and middle adolescence, controlling for age within wave. At ages 12-14, the model fit poorly ($\chi^2 [5] = 18.54, p < .01, CFI = .68, TLI = .36, RMSEA = .08$). At ages 15-17, the model provided a close fit to the data ($\chi^2 [5] = 4.71, p > .05, CFI = 1.00, TLI = 1.01, RMSEA = .00$); all EF loadings were significant, with highest loadings seen for speed (.63), set-shifting (.46), and response inhibition (.45). Adding IQ to the model did not significantly improve fit, although IQ loaded highly on the EF factor. Overall, the fit of the EF model was better during late adolescence.

Conclusions: EF processes may not be fully developed until late adolescence. During late adolescence, EFs may consolidate, influenced by prefrontal cortex synaptic pruning (Blakemore & Choudhury, 2006). Correspondence: *Michelle Martel, M.A., Learning Support Center, Texas Children's Hospital, 6621 Fannin St. CC 1630.66, Houston, TX 77030-2399. E-mail: mmmartel@texashospital.org*

A.E. MOLNAR, G.R. MESMAN & M.Y. KIBBY. Specific versus Common Executive Deficits in ADHD-C and ADHD-PI Using the BRIEF.

Objective: Co-morbidity research suggests that ADHD-C and ADHD-PI may be different disorders, whereas some neuropsychological research suggests these subtypes are synonymous. The purpose of our investigation was to examine differences in executive functioning between these subtypes using the Behavior Rating Inventory of Executive Functioning (BRIEF). It was hypothesized that children with ADHD-C would demonstrate greater deficits on the Behavioral Regulation Index (BRI) while both subtypes would be impaired on the Metacognition Index (MI).

Participants and Methods: All participants, ages 8-12 years, underwent neuropsychological evaluation as part of a larger study (R03 HD048752). Participants included 16 children with ADHD-C, 22 with ADHD-PI, and 39 controls. Parents completed the BRIEF as part of this study.

Results: Groups differed in FSIQ; thus, FSIQ was used as a covariate as it was moderately correlated with executive functioning. Using MANCOVA, groups differed on BRI and MI. ADHD-C had worse symptoms than ADHD-PI and controls on the BRI; ADHD-PI and controls were comparable. No differences were found between ADHD subtypes on the MI, and both subtypes had more symptoms than controls. Next, two additional MANCOVAs were run to analyze subscale performance. On subscales comprising the BRI, ADHD-C had greater symptoms than ADHD-PI and controls on Inhibit. Both subtypes had deficits in Emotional Control, and ADHD-C had deficits in Shift compared to controls. On all subscales comprising the MI, both subtypes had deficits but were comparable to each other.

Conclusions: Our findings support theories suggesting ADHD subtypes can be differentiated on the basis of behavioral regulation skills but not underlying cognitive abilities.

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C. NIKI, Y. MURAGAKI, T. MARUYAMA & T. KUMADA. Can patients with right frontal lobe damage intentionally inhibit activational action schema?

Objective: Action disorganization syndrome (ADS) refers to symptom that shows failure of familiar sequential tasks (Schwartz et al. 1991). We reported that patients with lesions limited to the right frontal lobe showed distractor errors that an unnecessary, distractor objects were used in performing a target sequential task (Niki, et al., 2005). Although ADS patients could not inhibit action schema of distractor objects, resulted distractor errors, it remains unclear the mechanism. In this study, we examined patients with right frontal brain tumor on performance of an utilisation behaviour task (Humphreys and Forde, 1998) to examine whether ADS patients who showed distractor errors could intentionally control action schema activated by objects.

Participants and Methods: Three patients were given a simple command to follow. There were two types of command; conventional action (e.g., write a post-code to an envelope), and novel action (e.g., write a post-code to a stamp).

Results: One of ADS patients could obey novel commands, but the other two could not. The latter two patients showed conventional action when novel action commands were given.

Conclusions: The result that there was a patient who could correctly follow the novel action command suggest that intentional control for action schema was not always important function for emerging distractor errors found in familiar sequential task. Distractor errors could not be accounted by impairment of intentional inhibitory function revealed by the utilization behaviour task. Another type of inhibition process should be considered.

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J. POOLE, S. MELISSA, M. DAHDAH, M. BUI, J. WAGER & L. SPINA. Profiles of Impairment in Traumatic Brain Injury using the Delis-Kaplan Executive Function System.

Objective: The Delis-Kaplan Executive Function System (DKEFS) consists of 9 tests, redesigned from traditional measures of executive abilities. This study provides a profile of DKEFS performance in patients recovering from traumatic brain injury (TBI).

Participants and Methods: Subjects: 30 patients with moderate to severe TBI, age 20-51 (median 28), median education 13 years. Brain injuries were mainly multifocal on neuroimaging, 65% were in coma 2+ hours; 85% had post-traumatic amnesia for 7+ days. Subjects were tested 2 months to 6 years post-injury (median 14 months). Impairment was defined as performance below the 5th percentile of the DKEFS standardization sample ($SS < 5$).

Results: 75% of subjects showed impairment on at least one DKEFS test. Performance was significantly reduced on six tests (with the most sensitive subtests noted): Color-Word (47% of subjects impaired on Inhibition-Switching), Word Context (40%, Total Achievement), Verbal Fluency (30%, Category Switching), Proverbs (25%, Multiple Choice), Sorting (25%, Sort Recognition), and Trails (16%, Switching). An Executive Index computed from these six tests had moderately high reliability ($\alpha > 0.7$). On Sorting and Proverbs, subjects had greater difficulty on recognition subtests than on free response subtests. The Twenty Questions and Tower tests showed low sensitivity to the effects of TBI.

Conclusions: This study delineated executive abilities that are likely to be impaired by TBI, and DKEFS subtests that identify these deficits. Patients with TBI had difficulty switching between tasks, inhibiting automatic responses, using deductive reasoning, and flexibly recognizing conceptual categories. A summary Executive Index, from six DKEFS subtests promise as an efficient, sensitive and reliable measure of executive dysfunction in TBI. Future validation studies will examine whether these measures can identify patients who are prone to dysexecutive behavioral problems and need compensatory interventions after TBI.

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K.L. POSSIN, H.J. ROSEN, S.M. BRAMBATI, V. BECKMAN, B.L. MILLER & J.H. KRAMER. Rule Violation Errors are Associated with Right Dorsolateral Prefrontal Cortex Atrophy in Neurodegenerative Disease.

Objective: There is growing evidence that the errors made on tests of executive functioning can be clinically useful, but the meanings of these errors are not well understood from a cognitive process or neural standpoint. It was hypothesized that rule violation errors made across executive tests tap failures in working memory response inhibition, and that they are associated with atrophy in right dorsolateral prefrontal cortex.

Participants and Methods: MRI images and neuropsychological test data were collected from 118 participants diagnosed with Alzheimer's disease (16), frontotemporal dementia (19), semantic dementia (14), progressive supranuclear palsy (3), corticobasal degeneration (9), amyotrophic lateral sclerosis (3), or mild cognitive impairment (37), or identified as neurologically healthy (17). Principal components analysis showed that rule violation errors made across four subtests from the Delis-Kaplan Executive Function System tapped a shared construct separate from repetition errors, and based on these results, rule violation factor scores were generated. The relationship between the factor scores and regional differences in grey matter atrophy was examined using voxel-based morphometry (VBM).

Results: A covariates-only statistical model was used with age, sex, and MMSE scores entered as nuisance covariates, and total grey matter volume entered as a global covariate. After whole-brain correction for multiple comparisons (SPM family-wise error), a significant relationship was observed between rule violation errors and VBM-determined atrophy in right dorsolateral prefrontal cortex ($p = .025$).

Conclusions: Rule violation errors made across tests of executive functioning are associated with right dorsolateral prefrontal atrophy in neurodegenerative disease, a brain region understood to play a critical role in working memory and inhibitory control. This study supports the use of these errors as a measure of working memory response inhibition, and further, provides a neuroanatomical context for their interpretation.

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J. POYSKY, C. HODGES & T. LOTZE. Executive dysfunction is predictive of social and school problems in Duchenne muscular dystrophy.

Objective: Duchenne muscular dystrophy (DMD) is an X-linked genetic disorder characterized by progressive muscle degeneration. The condition has also been associated with increased risk for cognitive/learning deficits, neurobehavioral disorders, and social problems. Although neurophysiological studies suggest frontal-cerebellar system involvement, studies evaluating the presence and impact of executive dysfunction (EXD) are limited and equivocal. The goal of the present study was to examine the relationship between EXD and psychosocial quality of life in boys with DMD.

Participants and Methods: Patients with mental retardation or autism were not enrolled. Twenty-four males, ages 4 to 18, were recruited from the MDA clinic at Texas Children's Hospital. Guardians completed the Behavior Rating Inventory of Executive Function (BRIEF) and PedsQL.

Results: Multiple regression indicated EXD is significantly predictive of poorer overall psychosocial quality of life in DMD ($R = .52, p < .001$), while controlling for disease severity ($R = .27, p = .20$). Post-hoc analyses indicated EXD accounts for a significant amount of the variability in social ($R^2 = .15, p = .05$) and school ($R^2 = .39, p < .001$) functioning, but not emotional adjustment ($R^2 = .04, p = .29$).

Conclusions: Executive dysfunction is related to poorer overall psychosocial quality of life in DMD, and is predominantly associated with school and social problems. These results highlight the need for additional research examining the prevalence and impact of executive deficits in DMD.

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D.T. PULSIPHER, M. SEIDENBERG, B. HERMANN, L. GUIDOTTI & J. MORTON. Thalamo-Frontal and Executive Dysfunction in Juvenile Myoclonic Epilepsy.

Objective: Previous studies in juvenile myoclonic epilepsy (JME), a common childhood idiopathic generalized seizure syndrome, have identified morphometric abnormalities in the thalamus and frontal lobes. Both structures are significantly involved in the expression of generalized seizures, have substantial interconnectivity, and are presumed to play a major role in executive functioning. Executive dysfunction has also been noted in childhood onset epilepsy, but it is unclear if this is associated with thalamo-frontal abnormalities. This study examined thalamic and frontal lobe volumes, executive function, and their interrelationship in JME.

Participants and Methods: Twenty children with recent onset JME and 51 healthy controls underwent quantitative MRI and comprehensive neuropsychological evaluation. The thalamus was manually traced and segmented frontal lobe volumes were obtained through an automated process. Select subtests from the Delis-Kaplan Executive Function System (D-KEFS) and the Behavior Rating Inventory of Executive Function (BRIEF) were used as measures of executive functioning.

Results: JME subjects had significantly smaller thalamic and frontal grey matter, and increased frontal CSF. JME subjects performed worse on color-word inhibition on the D-KEFS and their parents reported more

impairments on most BRIEF subscales. No significant correlations were found between the thalamus and executive function measures for either group. In contrast, significant correlations between D-KEFS word fluency category switching accuracy and frontal white matter were observed for the JME group. The control group had significant correlations between category switching accuracy and frontal gray matter, but not frontal white matter.

Conclusions: Children with JME have significantly smaller thalamic and frontal lobe gray matter, as well as significant executive dysfunction. Frontal lobe, and not thalamic, volumes appear to mediate the relationship between executive functioning and brain structure in JME.

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C. ROACHE, E.J. LUBOYESKI & G.N. HOLMBECK. Executive Functioning as a Predictor of Scholastic Functioning in Adolescents with and without Spina Bifida.

Objective: The current study examines whether executive functioning (EF) predicts scholastic outcomes for adolescents with spina bifida (SB) and their able-bodied (AB) peers. Recent research indicates that EF and rote-knowledge skills are divergent constructs. However, it is unclear how and if the presentation of these skill-sets differs for youth with neural tube defects, such as SB.

Participants and Methods: Participants included 68 adolescents with spina bifida and a matched sample of 68 able-bodied adolescents. At baseline, adolescents (ages 14 and 15) were administered portions of the Cognitive Assessment Systems (CAS), providing composite scores for Planning and Attention. Parents and teachers completed the Behavior Rating Inventory of Executive Function (BRIEF); which included 5 EF domains: Initiation, Sustained Attention, Organization, Planning, and Working Memory. Scholastic functioning was measured via parent and teacher report of grades two years later. Multiple regression analyses were conducted to determine the influence of EF on scholastic functioning.

Results: The BRIEF Planning subscale consistently predicted grades for AB adolescents ($p < .05$), whereas Organization predicted grades for adolescents with SB ($p < .05$). CAS Attention composite scores significantly predicted math grades for the SB group ($p < .05$), whereas Planning and Attention composites did not significantly predict grades for AB adolescents ($p > .05$).

Conclusions: Results suggest that real-world based assessments of EF (BRIEF) measure domains disparate from those measured by traditional laboratory-based neuropsychological assessments. Furthermore, the current study indicates that adolescents with SB may be utilizing EF differently than their able-bodied peers, thereby signifying the need for alternate teaching strategies and measures of academic ability for adolescents with SB.

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F.F. SARAZIN & C. TOUCHIE. Chronic severe executive and neurobehavioral dysfunction post recovery from hypothyroidism: A longterm follow-up case study.

Objective: Hypothyroidism is associated with deficits in memory, concentration, motor speed, and mood changes. Although improved performance occurs with replacement therapy, residual cognitive deficits may remain after a return to euthyroid state. This case-report illustrates the presence of a debilitating frontal system executive syndrome secondary to hypothyroidism, with persistent neurocognitive and neurobehavioral sequelae, despite restoration of thyroid levels. The ensuing psychosocial losses underscore the importance of transdisciplinary case management and research between neuropsychology, endocrinology, and neurorehabilitation.

Participants and Methods: A 47-year old college-educated woman with no prior neurological or psychiatric history was treated with radioactive ablation therapy for Grave's disease (hyperthyroidism). Her recovery was complicated by acute hypothyroidism and slowness to achieve and maintain a stable euthyroid state. Over the course of 4 years, she was followed for serial neuropsychological assessments and cognitive-behavioral remediation strategies.

Results: Neurobehavioral observations, neuropsychological testing, and completion of the FrSBe (by patient and family members) documented a prominent disturbance in executive and personality functions. Primary deficits featured impairment in initiation and maintenance of goal-directed behaviors, disinhibition, cognitive/behavioral disorganization, distractibility, as well as loss of social graces/judgment. More typical hypothyroid-associated deficits were also seen in complex attention, processing speed, and memory/learning.

Conclusions: This case-report is the first to delineate exquisite executive dysfunction and behavioral changes as a persistent and devastating manifestation of acute and prolonged hypothyroidism. Collaborative transdisciplinary research beyond single-case investigations is essential to further elucidate the underlying etiology of such frontal system dysfunction and the extent of potential recovery with cognitive rehabilitation.

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G.N. SAVLA, D.V. JESTE & B.W. PALMER. Do Executive Functions Uniquely Contribute to Capacity to Consent to Research Among People with Schizophrenia?

Objective: Our aim was to examine the degree of unique variance explained by executive functions, such as abstraction, and novel concept formation on decision making capacity among middle-aged and older individuals with schizophrenia, while controlling for level of overall cognitive impairment.

Participants and Methods: Our sample consisted of 169 individuals with schizophrenia (mean age = 51.0, SD = 6.9). Decision making capacity was evaluated with the total score from the University of California, San Diego Brief Assessment of Capacity to Consent (UBACC), a relatively new measure of decision making capacity (Jeste et al., 2007). Severity of overall cognitive deficits was measured with the total score from the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS), and executive functions were measured by three tests from the Delis-Kaplan Executive Function System (D-KEFS), i.e., the Word Context Test, the Proverb Test, and the Sorting Test. We conducted three separate hierarchical linear regression analyses on the primary total achievement scores on the three D-KEFS tests, while controlling for the RBANS total index score, and examined the semi-partial correlations to parse out the unique contribution of each D-KEFS measure.

Results: Our full models for Word Context, Proverb and Sorting tests were significant, explaining 34.5%, 39.6%, and 31.7% of the total variance on the UBACC, respectively (all p s $< .05$). While there was considerable overlap in the variance explained by RBANS and each executive functioning measure, the unique contribution of the three D-KEFS measures was 4.6%, 10.1%, and 2.3%, respectively (all p s $< .05$).

Conclusions: Our results imply that executive functioning abilities, such as abstraction and novel concept formation may uniquely contribute to capacity to consent to research among individuals with schizophrenia. However, the increment in predictive value above and beyond general cognitive functioning may be small to moderate, depending on the type of executive function assessed.

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E. SCHLICHTING, S. CORREIA, P. MALLOY & S. SALLOWAY. Classification of Patients with Mild Cognitive Impairment vs. Normal Controls Based on Experimental and Standardized Measures of Processing Speed and Working Memory.

Objective: To determine if N-back and Self-Ordered Pointing Tasks (SOPT) improve upon standard measures of processing speed and working memory for classifying patients with mild cognitive impairment (MCI) vs. cognitively normal controls (NC).

Participants and Methods: Twenty-six patients with MCI (Petersen criteria) and 20 age-matched NCs undertook a battery of cognitive tests as part of a study on frontal systems functioning in MCI. MANOVA was used to evaluate group differences and select measures for discriminant function analyses (DFAs). Three separate DFAs were conducted, one using standardized measures of processing speed, executive function and working memory, a second using the n-back and SOPT, and a third with measures retained in the two prior DFAs. Wilks' Lambda values from the three DFAs were examined to determine the combination of measures providing the greatest effect size (1-Wilks' lambda) for group classification.

Results: MANOVA revealed a significant multivariate effect for group, ($p < .001$). Measures retained in first DFA (Wilks' Lambda = .48; $p < .001$) were Symbol-Digit Modalities Test (SDMT) and Spatial Span (backward). Measures retained in the second DFA (Wilks' Lambda = .40, $p < .001$) were errors on SOPT (designs) and 3-back accuracy. In the third DFA, these variables produced one significant function (Wilks' Lambda = .28, $p < .001$). Discriminant loadings were SOPT (designs) ($r = -.59$), 3-back (total correct) ($r = .49$), SDMT ($r = .50$), and Spatial Span (backward) ($r = .41$).

Conclusions: Including N-back and SOPT variables with standardized measures of processing speed and working memory improved classification (i.e., increased effect size) of MCI vs. NC.

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D.J. SCHRETLEN, J.M. WINICKI, T.D. VANNORS DALL, S.A. MEDA, G.D. PEARLSON & B. GORDON. Voxel-Based Morphometric Analysis of Iowa Gambling Task Performance in Healthy Adults.

Objective: The Iowa Gambling Task (IGT) was originally presented as a decision-making task with putative sensitivity to orbitofrontal brain lesions. However, studies of patients with well characterized lesions have yielded mixed results concerning the location of lesions that impair IGT performance. Here we report a whole-brain analysis of regional gray matter (GM) volume associated with IGT performance (advantageous choices).

Participants and Methods: Participants included 114 healthy adults who were 20–92 years old. Each participant underwent a brain MRI scan in which T1-weighted 3D images were registered to a standard template, spatially normalized, and smoothed for voxel-based morphometric (VBM) analyses of IGT performance with age and GM-to-intracranial volume as covariates.

Results: Analyses revealed that IGT performance correlates with reduced GM volume over large portions of the prefrontal cortex using a false-discovery-corrected $p < 0.01$. Using a more stringent family-wise error correction ($p < 0.05$), reduced GM volume in the left dorsolateral prefrontal cortex correlated most strongly with the number of advantageous choices made on the IGT ($t = 4.71$). Volume reductions also were observed in the right cerebellum.

Conclusions: The results of this large descriptive study suggest that risk/reward decision making is more closely associated with individual differences in cortical regions that are thought to subservise working memory and other executive functions than with centers that regulate impulse control and reward-driven behaviors in normal healthy adults. We relate these results to previously-reported relationships between performance on the IGT and other neuropsychological measures in the same participants.

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S.S. SMITH, P.S. HAAN, R. KHATTREE, L.L. SYMONDS, J.R. OS-UCH, B. GIORDANI & M.J. BOIVIN. Cognitive Impairment in Women Newly Diagnosed with Breast Cancer.

Objective: Studies reporting decreased cognitive ability in women with breast cancer propose that treatment for the disease (e.g., radiation/chemotherapy) may be a major factor. We suggest that psychosocial factors (e.g., stress) affect cognitive ability independent from treatment. This study is an on-going examination of cognitive ability in women newly diagnosed with breast cancer.

Participants and Methods: Fifty-eight women (17 breast cancer patients prior to chemotherapy/radiation, 21 women with recent benign diagnoses, 20 women who completed treatment at least one year previous; mean age = 53.17 years) participated in a computer administered comprehensive cognitive evaluation (CogState). Accuracy and speed on separate working memory tasks were evaluated using one-way ANOVAs and Scheffe's post hoc comparisons.

Results: Women recently diagnosed with breast cancer were slower and less accurate on a spatial learning/working memory test compared to the other groups. (Full-model p values: speed, 0.041; accuracy, 0.032; post hoc comparisons, $p < 0.05$). Newly diagnosed women with breast cancer were significantly less accurate on a one-back working memory test than women who had completed treatment ("survivors"), while their performance difference from the benign diagnosis group was marginally significant (full model $p = .051$). In a simple speed of information processing test, breast cancer patients were not significantly different from women with a benign diagnosis, but were significantly slower than breast cancer survivors.

Conclusions: The results suggest that cognitive difficulties in women with a new breast cancer diagnosis may be related to stress as a result of the cancer diagnosis, and not simply the effects of radiation/chemotherapy.

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E.E. SUNDERMANN, L. RUBIN, K. MORDECAI & P.M. MAKI. Relationships Between Nonverbal and Verbal Measures of Fluency.

Objective: Despite the frequent use of nonverbal and verbal fluency measures in neuropsychological research, little has been published about interrelationships among these measures. The aim was to evaluate the relationships among phonological, semantic, design and rhyme fluency performance in healthy adults in order to provide insight into their clinical usefulness for assessing executive function.

Participants and Methods: A sample of 71 healthy adults (mean age = 22, mean education = 14) completed tests of design (fixed and free conditions), phonological, semantic, and rhyme (easy and difficult conditions) fluency. The Digit Symbol Substitution Test (DSST) was also administered.

Results: Scores on the fixed design fluency condition were significantly related to scores on the easy condition of rhyme fluency ($p < .05$) and the phonological fluency task ($p < .05$). The free condition of design fluency showed no significant relationships with other fluency measures. Both fixed and free measures correlated with DSST performance ($p < .05$). Scores on the rhyme fluency task across both conditions were significantly related to semantic ($p < .001$) and phonological fluency tasks ($p < .001$).

Conclusions: Speed of processing predicts performance on both fixed and free measures of design fluency, but only fixed design fluency significantly related to verbal fluency measures. This pattern may reflect the less constrained structure of the free design fluency task compared to other fluency measures.

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M. SWANSON, C. SULLIVAN, M. DAHDAH & J. POOLE. Sensitivity of DKEFS Fluency, Trails and Color-Word Inhibition Compared to their Traditional Counterparts in Assessing Traumatic Brain Injury.

Objective: The Delis-Kaplan Executive Function System (DKEFS) was developed to enhance sensitivity to executive deficits and the ability to parse these from other cognitive difficulties. We compared TBI patients' performance on DKEFS Trails, Verbal Fluency, Design Fluency, & Color-Word Interference to the original Trail Making Test (TMT), Verbal Fluency, Jones-Gottman Design Fluency, and Stroop Tests.

Participants and Methods: Subjects were 27 patients with moderate to severe TBI, median age 30, median education 14. They were administered the above tests 2 months to 6 years post TBI (median 14 months). Spearman correlations and paired sample t-tests were used to evaluate similarity and differences between the two versions of each test, based on published norms.

Results: The DKEFS tests were all significantly correlated with their traditional counterparts ($r = .4$ to $.8$, $p < .05$). Subjects showed significantly more impairment on the Jones-Gottman Design Fluency than on the DKEFS version ($p < .002$). Conversely, the DKEFS Color-Word Inhibition-Switching task showed greater impairment than the traditional Stroop ($p < .03$). The DKEFS Trails and traditional TMT did not differ in level of performance; however, the DKEFS visual scanning and motor speed subtests showed potentially informative correlations with Trails A only ($r = .6$, $p < .004$). None of the DKEFS Verbal Fluency subtests differed significantly from their traditional counterparts.

Conclusions: (1) The Jones-Gottman Design Fluency test shows greater sensitivity to impairment than the DKEFS version, perhaps due to the former test's unstructured format and requirement for sustained performance. (2) The switching condition of the DKEFS Color-Word test is more sensitive to cognitive impairment than the traditional Stroop. (3) DKEFS Trails and Verbal Fluency show equivalent sensitivity to their traditional counterparts; however, the additional trials on DKEFS Trails are useful in identifying attention and motor contribution to test performance. Correspondence: *Campbell Sullivan, MA, VA Palo Alto and Stanford University, 3801 Miranda Ave, Palo Alto, CA 94304. E-mail: campbell.sullivan@stanford.edu*

C. TILLMAN, G. BOHLIN, L. SORENSEN & A. LUNDERVOLD. Working Memory, Inhibition, and Sustained Attention as Independent Predictors of Intelligence in Children.

Objective: The majority of the cognitive functions that have been suggested to be important for intellectual ability are overlapping processes, which makes it essential to look at the independent contributions made by several of these functions when attempting to understand the nature of these relations to intelligence. Research of this type is very limited, especially in children. The present study investigated how components of the WM system, inhibition, and sustained attention, independent of each other, relate to fluid and crystallized intelligence in children.

Participants and Methods: Two hundred and seventy-eight 8-11 year old children were tested on WISC-III to obtain measures of the WM components, general processing speed, and intelligence (these functions were measured by non-overlapping subtests). Sustained attention was assessed by a Continuous Performance Test and inhibition was measured by the Stroop and Flanker task.

Results: The results from multiple regression analyses firstly indicated that both short-term storage and executive processes of the WM system were independently relevant in the relation to intelligence in children. Secondly, our results are suggestive of the executive WM component and inhibition being independent functions, at least in the relation to intelligence. Thirdly, we showed that sustained attention, and the WM components and inhibition, respectively, each explained unique parts of the variance in intelligence. Further, all of these relations stayed significant when general processing speed was controlled for.

Conclusions: In summary, we found evidence for clear independence of the WM components, inhibition, and sustained attention in the prediction of intelligence in children – a notion that has been debated in previous research on adults.

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J.M. VAN ADEL & K.A. KERNS. The Development of Multitasking in Children.

Objective: The coordination and performance of multiple concurrent activities is a skill described to lie at the very heart of competency in everyday life (Burgess, 2000). Impairment in the organization of multiple intended actions has been shown to result in difficulties leading effective, independent lives. The purpose of the current study is to examine the development of the ability to multitask in children, as well other executive control processes that likely underlie goal-directed behavior in novel situations - including prospective memory (PM), working memory (WM) and inhibition.

Participants and Methods: 27 children ages 7-11 completed an experimental multitasking paradigm, the Children's Multiple Activities Game (CMAG), and an existing measure, the Six Parts Test (SPT) from the Behavioural Assessment of the Dysexecutive Syndrome in Children (BADSC). Two WM tasks, two inhibition tasks and a PM task were also be used to investigate the cognitive processes that multitasking may rely on

Results: Analyses revealed that age was significantly correlated with multitasking performance (CMAG & SPT) as well as WM and inhibition. Furthermore, performance on the CMAG was found to be related to a number of executive abilities including WM, inhibition and especially PM; while the SPT was only related to a measure of WM.

Conclusions: Results indicated that multitasking ability improves across this age range and is related to a number of executive abilities thought to underlie it. Path analysis will be presented to provide a better understanding of the development of multitasking in children and address which cognitive processes are crucial and account for its variation. Correspondence: *James M. Van Adel, Psychology, University of Victoria, 4250 Quadra St, Victoria, BC V8X 2L5, Canada. E-mail: mikeranadel@hotmail.com*

J. VASSILEVA, R. GONZALEZ & E. MARTIN. Impaired Decision-Making in Antisocial MDMA Users.

Objective: Research suggests that recreational users of the common club drug 3,4-methylenedioxymethamphetamine (MDMA, "Ecstasy") evidence neurocognitive deficits consistent with increased impulsivity and impaired decision-making. Similar deficits are often exhibited by antisocial individuals. The aim of this study was to examine the effects of antisociality on decision-making and impulsivity in recreational MDMA users.

Participants and Methods: One hundred and five HIV-seronegative male recreational users of MDMA were classified as "antisocial" (n=49) and "non-antisocial" (n=56) based on a median split of their scores on

the Socialization Scale of the California Psychological Inventory (So-CPI). The two groups were matched on severity of MDMA and other drug use and abstinence at testing was verified by tox screening. All subjects completed the computerized version of the Iowa Gambling Task, a well-known measure of decision-making and cognitive impulsivity.

Results: A mixed-model ANOVA revealed that antisocial MDMA users performed significantly worse than non-antisocial MDMA users on the IGT, indicated by significantly more disadvantageous decisions [$F(1,103)=8.48, p<.004$]. The main effect of antisociality remained significant ($p<.02$) after controlling for potentially confounding effects of demographic variables.

Conclusions: Results suggest that antisociality may exacerbate decision-making deficits in recreational MDMA users and its effects should be considered by future studies.

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C. VEGA, M. FERNANDEZ & R. NAIDOO. Cognitive Flexibility in Spanish/English Bilingual Children.

Objective: Existing data indicates that bilingual (BIL) children exhibit better selective attention and inhibitory control compared to their monolingual (MON) peers (Bialystok 1999; 2004), but other developmental aspects of executive skills in relation to bilingualism remain unexplored. We examined cognitive flexibility and set shifting in Spanish-English BIL and English MON children using the Wisconsin Card Sorting Test (WCST), and hypothesize a lower rate of perseverative responses and errors in the bilingual group.

Participants and Methods: A total of forty children (23 females, 17 males) were recruited from a private elementary school in South Florida. The Oral Vocabulary subtest of the Bilingual Verbal Ability Tests (Munoz-Sandoval, Cummings, Alvarado, Ruef, 1998) was used to classify children as MON or BIL based on established criteria. Demographic variables were contrasted with t-test or chi-square comparisons. The WCST and the Wechsler Abbreviated Scale of Intelligence (WASI) were administered to all subjects, and group performance was analyzed utilizing independent sample t-tests. Additionally, the relationship between degree of bilingualism and WCST performance was explored with Pearson's product-moment correlation coefficients.

Results: Demographic data and intellectual score comparisons did not reveal differences between the BIL and MON groups. On the WCST, the BIL group made significantly fewer perseverative responses ($p=.004$) and errors ($p=.006$). The sample as a whole showed an inverse relationship between degree of bilingualism and set shifting capacity ($p<.05$).

Conclusions: Our findings indicate that bilingual children demonstrate better cognitive flexibility and set-shifting skills relative to their monolingual counterparts after controlling for age, gender, and intellectual capacity. Becoming bilingual during childhood requires the development of mental constructs to contextually differentiate between languages, thus enhancing cognitive flexibility and set shifting capacity.

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M.C. WAGNER, A.E. MOLNAR, P.J. MOLFESE, J. BESWICK, V.J. MOLFESE & D.L. MOLFESE. Electrophysiological Indices of Age-Related Differences in Response Inhibition.

Objective: The N2 component of the ERP over medial-frontal sites has been studied as an index of cognitive control in children (Lamm, Zelazo, & Lewis, 2006). The present study sought to expand our current knowledge of inhibitory control development by measuring age related changes in electrical brain activity during a response inhibition task.

Participants and Methods: 105 children ages 5-8 ($M = 72$ months) completed a computerized response inhibition task while electrical brain activity was recorded using 128-channel high-density array brain recording systems (EGI, Inc.).

Results: ERP data were analyzed using temporal principal component analysis (PCA), which yielded a 5-factor solution accounting for 88.57% of the total variance. Factors were analyzed using repeated measures ANOVAs: Visual Field (2) X Condition (3) X Electrode (5) X Hemisphere (2) by between-subjects variables Age and Sex. Analyses of Factor 1 identified a significant 3 way interaction for Age, Condition, and Hemisphere, $F(6,198) = 2.53, p = .022$, that characterized variability between 236 - 592 ms post stimulus onset. Factor 2 analyses identified a significant 3 way interaction for Age, Electrode, and Hemisphere, $F(7, 243), = 2.72, p = .009$, for a later portion of the ERP between 388 - 700 ms. A significant 3-way interaction for Age, Condition, and Hemisphere, $F(6, 198), 2.31, p = .036$, occurred in Factor 4 (64 - 192 ms).

Conclusions: Results indicate ERP responses differ as a function of age in three components of the waveform that interact with condition and differences in voltages across the scalp.

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J.A. WELLER, E.W. TWAMLEY & C.H. ZURHELLEN. Executive Dysfunction in Suicide Ideators and Suicide Attempters.

Objective: The elevated risk of suicidal behavior in individuals with serious mental illness may reflect impulsivity and impaired problem-solving ability, neuropsychological domains associated with orbitofrontal and dorsolateral-prefrontal functioning. Research in this area may identify potential targets of treatment to reduce suicidal behavior in at-risk groups.

Participants and Methods: In the current study, 36 suicide attempters and 23 suicide ideators who did not make an attempt completed a brief neuropsychological battery. Participants represented a broad range of ages, education levels, estimated IQ scores, and diagnoses (depression, bipolar disorder, psychotic disorders, and borderline personality disorder).

Results: With impairment defined as a T-score <40 , 44% of the sample was impaired on Trails B and 42% were impaired on verbal fluency. On the Wisconsin Card Sorting Test-64, 35% were impaired on conceptual level responses and nonperseverative errors, 31% were impaired on total errors, 41% achieved <3 category sorts, and 33% made at least one set-loss error. Most participants performed normally on a continuous performance test, but 56% were impaired on the Stroop Interference condition.

Conclusions: These preliminary results support the notion of impaired dorsolateral-prefrontal and orbitofrontal executive functions in both groups; however, the groups did not differ significantly with respect to the degree of impairment. Further research in this area may identify potential targets of treatment to reduce suicidal behavior in at-risk groups.

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M. WELSH, P. GORMAN BARRY, N. SPERAKAS & J. CHESTNUT. A Longitudinal Study of Executive Functions in a Low-Income Hispanic Sample of Young Children.

Objective: Currently, there exists a paucity of information regarding the association between sociodemographic factors such as ethnicity, native language, and family SES and children's performance on traditional executive function tasks.

Participants and Methods: Ninety-three male and female 2nd-graders who were low-income, Hispanic (99%), and either primarily English-speaking (N=51) or Spanish-speaking (N=42) participated in the spring of 2006. In follow-up testing one year later (3rd grade), 28 of the primarily English-speaking children and 31 of the primarily Spanish-speaking remained in the sample, with approximately equal numbers of males and females in each group. The executive function measures were administered in the participants' preferred language (held constant from 2nd to 3rd grade) and included: the NEPSY Tower of London and Stroop.

Results: The impact of Gender, Language of Administration, and Session (2nd vs 3rd grade) were analyzed. Improved performance from 2nd to 3rd grade was found for TOL accuracy and Stroop conflict task performance, but not for the more specific Stroop interference measures. Session X Language interactions reflected greater improvement for Spanish-speaking children on the TOL, and for English-speaking children on the Stroop conflict task. Gender X Language interactions were found for the two specific Stroop interference measures, such that Spanish-speaking males showed better inhibition than English-speaking males, but the reverse was true for females. Finally, the Stroop scores showed reasonable stability over the one year period, whereas, the NEPSY TOL scores did not.

Conclusions: These findings suggest the need to carefully describe group differences on executive function tests as a foundation for future studies designed to examine the contributions to these variations.

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J.M. WINICKI, B. GORDON & D.J. SCHRETLEN. Reliability, Validity, and Normative Data for the Hopkins Ideational Fluency Test Battery.

Objective: Tests of word and design fluency both assess ideational fluency, but they show differential sensitivity to lesions of the left and right prefrontal cortex, and they are rarely studied together. Here we present descriptive data for a brief battery that assesses both word and design fluency.

Participants and Methods: We administered tests of letter- ("s" & "p") and category-cued (animals & supermarket items) word fluency and design fluency as part of a larger neuropsychological test battery to 326 healthy adults aged 18–92 years. We re-administered the same tests to 85 participants 5.5 years later.

Results: The participants produced a mean (SD) of 28.2 (9.2) letter-cued words, 44.8 (11.1) category-cued words, and 14.1 (7.3) novel non-nameable designs. As an ideational fluency battery, the three measures showed acceptable internal consistency ($\alpha = 0.75$). When entered along with 16 other measures of intelligence, attention, and memory into an exploratory factor analysis, all three fluency tasks showed their highest loading on a single factor despite the emergence of three other factors defined by measures of visual-spatial, verbal intelligence, and verbal memory abilities. All three fluency measures also showed acceptable test-retest reliability over 5.5 years, with Pearson correlations of 0.65 for letter words, 0.76 for category words and 0.65 for designs (all $ps < 0.0001$). Co-normed tables showing the cumulative frequencies of performance on all three fluency measures for overlapping age groups are presented.

Conclusions: This battery provides a reliable and valid assessment of letter- and category-guided verbal fluency together with design fluency in less than 10 minutes.

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C.I. WORKMAN, R.J. SPENCER, M.M. HOSEY, S. RICE & S.R. WALDSTEIN. Self-Reported Sleep Predicts Performance on Tests of Attention and Executive Function: Preliminary Findings.

Objective: Several investigations have indicated that habitual sleep patterns influence executive function. Thus, self-reported sleep may be important in understanding performance on neuropsychological tests.

Participants and Methods: We correlated self-reported hours of sleep the night prior to assessment with performance on 13 neurocognitive measures. Participants were 65 university students (mean age = 22.3 (4.5) years, 17% male) enrolled in a study of executive function.

Results: Significant (or marginally significant) associations were noted between sleep and several measures of attention, perceptuo-motor speed, and executive function including Trails-A ($r = -.27, p = .03$), Trails-B ($r = -.26, p = .03$), Symbol Digit Modalities Test ($r = .23, p = .06$), Symbol Digit Modalities Test-Incidental Learning ($r = .25, p = .05$), Rey Complex Figure Time to Copy ($r = -.32, p = .01$), Rey Complex Figure Time to Recall ($r = -.33, p = .01$), Rey Copy Organization ($r = .29, p = .02$) and Rey Recall Organization ($r = .27, p = .03$). Self-reported sleep did not correlate significantly with measures of visuospatial ability, visual memory, or verbal fluency.

Conclusions: Results indicate that fewer reported hours of sleep the night before testing predicts variability in performance on tests of attention, perceptuo-motor speed, and executive function. These findings suggest that the common clinical practice of inquiring about habitual sleep patterns may be made more useful by specifically inquiring about the previous night's sleep.

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B. YOCHIM, J.V. BALDO, L.C. KING, K.D. KANE & D.C. DELIS. Effects of Focal Frontal Lobe Lesions on the D-KEFS Tower Test.

Objective: Introduction: This study evaluated the ability of patients with focal frontal lobe lesions to perform the Tower Test from the Delis-Kaplan Executive Function System (D-KEFS). Like previous versions of the test, the D-KEFS Tower Test provides a means of assessing spatial planning, rule learning, inhibition, and self-monitoring, but does so by testing performance on a series of towers of increasing difficulty. However, to date there has been no direct test of the effects of focal frontal lobe lesions on this test.

Participants and Methods: Method: Fourteen patients with focal lesions in the frontal lobes were identified through review of CT and/or MRI scans and tested at least one year post-injury. They were administered the D-KEFS Tower test as part of a larger battery. A group of 11 age- and education-matched neurologic control participants were tested for comparison.

Results: Results: A series of t-tests found that, compared to normal control participants, patients with lesions in the frontal lobes obtained lower scores on the total achievement score, spent more time on each move, and committed significantly more rule violations ($p < .01$). Mean first-move times were similar between groups.

Conclusions: Discussion: These findings suggest that focal frontal lesions lead to impaired performance on a spatial problem solving task, in part due to poor planning, poor self-monitoring, and reduced speed of processing. These findings also suggest that the D-KEFS Tower test is sensitive to focal frontal lobe damage.

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S. ZINN, Y. GOLIGHTLY, K. MCCULLOCH & M. DOUGLAS. Mobility Proficiency as a Function of Cognitive Speed in Cerebrovascular Disease.

Objective: Balance, walking speed and dual task performance are important clinical variables in physical therapy. Using a unique dual task

mobility measure, we evaluated the effects of speed and cognitive flexibility on mobility in a cerebrovascular disease population. We hypothesized that information processing limitations from generalized effects of cerebrovascular disease would impair balance and mobility in complex environmental conditions.

Participants and Methods: We evaluated this hypothesis using a recently developed instrument that assesses the impact of cognitive resources on mobility using a dual task paradigm (the Walking and Remembering Test; WART). The WART uses Digit span as its cognitive task performed concurrently with brisk walking on a narrow path. Fifty primary care patients with likely cerebrovascular disease (diagnosis of two or more stroke risk factors) completed the WART, the Berg Balance Scale, the Symbol Digit Modalities Test (SDMT), and a Stroop task (Color Word Test; CWT) from the DKEF's battery. Multiple linear modeling was used to evaluate the contributions of cognitive variables to decrements in walking speed, balance and dual tasking.

Results: Reading speed contributed to walking speed ($p < .01$) and dual-task walking ($p < .05$). Neither prior stroke status nor age were significant. Balance, however, was predicted by prior stroke status and cognitive flexibility (both $p > .05$).

Conclusions: We conclude that reduced processing speed and, to some extent, cognitive flexibility, are related to balance and mobility in cerebrovascular disease patients. The effect of age on mobility may be mediated by cognitive processing capacity.

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Traumatic Brain Injury

J.L. PONSFORD, K. DRAPER & M. SCHONBERGER. **Psychosocial and Emotional Outcome Ten Years Following Traumatic Brain Injury.**

Objective: To investigate psychosocial outcome ten years following traumatic brain injury (TBI) and its association with demographic variables, injury severity, current cognitive functioning, emotional state, aggression, alcohol use and fatigue.

Participants and Methods: Participants included 53 individuals, aged 26-74 years, with mild to very severe TBI (Mean PTA=26.78 days), sustained 10 years previously and their close others. Measures included the Sydney Psychosocial Reintegration Scale (SPRS) and Glasgow Outcome Scale-Extended as outcome measures, the Hospital Anxiety and Depression Scale, NFI Aggression scale, Fatigue Severity Scale, Alcohol Use Disorders Identification Test, neuropsychological tests of attention/processing speed, memory and executive function.

Results: Psychosocial functioning was lowest in the occupational activity domain and highest in the living skills domains. Variables including education, PTA duration, numerous cognitive measures of attention, memory and executive function, concurrent fatigue, aggression, anxiety and depression were significantly associated with psychosocial outcome, although the strength of correlations varied between TBI participants' and relatives' ratings. PTA duration was most strongly associated with psychosocial outcome, measured by relatives, and anxiety, aggression and depression were the strongest predictors when ratings were made by TBI participants. Self-reported fatigue, depression and alcohol use were the strongest predictors of aggression.

Conclusions: It is important to address problems with anxiety, depression, fatigue and alcohol use as a possible means of improving long-term psychosocial outcome following TBI.

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Symposium 9

1:15–2:45 p.m.

Cognitive Neuroscience and Experimental Psychopathology: a Transdisciplinary Approach Towards a Better Understanding of Depression Vulnerability

Chair: Rudi De Raedt

R. DE RAEDT, U. DANNLOWSKI, R. DE RAEDT, U. DANNLOWSKI, M. VANDERHASSELT & C. BAEKEN. **Cognitive Neuroscience and Experimental Psychopathology: a Transdisciplinary Approach Towards a Better Understanding of Depression Vulnerability.**

Symposium Description: In the field of experimental psychopathology, the importance of cognitive neuroscience becomes ever more prominent. Cognitive theories of depression increasingly recognize that information-processing biases may be at the core of depression vulnerability. In the proposed symposium, innovative transdisciplinary experimental research that allows relating information-processing characteristics of depression to the underlying neuropsychological and biochemical processes will be presented. In the first presentation, a biopsychosocial model to frame the research presentations will be presented by Rudi De Raedt. The model starts from the observation that, in people who are vulnerable for depression, stressors trigger mood-congruent information-processing, characterized by reduced attentional control, causing an increased elaboration of depressogenic thoughts. A neurobiological framework to understand the interplay between increasing cognitive and biological vulnerability is proposed, to enhance insight in the underlying working mechanisms of depression. Udo Dannlowski will present data on how negatively biased automatic evaluative responses are related to depression, in combination with research investigating the pivotal role of the amygdala and prefrontal areas in automatic evaluative processes and emotion regulation. Moreover he will discuss the modulation of amygdala activity by genetic polymorphisms in serotonergic signal transmission. Marie-Anne Vanderhasselt will present experimental studies using repetitive Transcranial Magnetic Stimulation (rTMS) of the Dorsolateral Prefrontal Cortex to investigate underlying cognitive vulnerability factors for depression, such as a dysfunctional attentional processing of emotional and non-emotional information. Chris Baeken will present research investigating the effects of rTMS on specific brain activity patterns, saliva cortisol and mood in healthy and depressed participants, making a link to clinical applications.

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R. DE RAEDT. **Depression Vulnerability: the Interplay Between Increasing Cognitive and Neurobiological Vulnerability.**

Objective: To enhance our understanding of information processing characterizing depression -how people attend to, control and interpret information- we adopt a transdisciplinary approach integrating findings from clinical, cognitive and neurobiological research.

Participants and Methods: We propose a general biopsychosocial model that links attention processes and schema-activation to negative mood states, outlining the interplay between increasing cognitive and neurobiological vulnerability, to enhance our understanding

of the observation that depression vulnerability seems to increase after each episode. The model is in line with research findings based affective modifications of experimental psychology paradigms, neuroimaging research, psychophysiological data, recent knowledge on genetic variations and methods that allow the experimental manipulation of information-processing, such as repetitive Transcranial Magnetic Stimulation.

Results: The model starts from the clinical observation that stressors in the environment trigger mood-congruent information-processing, characterized by reduced attentional and inhibitory control, related to increased elaboration of depressogenic schemata and prolonged experience of negative emotional states. These stressors activate the hypothalamic-pituitary-adrenal axis. Sustained CRH/cortisol overdrive influences the serotonergic system, leading to decreased frontal activity and decreased cognitive control. The neural circuitry involved in this disruption consists of the anterior cingulate, the prefrontal cortex and the amygdala, brain regions that are related to the pathophysiology of depression. Research underpinning the model will be presented in the three following presentations of the symposium.

Conclusions: The major aim of our model is to gain a deeper understanding in the working mechanisms of depression, in order to stimulate translational research to improve the effectiveness of interventions. Correspondence: *Rudi De Raedt, Ph.D., Department of Psychology, Ghent University, Henri Dunantlaan 2, Ghent B-9000, Belgium. E-mail: Rudi.DeRaedt@UGent.be*

U. DANNLOWSKI, P. OHRMANN, J. BAUER, C. KONRAD, S. SCHÖNING, J. DECKERT, C. HOHOFF, H. KUGEL, V. AROLT, W. HEINDEL, A. KERSTING, B.T. BAUNE & T. SUSLOW. Emotion Processing in Major Depression: Neural Correlates and Genetic Susceptibility.

Objective: According to appraisal theories of emotion, automatic evaluative responses to incoming stimuli are crucial components of emotion processing. In a series of studies, automatic evaluative processes were studied by means of masked affective priming paradigms that characterize automatic emotion processing by investigating the biasing effect of subliminally presented emotional faces on evaluative ratings to subsequently presented neutral stimuli.

Participants and Methods: We investigated the neural substrates of automatic emotion processing by means of fMRI in a sample of healthy volunteers and in sample of depressed patients. A third study investigated genetic variations, and functional connectivity related to emotional control in depressed patients.

Results: We found a strong correlation of amygdala reactivity in response to masked negative faces with automatic negative judgmental biases in the affective priming task.

Moreover, in the depressed patients, automatic negative judgmental bias was strongly associated with a longer and severer history of depression. In the final study, it was demonstrated that amygdala reactivity to masked facial emotions was modulated by a genetic variation in the serotonergic system. Furthermore, depressed patients showed reduced functional connectivity with prefrontal areas involved in emotion regulation. This finding was stronger in carriers of MAO-A high activity risk alleles and associated with a severer course of disease.

Conclusions: We conclude that the amygdala plays a pivotal role in automatic evaluative responses. A probably genetically influenced amygdala hyper-reactivity and prefrontal uncoupling might affect the onset and maintenance of depression by eliciting dysfunctional negative biases already at automatic stages of emotion processing combined with impaired emotion regulation.

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M. VANDERHASSELT, R. DE RAEDT, L. LEYMAN & C. BAEKEN. High Frequency-Repetitive Transcranial Magnetic Stimulation Over the Left and Right Prefrontal Cortex: Effects on Attentional Processing of Non-Emotional and Emotional Information in Healthy Volunteers.

Objective: We investigated the effects of HF-repetitive Transcranial Magnetic Stimulation (rTMS) on underlying cognitive vulnerability factors for depression, such as a dysfunctional attentional processing of negative information, since this can be an interesting pathway investigating the interaction between emotional and attentional information processing.

Participants and Methods: The most straightforward method to start investigating this relationship is by assessing the temporary effects of one session of Hf-rTMS applied to the right and left DLPFC on cognitive functioning for non-emotional and for emotional information processing in healthy participants while mood was kept under control. We have used a double-blind, placebo-controlled crossover, within subjects study design investigating the performance on a modified Stroop paradigm and a Negative Affective Priming (NAP) paradigm.

Results: For non-emotional information processing, results indicate that one single session of Hf-rTMS over the left and over the right DLPFC improved top down strategic processes during a Stroop task in which we manipulated attentional control relative to context related information. On the other hand, HF rTMS over the right DLPFC established a significant decrease in inhibitory control towards negative information, measured using a NAP task.

Conclusions: Our results suggest that primary to the antidepressant effect of rTMS, administered with parameters typically used in clinical studies of major depression, specific attentional alterations emerge. Antidepressant effects of rTMS could be related to the same neurochemical changes that underlie cognitive functioning. Therefore, cognitive performance may provide a unique window into the extent of antidepressant effects.

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C. BAEKEN, R. DE RAEDT, J. SCHIETTECATTE, R. LUYPAERT, M. VANDERHASSELT, L. LEYMAN & A. BOSSUYT. Biological Impact of High Frequency-Repetitive Transcranial Magnetic Stimulation of the Dorsolateral Prefrontal Cortex in Depression.

Objective: HF-rTMS is currently used as an experimental tool to investigate neurocognitive processes in healthy volunteers or to treat affective disorders. HF-rTMS, performed on the left dorsolateral prefrontal cortex (DLPFC), has yielded divergent results and effects on mood seem to be opposite lateralized between healthy and depressed people. The main objective of our studies was to investigate the biological impact of rTMS, taking into account several methodological issues that might be responsible for the inconclusive results found in rTMS research.

Participants and Methods: Because an important aspect of the physiology of HF-rTMS could be related to the endocrinological response of the hypothalamic-pituitary-adrenal (HPA)-axis, we investigated not only mood effects but also Saliva cortisol in healthy individuals and in depressed patients after one rTMS session. Moreover, studies of blood flow and glucose metabolism in patients with primary depression show consistently decreased prefrontal activity, which normalises upon clinical recovery. Therefore, in a FDG-PET study, we also explored the effect of multiple sessions of rTMS on glucose metabolism in patients suffering from Treatment Resistant Major Depression (TRD).

Results: Our preliminary results do not point at a possible impact of HF-rTMS on mood or on the HPA-axis after one session in both groups. However, our FDG-PET study showed a significant biological impact of multiple HF-rTMS sessions on prefrontal cortical brain CMRglc, which revealed to be related to the effects of HF-rTMS on mood.

Conclusions: We conclude that multiple sessions are needed to produce mood and biological effects, which is in line with many rTMS treatment studies.

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Paper Session 8

2:45–4:15 p.m.

Neuropsychiatry

S.A. LANGENECKER, M. SCHALLMO, M.L. BRINKMAN, E.A. YOUNG, J. ZUBIETA & B. GIORDANI. Predicting Treatment Response in Major Depressive Disorder (MDD) using Computer-based Neuropsychological Instruments in a Clinical Setting.

Objective: A number of small studies have successfully used neuropsychological data to predict treatment response in patients with MDD. These studies suggest that incremental value might be provided by using cognitive tests in clinical settings when engaging in treatment planning. Previously, we demonstrated that a Facial Emotion Perception and a Parametric Go/No-go test were sensitive to cognitive dysfunction in a large psychiatric sample. Herein we use the same tests in a retrospective analysis of prediction of naturalistic treatment response in a MDD sample, hypothesizing that factors from these tests would be significant predictors of treatment response.

Participants and Methods: Eighty-seven consecutive patients (M age = 38.5, M education = 15.8) with mild to severe depression (Patient Health Questionnaire [PHQ] range 6 to 24, M = 15.5) were administered these test prior to the first clinical visit. Retrospective data were collected on performance, demographic variables, and response to treatment as usual at the first return visit.

Results: With a mean of 50 days (SD=65.4) between initial and return visits, mean reduction in depression symptoms was 32.5% (SD=37.0). Inhibitory processing speed (B=.22, visual spatial accuracy (face and animal accuracy, B=-.09), years of education (B=-.25), age (B=.12), and initial PHQ (B=-.17) contributed to a significant predictive model of changes in depressive symptoms ($F[5,81] = 4.47, p = .001, R^2 = 22\%$).

Conclusions: Computer-based neuropsychological instruments designed to assess regions typically affected in depressive disorders provide distinct incremental predictive value above and beyond demographic data when predicting treatment response in a naturalistic setting.

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J.G. KEILP, M. GORLYN, M. RUSSELL, A.K. BURKE, M.A. OQUENDO & J.J. MANN. Neuropsychological Dysfunction in Suicidal Behavior: Executive or Information Processing Deficit?

Objective: Risk for suicidal behavior in depression is related to a variety of neuropsychological abnormalities, but there is no clear consensus about their nature. Most theoretical models link suicidal behavior to executive dysfunction, but deficits in other information processing capacities are also common. We sought to determine, in a relatively large sample of unmedicated depressed subjects, if executive impairment was more characteristic of past attempters than impairment in these other information processing domains.

Participants and Methods: Subjects were 88 depressed subjects with a prior history of suicide attempt, 85 depressed subjects with no history

of attempt, and 55 non-patients. Subjects received a comprehensive battery (17 tests) assessing eight domains: four aspects of information processing that are typically affected by depression (Motor Functioning, Psychomotor Function, Attention, Memory) and four related to executive abilities (Abstraction, Working Memory, Language Fluency, Impulse Control).

Results: Both depressed subject groups were poorer than non-patients in Motor and Psychomotor domains, but past attempters alone differed in Attention and Memory. No group differences related to suicide attempt were found in any executive performance domains. The Stroop task, Buschke Selective Reminding Test, and Benton Visual Retention Test best discriminated past attempters.

Conclusions: Deficits related to past suicide attempt were restricted to attention and memory measures, suggesting that suicide attempters' reported difficulties in problem solving, reasoning, and decision-making may be related to more fundamental deficits in information processing. Executive processes most commonly affected in suicidal individuals appear to be those that are related to the basic organization of attention and learning, rather than higher order thinking.

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J.A. KNIGHT, D.S. VOGT, D.W. KING & L.A. KING. Relationship of Neurocognitive Problems to PTSD in Gulf War Veterans.

Objective: Associations between neurocognitive problems and post-traumatic stress disorder (PTSD) were examined in veterans 10-years post-service to identify predictors of long-term impairment. These findings are particularly relevant to current day OIF/OEF returning soldiers with polytrauma-related TBI and PTSD.

Participants and Methods: A randomly-drawn, national sample of 357 Gulf War veterans (male=74%), from population source lists provided by the Defense Manpower Data Center and the VA Gulf War Registry, was stratified on predeployment duty status (Active duty, National Guard, or Reserves). All branches of service were represented: Army(77%), Navy(5%), Air Force(10%), Marines(6%). The sample was 73% Caucasian, 27% diversely-mixed minority participants. All were interviewed via telephone using a standardized protocol for the Deployment Risk and Resilience Inventory (DRRI), which contains multiple scales for measuring predictors and outcomes related to military warzone deployments.

Results: Data analyses revealed high internal consistency for all measures employed (.86-.97). Contrasts using the PTSD Checklist (PCL-M; cutting point of 50 defined PTSD/non-PTSD groups) found significant differences between groups for attention/concentration, memory and executive functioning ($p < .0001$). Correlations between PCL scores and neurocognitive problems were high (.68-.79). Factor analysis yielded two factors, one containing all PTSD scales and the other, all neurocognitive measures. Follow-up pattern analysis revealed very low and high symptom subgroups.

Conclusions: Warzone deployments can produce long-lasting comorbid neurocognitive problems and PTSD symptoms with independent and interacting effects in a significant minority of deployed individuals. High correlations observed reflect true, polytrauma-related comorbidity, not measurement overlap. Additional patterns among the data will be discussed.

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L. MACMULLEN, R.K. KESSLER, P. BRITNELL, B. MAGOUIRK BETTCHER & T. GIOVANNETTI. Errors? What Errors? Impaired Everyday Error Detection in People with Schizophrenia.

Objective: Cognitive deficits associated with schizophrenia (SZ) are known to negatively impact everyday functioning and error monitoring. This study examined detection and correction of everyday action errors in people with SZ.

Participants and Methods: Twenty-three participants with SZ were administered the Naturalistic Action Test (NAT), which requires performance of 3 everyday tasks. Twenty participants with mild dementia (DE), matched on total number of errors with the SZ group, were recruited as a comparison group with known error detection deficits. The percent of total errors and error types detected were calculated. NAT performance and error detection patterns were evaluated within the SZ group and then compared to DE participants.

Results: SZ participants detected only 24% of their NAT errors and corrected even fewer (18%). However, error detection/correction differed by error type, with significantly more substitutions detected relative to perseverations (33% vs. 9%, $z = 2.07$, $p = .03$). Error detection was unrelated to overall error rate and task accomplishment. SZ and DE participants did not differ on error detection/correction variables. However, SZ participants accomplished more task steps than DE participants ($z = 2.79$, $p < .01$).

Conclusions: SZ participants showed markedly impaired error detection and correction on everyday tasks, but detection/correction was significantly influenced by error type. Correlation analyses suggest error-monitoring deficits may be dissociable from the difficulties that lead to high error rates. Moreover, high error rates and reduced error monitoring in SZ did not significantly preclude task accomplishment in SZ. These findings, in addition to prior work from our group, suggest SZ patients maintain relatively preserved knowledge of everyday tasks and goals, but experience everyday action impairment due to both high error rates and error monitoring difficulties.

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E.W. TWAMLEY, S.P. WOODS, C.H. ZURHELLEN, M. VERTINSKI, J.M. NARVAEZ, B.T. MAUSBACH, T.L. PATTERSON & D.V. JESTE. Prospective Memory Impairment and Everyday Functioning in Schizophrenia.

Objective: People with schizophrenia demonstrate impairment in prospective memory (ProM), or memory for future intentions. ProM-based task cues may be time-based (e.g., take medication at 9:00 a.m.) or event-based (e.g., take medication with dinner). Although “remembering to remember” has clear implications for everyday functioning, the neuropsychological substrates and functional correlates of ProM performance in schizophrenia are not known.

Participants and Methods: We administered the Memory for Intentions Screening Test (MIST), a standardized measure of ProM, to 72 outpatients with schizophrenia or schizoaffective disorder. Their comprehensive neuropsychological and psychiatric research evaluation also included the UCSD Performance-Based Skills Assessment—Brief Version, a measure of functional capacity.

Results: ProM performance was positively correlated with performance on standardized tests of attention, working memory, processing speed, learning, and executive functioning, but not delayed recall. In the context of multiple neuropsychological predictors, learning ability was the only domain that independently contributed to ProM. Better ProM also predicted higher functional capacity, above and beyond the variability explained by demographic and disease factors. The strongest ProM predictors of functional capacity were event-based ProM, as well as no response (i.e., omission) and task substitution errors.

Conclusions: These findings suggest that ProM impairment in schizophrenia is associated with multiple cognitive substrates, particularly episodic learning deficits, and plays an important role in everyday living skills. Future studies are needed to examine the potential effectiveness of ProM-based remediation strategies to improve functional outcomes in schizophrenia.

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Poster Session 9: Pediatric Acquired and Developmental Disorders

2:45–4:15 p.m.

Child - Acquired Disorder: Other

P.K. ADDAMO, M. FARROW, K. HOY, J. BRADSHAW & N. GEORGIOU-KARISTIANIS. The Influence of Attentional and Motor Demands on Childhood Motor Overflow Production.

Objective: Motor overflow is a developmental motor phenomenon involving “unnecessary” involuntary muscle activity that coincides with voluntary movement. The purpose of this study was to quantitatively measure the effect of attentional and motor demands on motor overflow in children and adults. Compared to adults, children were hypothesized to exhibit greater overflow under all conditions.

Participants and Methods: Seventeen children, aged 8–11 years, and 17 adults, aged 18–35 years, performed a finger pressing task and exerted a percentage of their maximal force output with one hand while overflow was recorded as force in the passive hand. Motor demands were manipulated by requiring target force output at either 33% or 66% of maximal force, and performing half the trials with the non-dominant hand. Attention was manipulated by presenting a tactile stimulus to one or both hands for some trials.

Results: The dependent variables (Relative Overflow, Task Force Variability) were subject to an ANOVA analysis. Results indicated that children exhibited greater overflow compared to adults. Both age groups displayed greater overflow at the lower target force, while neither group was influenced by attentional manipulation. Unlike adults, in children overflow was greater when the left hand performed the task, especially during higher target force maintenance. Variability of task performance was greater in children than adults. For both groups, force variability was lower when attention was directed to the active hand, and at the higher target force.

Conclusions: In children, the functional immaturity of the motor system is thought to result in both less refined voluntary motor movement, and an inability to suppress involuntary movement. The underlying mechanisms of childhood overflow may relate to claims of the left hemisphere’s dominance in movement. However, a possible functional role of childhood motor overflow may be motor stabilization, particularly when the non-dominant hand must perform the task.

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G.L. ANDREWS & R. CRAMPTON. Behavioral Development of Children with Agenesis of the Corpus Callosum: A 4-year Follow-up Study.

Objective: Progress is being made in understanding symptoms (Brown et al, 2005), social behaviors (Paul et al, 2006), educational challenges (Doherty et al, 2006) and early signs (Stickles et al, 2002) corresponding with complete agenesis of the corpus callosum (ACC), but no longitudinal studies have been completed to evaluate the effects of maturation on observable behaviors. This study investigated changes in various behaviors in children over a 4-year maturation period.

Participants and Methods: Using the Achenbach Behavior Checklist (ABC), initial data were gathered from care-providers of children (ages of 1.5 and 17 years) diagnosed with complete or partial ACC. Follow-up data were obtained on 34 of these children 4 years later (13 females; 21 males). Special educational services were utilized by 94% of the sample.

Results: Behavioral profiles indicated that children with ACC are significantly higher on internalizing behaviors than externalizing behaviors and the difference remained constant over the years for both the 1.5 to 5 year group and the 6 to 18 year group. Of concern is that their scores for internalizing behaviors placed them in the clinical range ($T > 60$) indicating they utilized coping styles of withdrawal, somatic complaints, and experienced anxiety more than would be desired. The majority of specific behavior categories from the ABC were significantly correlated over the four years. Three categories of behavior, somatic complaints, social problems, and rule breaking behaviors, were not significantly correlated as the children matured.

Conclusions: From the initial follow-up data, children with ACC do not benefit from the natural maturation process with regard to observable behavior developments. They appear to be at higher risk for possible depressive or anxiety symptoms. Early intervention programs that address social skills and coping methods will be important rather than waiting for the maturation process to enable the children to catch up socially and emotionally with their peers.

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M.M. ARMSTRONG, D.A. WHITE, J.D. GFELLER & M.R. DEBAUN. Depression, Anxiety, and Neuropsychological Performance in Children with Sickle Cell Disease.

Objective: Deficits in a range of neuropsychological abilities have been identified in children with sickle cell disease (SCD), but research findings have been inconsistent. We investigated the possibility that some inconsistencies may be accounted for by variability in symptoms of childhood depression and anxiety. We also investigated the prevalence rates of depression and anxiety.

Participants and Methods: Twenty-one children with SCD and history of stroke (stroke group) and 45 children with SCD and no history of stroke (no-stroke group) completed a test battery that included measures of executive ability, attention, visual-motor ability, and academic achievement. Mean (SD) years of age for stroke and no-stroke groups were 12.1 (3.9) and 11.3 (3.4), respectively. Parents completed the Behavioral Assessment Scale for Children to assess presence and severity of depression and anxiety.

Results: The overall prevalence rates of depression and anxiety were 12.9% and 11.4%, respectively, and the groups were not significantly different on these variables. The stroke group performed less well on color-naming and color-word conditions of the Stroop relative to the no-stroke group ($p < .05$ in both instances). We also identified significant correlations between depression and anxiety scores and several measures of executive ability, particularly in the stroke group (e.g., Trails B, Stroop, and CMS numbers backwards).

Conclusions: These results suggest that inconsistent findings in the literature may be related to varying degrees of depression and anxiety in children with sickle cell disease.

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J. BAPP NEWMAN, A. GUSTAFSON-DEBASTOS, J. PERRY, S. MEACHEN, D. BATTON & S. RAZ. Categorical vs. Continuous Indices of Illness Severity and Neuropsychological Outcome: A Study of Preterm-Birth Preschoolers with History of Chronic Lung Disease.

Objective: Bronchopulmonary Dysplasia (BPD) is a chronic lung disease, mediated by pulmonary inflammation, that is associated with increased risk of cerebral insult. We examined the relationships between BPD severity and neuropsychological outcome in preterm birth preschoolers.

Participants and Methods: Eighty preschoolers with history of BPD (≥ 28 days respiratory support by oxyhood, mechanical ventilation or CPAP) were identified from an ongoing prematurity study at William Beaumont Hospital. BPD severity was indexed by the NICHD (2000) consensus categorical classification, or by time on mechanical ventilator, a continuous variable. Outcome was evaluated using cognitive (WPPSI-R), language (PLS-3), memory (WJ-III and NEPSY), attention (NEPSY), and motor skills (PDMS-2) tests.

Results: We used MANCOVA, with either NICHD (2000) categorical classification, or mechanical ventilation days, serving as BPD severity indices in separate models. After adjustment for gestational age, sex, SES, and the total number of non-respiratory perinatal complications, BPD categorical classification (NICHD 2000) did not contribute significantly to explaining outcome variance on any measure. In contrast, mechanical ventilation time, a continuous index of BPD severity, was significantly related to gross motor ($F [1, 74] = 7.14, p < .01$), memory ($F [4, 61] = 2.63, p < .05$), and expressive language ($F [1, 72] = 4.05, p < .05$) skills.

Conclusions: Performance in specific outcome domains is more strongly linked to mechanical ventilation time than to consensus categorical classification of BPD severity, in preterm-birth preschoolers with history of BPD. The need for mechanical ventilation may provide a more sensitive indirect index of cerebral insult associated with BPD and its putative inflammatory etiology.

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R.W. BUTLER, A. WENTZ, A. GERSON, S. HOOPER, B. WARADY & S. FURTH. Attentional Function in Children with Chronic Kidney Disease.

Objective: Chronic kidney disease in children has been long thought to have significant central nervous system impact, but very few studies have investigated the neuropsychological status of children who suffer complications of renal disease. The current study investigated the effects of childhood kidney disease related variables on two measures of vigilance attention: errors of omission and commission. It is generally recognized that attentional variables are very sensitive indicators of a CNS insult, and we predicted that kidney disease would be associated with decreased functioning on these two important indices of attention under conditions of vigilance.

Participants and Methods: One hundred and forty four participants within the age range of 6-16 completed the Connor's Continuous Performance Test. These individuals were accrued from numerous institutions nationwide. All participants had been enrolled into an NIH funded study (CKiD) that required documented status of chronic kidney disease, and IRB approval.

Results: Overall, the group performed within the normal range on both variables as documented by respective mean T scores of 54 and 52. Errors of omission were significantly associated with age at diagnosis of kidney disease and also hemoglobin. Errors of commission were significantly associated with Glomerular Filtration Rate. All relationships were in the expected direction, even when statistical significance was not achieved.

Conclusions: Chronic kidney disease in children has been an understudied medical condition from the neuropsychological perspective. Our study suggests that disease related variables within this population are associated with difficulty in maintaining attention under conditions of vigilance, and also increased impulsivity. While further studies are necessary if findings are validated, we assert that interventions designed to improve attentional abilities for these patients should begin to be explored.

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R.C. CHAN, B. YANG, T.C. MANSCHRECK, W. LIU & X. ZHOU. Neurological soft signs in healthy school-aged children and children with ADHD.

Objective: This study aimed to examine the clinical utility of the abridged version of the Cambridge Neurological Inventory (CNI) in children with ADHD. In particular, it attempted to determine if there were any soft signs differences between the Chinese children with ADHD and healthy school-age controls.

Participants and Methods: Two hundred and nine (127 boys and 82 girls) children between the ages of 3 to 14, were recruited from the kindergartens and primary schools. Children were divided in 8 age-groups according to their ages, i.e. from 3-year to 10-year or above. Another sample of 52 children (44 boys, 8 girls) with ADHD, aged 6-12 years (mean = 8.8, SD = 1.3). All children were administered the neurological soft signs subscales from the abridged version of the Cambridge Neurological Inventory (CNI). A comprehensive test of neurocognitive functions was also administered to all children.

Results: The findings showed that younger children were associated with higher prevalence of neurological soft signs. Moreover, boys demonstrated more motor coordination signs as compared to girls. The motor coordination subscale reliably distinguishes children with ADHD from healthy controls with sensitivity 0.769 and specificity 0.666. Finally, there were significant correlations between CNI subscale and cognitive functions after controlling for age and IQ in healthy controls.

Conclusions: This study demonstrates that neurological signs are found among healthy Chinese children with prevalence by age consistent with reports in western samples. The abridged version of the CNI also demonstrates an impressive clinical utility of discriminating ADHD children from healthy children. The significant associations between neurological soft signs and executive functions suggest that these two constructs may share common neural substrates or network.

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M. DI PINTO, H. CONKLIN, C. LI, X. XIONG & T. MERCHANT. Predicting Verbal Memory Performance after Conformal Radiation Therapy for Children with Craniopharyngioma, Ependymoma, and Low Grade Astrocytoma.

Objective: This study examined the longitudinal effects of conformal radiation therapy (CRT) on verbal memory in a sample of children with primary CNS tumors. The effects of cancer diagnosis and patient/treatment characteristics were examined to identify potential prognosticators of poor versus preserved verbal memory function following CRT.

Participants and Methods: A sample of 182 patients was included: 46 diagnosed with craniopharyngioma, 79 with ependymoma, and 63 with low grade astrocytoma. Verbal memory was assessed with the California Verbal Learning Test – Children's Version (CVLT-C), which was administered before CRT, at six months and then yearly following initiation of CRT. The median length of follow-up was 47.8 months (± 19.51).

Results: Linear mixed models failed to reveal a decline in verbal memory, which remained stable over time with similar performance across all tumor types. Examination of the effect of repeat testing on longitudinal change did not reveal significant practice effects. Examination of baseline performance revealed hydrocephalus, the requirement of a permanent CSF shunt, and female gender were predictive of worse performance for the craniopharyngioma group; number of surgeries, and CSF shunting were predictive of worse performance for the ependymoma group; and number of surgeries, extent of surgical resection, hydrocephalus, and CSF shunting were predictive of worse performance for the low grade astrocytoma group.

Conclusions: Specific treatment and patient characteristics were predictive of significant group differences in verbal memory at baseline. These findings could assist with the early identification and follow-up of children at greatest risk. However, verbal memory tended to stabilize and improve over time suggesting these differences may be more prominent during initial presentation rather than emerge or worsen over time. Correspondence: *Marcos Di Pinto, Ph.D., Division of Behavioral Medicine, St. Jude Children's Research Hospital, 332 N. Lauderdale St., Mail Stop 740, Memphis, TN 38105-2794. E-mail: marcos.dipinto@stjude.org*

L.H. ENGLISH, M.A. BARNES & J.M. FLETCHER. The Impact of Reading Goals on Text Comprehension and Reading Speed in Children with Spina Bifida Myelomeningocele.

Objective: Spina bifida myelomeningocele (SBM) is a disorder of the central nervous system associated with intact word recognition skills and deficient text and discourse comprehension. However, little is known about the metacognitive aspects of comprehension in children with this disorder. We hypothesized that children with SBM would demonstrate poor metacognitive abilities associated with comprehension, a pattern that has emerged in neurologically intact good decoders/less skilled comprehenders.

Participants and Methods: This study investigated metacognitive monitoring abilities in 79 children with SBM (9-19 years of age) and 39 controls (8-17 years of age). Participants were tested on their ability to adapt reading strategies in accordance with specified reading goals (from Cain, 1999). They read stories in four conditions: i) Study: answer comprehension questions; ii) Title: produce a title for the story; (iii) Skim: find the answer to a particular question; iv) Fun: read for pleasure. Participants answered comprehension questions for every story.

Results: Using repeated measures ANOVAs, we found that both groups demonstrated slower reading speeds and enhanced comprehension when reading for deeper meaning (Study and Title) than for specific information or entertainment (Skim and Fun). However, children with SBM answered fewer comprehension questions overall and read more slowly than controls.

Conclusions: Interestingly, children with SBM show a dissociation between comprehension skills and metacognitive abilities that is not found in comparable groups of children without brain insult. The results are discussed in relation to models of text comprehension, the hypothesized cognitive and neurological underpinnings of comprehension deficits in SBM, and strategies for improving comprehension in children with SBM. Correspondence: *Lianne H. English, Psychology, University of Guelph, 3-315 Woolwich St, Guelph, ON N1H 3W4, Canada. E-mail: english@uoguelph.ca*

P.S. FASTENAU, C.S. JOHNSON, A.W. BYARS, D.W. DUNN & J.K. AUSTIN. Comorbidities Associated with Declining Neuropsychological Performance 3 Years Following First Recognized Seizure in Children.

Objective: In a large community-based prospective, longitudinal study of children following their first recognized seizure (FRS), we identified psychosocial comorbidities associated with neuropsychological decline versus neuropsychological stability.

Participants and Methods: 181 children with seizures (52% girls, 88% right-handed, 89% Caucasian) and 122 closely matched sibling controls completed a NP test battery after their FRS and again 36 months later. Age at FRS ranged from 5.8 to 14.9 years ($M=9.5$, $SD=2.5$), and diverse seizure types were represented. $IQ>55$ was required for inclusion ($M=101.9$, $SD=16.0$). Children were classified as having declined on NP if their score declined by one-half standard deviation on any of

the four composite scores (Language, Processing Speed, Executive/Attention/Construction, Verbal Memory); all other children were considered to be stable. The three groups (Declining, $n=103$; Stable, $n=78$; Sibling, $n=122$) were compared on measures of academic achievement (WJR), depression (CDI) and behavior problems (TRF, CBCL).

Results: A total of 57% of children with FRS showed decline in at least one domain. The Declining group exhibited more higher rates of mental health problems and poorer academic achievement ($p<.0001$) and in all areas of academic achievement ($p<.01$) compared to the Stable and Sibling groups.

Conclusions: In this prospective study with a large, representative cohort of children who experienced their FRS, over one-half experienced a decline in neuropsychological performance, and that decline was associated with worse behavioral and academic functioning. These results are consistent with theories positing that neuropsychological dysfunction mediates the impact of underlying physiological disruption and psychosocial comorbidities in this population. [Funded by NIH/NINDS #22416]

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R. HARDIN, S.T. MOELTER, J.L. CUNNINGHAM & C.L. ARMSTRONG. Executive Dysfunction in Children after Posterior Fossa Tumor Resection.

Objective: We longitudinally assessed cognitive functioning in children who had undergone surgical resection of a cerebellar tumor. We anticipated that baseline indices of global intellectual and academic achievement would show only mild impairment relative to norm-based expectations. In contrast, we hypothesized that measures of attention and working memory would be more compromised due to reciprocal connections between the cerebellum and prefrontal cortex. We also expected to observe a rebound in performance at longitudinal follow-up.

Participants and Methods: A broad neuropsychological test battery was administered to 22 children at a baseline evaluation approximately two to eight weeks post surgery and a brief battery was repeated in 12 children at six months to one year post-surgery.

Results: The results of both the baseline and the follow-up evaluation showed consistent but mild impairment on measures of verbal and performance intelligence as well as indices of single word reading and spelling. At the baseline assessment, the most notable impairment in performance was observed on measures of verbal-auditory processing, including sentence repetition and immediate narrative story recall. In contrast to our expectations we did not observe significant improvement at the time of the follow-up evaluation.

Conclusions: We speculate that the observed pattern of deficits results from interconnections between the cerebellum and regions of the prefrontal cortex associated with verbal-auditory processing, response inhibition, and working memory.

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E. HODGES, B.J. GIORDANI, D.L. RUZICKA, S.L. GARETZ, K.E. GUIRE, S.R. SHAIR, A.M. KADE, E.T. AVERY, J.E. DILLON, T.F. HOBAN, B.T. FELT & R.D. CHERVIN. The Relationship of Parent-Reported Sleep Problems and Neuropsychological Functioning in Children Referred for Adenotonsillectomy.

Objective: Childhood sleep-disordered breathing (SDB) is thought to have significant impact on cognitive and behavioral functioning. The gold standard in diagnosis of SDB is polysomnography, but simpler screening methods could be useful in practice and research. The parent-completed Pediatric Sleep Questionnaire (PSQ) includes snoring and daytime sleepiness subscales that discriminate between children

with and without SDB and show significant relationships with cognitive and behavioral performance. The purpose of the present study was to examine the associations between specific snoring and daytime sleepiness symptoms – which could be used more easily than subscales in clinical or research screening programs – and cognitive and behavioral functioning among children scheduled to undergo adenotonsillectomy (AT).

Participants and Methods: Participants included 64 children ranging in age from 5 to 12.11 years, who were referred for AT. A psychologist or neuropsychometrician administered well validated measures of intellectual functioning (abbreviated), academic achievement, attention and executive functioning, learning and memory, and sustained attention and impulsivity. Parents completed the PSQ, Conners' Rating Scale-Revised: Long Version, and Behavioral Rating Inventory of Executive Functioning.

Results: Responses to individual question-items about habitual snoring and daytime sleepiness each predicted lower scores for intelligence, memory, attention, impulsivity, and academic achievement. Habitual snoring and daytime sleepiness each predicted higher levels of behavioral disturbance.

Conclusions: Parental responses to simple questions about habitual snoring and sleepiness predict SDB-sensitive cognitive and behavioral measures, and may prove useful for screening purposes in clinical and research settings.

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T. HOPYAN-MISAKYAN & M. DENNIS. Impaired Cognitive Regulation of Emotion in Music in Children with Cerebellar Tumors.

Objective: The cerebellum is involved in movement coordination, but also in cognitive regulation. We studied how children with cerebellar tumors identify musical emotion when musical and lexical emotions were either congruent or incongruent.

Participants and Methods: Participants were 74 children aged 7-16 years, 37 diagnosed and treated for two of the most common pediatric cerebellar tumors (benign astrocytomas or malignant medulloblastomas), and 37 age- and gender-matched controls. In an Affective Musical Stroop task, children listened to 48 musical excerpts sung by a female voice and decided whether the music was happy or sad. In the congruent condition, musical emotion matched lexical emotion (e.g., an excerpt in a major mode with an upbeat tempo with the word "happy" being sung). In the incongruent condition, musical emotion conflicted with lexical emotion (e.g., an excerpt in a minor mode with slower tempo with the word "happy" being sung).

Results: MANOVA for reaction time showed no significant group differences for either condition. MANOVA for accuracy revealed significant group differences in the incongruent condition, $F(2, 71) = 15.0$, $p = .000$, but not for the congruent condition. Tukey post-hoc testing showed both tumor groups differed significantly from matched controls such that they were less accurate when the musical and lexical emotion did not match.

Conclusions: Children with either benign or malignant cerebellar tumors are able to identify musical emotion when the musical and lexical emotion are congruent, but are impaired when the musical and lexical emotion are incongruent, suggesting impaired cognitive regulation.

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T. HOPYAN-MISAKYAN, D. JEWELL & M. DENNIS. Increased Cognitive Load Slows Reaction Time in Children with Malignant or Benign Cerebellar Tumors.

Objective: Children with tumors of the cerebellum have slowed reaction time (RT), but it is not clear how RT task performance varies with the demands of the task and radiation treatment, which occurs in some but not all cerebellar tumors. We studied the effects of increasing cognitive demands on RT in children with cerebellar tumors.

Participants and Methods: We administered three 32-trial RT tasks to 74 children aged 7–16 years, 37 diagnosed and treated for either benign astrocytomas or malignant medulloblastomas, and 37 age- and gender-matched controls. In the Simple RT task, the child pressed a button when a downward-pointing arrow appeared in the centre of the screen. In the Choice RT task, the child pressed the button on the same side that the arrow had been presented on the screen. In the Cognitive RT task, the child pressed a blue button when the arrow was pointing up or red button when the arrow was pointing down.

Results: MANOVA for Simple, Choice, and Cognitive RT tasks revealed significant differences between groups for response time and accuracy. Tukey post-hoc testing showed that the Medulloblastoma group performed more slowly than either Controls or Astrocytoma groups on all three tasks, but that both tumor groups reacted more slowly than Controls on the Cognitive RT task.

Conclusions: Children with malignant cerebellar tumors requiring radiation are impaired on all RT tasks, whereas children with benign cerebellar tumors are specifically impaired on the Cognitive RT task, involving greatest cognitive demand.

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S. MCLAUGHLIN-BELTZ & J. FILIANO. The Neurological and Neuropsychological Sequela of Eastern Equine Encephalitis: A Case Study.

Objective: The purpose of this case study was to examine the neurological and neuropsychological sequela of Eastern Equine Encephalitis in a young child.

Participants and Methods: Neurological and neuropsychological evaluations were conducted on patient C.B. throughout a two year period following initial infection with the virus. C.B. was also videotaped during treatment sessions, which included speech/language therapy, occupational therapy, physical therapy, and cognitive rehabilitation.

Results: C.B. was initially infected with EEE in August 2005. Neurologically, he presented with coma, seizures, tremor, fever and hypogammaglobulinemia, which was treated with IV immunoglobulin. Seizures included right sided tonic/clonic activity, staring spells, and EEG evidence of left temporal spike discharges. Over a four week recovery, he had transient aphasia, swallowing dyssynergy requiring gastrostomy feeding, parkinsonism, and right hemiparesis; aggressive behaviors occurred later. MRI scan on admission showed FLAIR imaging evidence of white matter change reminiscent of leukodystrophy at the anterior and posterior portions of the parietal centrum semiovale. Over the course of the next three months, language returned. MRI findings remained constant. Neuropsychologically, C.B. presented with deficits in the areas of speech, motor, visual processing, sensory processing, auditory processing, behavior and social skills. He required and received multiple therapies weekly. At two years post infection, C.B. continues to have deficits in these areas, however he has made significant progress.

Conclusions: C.B. was a 5 year old Caucasian boy infected with Eastern Equine Encephalitis in August 2005. Initially, he was in a coma and had partial recovery over the next three months. At two years post-infection, he continues to receive rehabilitative services for speech, motor, and cognitive development.

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C. REY-CASSERLY, C. TURNER, H. BEGLEY, C. CHORDAS, C. CIEURZO, B. DELANEY & L. KIM CUNNINGHAM. Long-term Outcomes in Pediatric Low Grade Gliomas Treated with Surgery Only.

Objective: The goal of this study was to characterize long term medical, neuropsychological, and psycho-social outcomes in survivors of pediatric low grade gliomas (LGG) treated with surgical resection only.

Participants and Methods: Medical, neuropsychological, and psychosocial outcome data were collected through a retrospective chart review of LGG surgery-only patients diagnosed before age 22 and analyzed using standard data reduction techniques and descriptive statistics.

Results: Medical records of 72 (M=34, F=38) surgery-only LGG survivors were reviewed. Median age was 15.5 years; median time since diagnosis was 8.0 years. Diagnoses included astrocytomas, gangliogliomas, oligodendrogliomas, and LGG not otherwise specified; primary locations varied. Post-treatment medical issues were experienced by 93% of survivors and included: motor (60%) or gait (35%) dysfunction, visual problems (43%), chronic pain (36%), seizure disorders (32%), and problems with weight (29%). At least one or more significant psychosocial issue was identified in 72% of patients. Neuropsychological evaluations were available for 51 patients; mean IQ was 97. Number of survivors scoring at or below 85 was twice the expected number in the normative population ($p=0.011$). Evaluation of adaptive function was available for 32 patients; 28% had scores of 85 or below. Although adaptive function scores were not correlated with IQ, they were significantly correlated with executive function ratings ($p = .01$).

Conclusions: The majority of LGG surgery-only survivors followed in a survivorship clinic experience late effects. Neuropsychological outcomes include normal mean scores on measures of IQ, adaptive skills, and executive function but proportion of survivors with scores below the normal range was higher than expected and problems with executive functioning were more closely associated with problems in adaptive living than IQ. Longitudinal follow-up and prospective study of survivors continue to be needed.

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A. SCHWEIGER, O. ELKANA, D. BEN BASHAT, T. HENDLER & U. KREMER. Hemispheric Lateralization following Recovery from Childhood Insult Depends on Age at Onset: Longitudinal fMRI Data.

Objective: There is an ongoing debate concerning the capacity of the right hemisphere (RH) to takeover language abilities after a focal lesion to the left hemisphere (LH). We investigated the relations between age at onset and hemispheric reorganization with respect to linguistic functions over time.

Participants and Methods: We report fMRI language activation data from 2 patients who sustained CVA at widely differing ages who were scanned twice each, 3 years apart. One had the onset at age 8 and first scanned at age 12, the other's onset was at age 16, first scanned at age 23. Neuropsychological & language testing were performed at the times of both scanning. Twelve healthy children served as controls. All underwent fMRI scanning using three linguistic tasks

Results: Outcomes yielded predominant tendency, on all three tasks, for LH Lateralization in the patient with late onset, but RH predominance in the case of the patient with early onset. This pattern was seen also on the second scanning with even more pronounced lateralization. The patterns of activation in the RH in the early onset patient were in brain areas homologous to LH regions involved in language processing.

Conclusions: These findings imply that whether the LH or RH become more involved in linguistic functions following CVA may depend on the age at onset of the lesion: At an earlier age there may be higher proclivity for RH 'take over' of language functioning, whereas late, post-pubertal onset may preclude such RH take over, with the LH remaining dominant for language.

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R. STARGATT. Academic Skills in Children Treated for Brain Tumor are Influenced by a Variety of Tumor, Treatment, Neuropsychological & Family Factors.

Objective: Cognitive and academic deficits are frequently reported in children treated for brain tumours. A range of tumor, treatment, medical and treatment complications have been implicated in causing a variety of cognitive and thereafter academic deficits. The aim of this study is to identify factors that influence the development of academic skills in children with tumors in the Posterior Fossa (PF) compared with the Supertentorium.

Participants and Methods: Fifty six children with brain tumours [aged 4 – 16] attending the Royal Children's Hospital Melbourne, Australia, were enrolled into a prospective, repeated measures design. Neuropsychological and academic assessments were conducted at diagnosis and at 12 month intervals for three years.

Results: Statistical analyses indicate variable results across different academic skills with declines in reading and spelling but not mathematics observed over the study period. Tumor location was more predictive of decline than treatment with cranial radiation. Deficits in handwriting speed were found at all time points in children with PF tumours but skills did not decline over time. Regression analyses finds that a variety of tumor, treatment and family factors contribute to the development of academic strengths and weaknesses and that different factors influence the development of different skills.

Conclusions: Different tumor locations and treatment regimes confer varying risk for the development of academic skills. Children with brain tumors require individual assessment and intervention strategies need to account for both neuropsychological deficits and family factors.

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C. UENO, Y. YAMAMOTO, T. SUZUKI, A. SAITO, H. OKAMURA, M. INOUE & T. KINOSHITA. Environmental Management Improves Behaviors and Intellectual Growth of Juvenile Delinquents in Reformatories.

Objective: Reformatories in Japan are welfare institutions where juvenile delinquents with inappropriate home environment are housed for some period. This study investigated the outcomes of the admission to a reformatory from psychiatric perspectives.

Participants and Methods: Juvenile delinquents placed in a reformatory who visited our hospital within the last three years were investigated. Background information of each subjects including history of psychiatric treatment, family environment, psychiatric diagnosis according to ICD-10, medication were investigated. All subjects took psychological tests (including WISC). The medications and the IQs before and after the admission to the reformatory were compared.

Results: Eleven boys and three girls (average age = 12.9 years) visited our hospital within the study period. The psychiatric diagnoses of the subjects were; conduct disorder (11), ADHD (4), neurotic disorders (3), PDDNOS (1), mental retardation (1). Six subjects had been already on medication for impulsive and/or hyperactive behaviors at the time of admission to a reformatory. In the course of the treatment, the dosages of the medications were reduced in three subjects, and one subject was well off without medication. Seven subjects were applicable for comparison of IQs; five out of these seven subjects showed improvement in IQs after admission period (Wilcoxon Test; $z = -1.99$, $p < .05$).

Conclusions: The feature of reformatory is "environmental treatment in the homely atmosphere". When the environment of the juvenile delinquents is properly adjusted, impulsive and/or hyperactive behaviors could be controlled. This study also suggests the importance of environments in the intellectual growth of children.

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Child - Acquired Disorder: TBI

D.W. BEEBE, S.L. WADE, K.O. YEATES, H.G. TAYLOR, N.C. WALZ & T. STANCIN. Sleep problems after Traumatic Brain Injury (TBI) in 3-6 Year-Old Children.

Objective: Traumatic brain injuries (TBI) in adults are known to affect sleep quality and quantity. We recently published evidence that severe TBI in school-aged children is followed by a sharp and persistent increase in sleep problems. Sleep problems can seriously compromise a child's quality of life, potentially impact cognitive functioning and result in considerable parent distress. We know little about the effects of TBI in very young children. Here we report on the short-term impact of TBI on the sleep of injured 3-6 year-old children.

Participants and Methods: As part of a larger longitudinal study, caregivers (97% mothers) of children who had experienced only Orthopedic Injuries (OI, $n=97$) or TBI ($n=77$; 45 mild, 15 moderate, 17 severe) completed a validated sleep questionnaire on two occasions: once about 1 month post-injury that asked about pre-injury functioning, and again about 6 months post-injury that asked about current functioning.

Results: At the 6 month follow-up, parents reported that children post-TBI displayed more parasomnias (e.g., sleepwalking, nightmares) and inadequate sleep duration than did those post-OI, $p < .005$; these differences remained statistically significant after covarying for reported pre-injury sleep. No significant cross-group differences were observed in levels of bedtime resistance, sleep onset delay, night wakings, sleep-disordered breathing symptoms, or daytime sleepiness. The severity of TBI did not significantly relate to any sleep subscale, though severity subgroups were small.

Conclusions: These data highlight the need for clinicians to watch for sleep problems in young children post-TBI, and for further research into the etiology, consequences, and treatments for such post-injury sleep difficulties.

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T.B. FAY, K.O. YEATES, G.H. TAYLOR, J. RUSIN, B. BANGERT, A. DIETRICH, K. NUSS & M. WRIGHT. Cognitive Predictors of Postconcussive Symptoms in Children with Mild Traumatic Brain Injury.

Objective: To examine whether the occurrence of postconcussive symptoms (PCS) following mild traumatic brain injury (MTBI) in children is moderated by cognitive functioning.

Participants and Methods: Participants included 164 children with MTBI and 82 children with orthopedic injuries (OI), from 8-15 years of age when injured. Assessments were completed within 2 weeks of injury, and again at 1, 3, and 12 months post-injury. The baseline assessment included standardized cognitive tests, as well as a retrospective rating of pre-injury postconcussive symptoms (PCS; parents only). PCS were rated by children and parents at baseline, 1, 3, and 12 months post-injury. Principal components analysis of cognitive test data with orthogonal rotation resulted in two factors: (1) IQ/academic achievement (i.e., cognitive functioning); (2) executive functioning. Child and parent rated PCS were examined separately across time using repeated measures analysis of variance and cross sectional analysis, with group membership, cognitive variables, and their interactions entered as predictors.

Results: Executive functioning did not predict PCS. Cognitive functioning predicted the number of PCS in the first year post-injury for both groups. Cognitive functioning predicted child rated PCS at baseline, 3 and 12 months post-injury. Retrospective parent ratings of pre-injury PCS and ratings of PCS at 1, 3 and 12 months post-injury were also predicted by cognitive functioning. Children with lower IQ and academic functioning demonstrated more PCS across time, regardless of injury type.

Conclusions: Cognitive functioning predicts PCS in children with mild injuries during the first year post-injury, but does not moderate the effects of MTBI.

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G.A. GIOIA, J.A. JANUSZ, P.K. ISQUITH & D. VINCENT. Psychometric Properties of the Parent and Teacher Post-Concussion Symptom Inventory (PCSI) for Children and Adolescents.

Objective: Input from multiple caretakers significantly enhances assessment of children with mild TBI. We investigated psychometrics of parent and teacher versions of the Post-Concussion Symptom Inventory (PCSI) by exploring the base rates of symptom reporting and evidence for reliability and validity.

Participants and Methods: Parents (n=490) and teachers (n=67) of children aged 5-18 years who participated in a normative study completed the 22-item PCSI (0-6 Likert scale). Means, SDs, and base rates of reported symptoms (ratings of "1" or higher) were generated for each symptom and ranked in order for each scale.

Results: Base rates for symptoms in the normative population were generally low (Parent PCSI total score mean= 2.2, SD=4.8; Teacher mean =5.7, SD=8.4). Cognitive symptom reports were relatively higher for teachers. There were no differences in parent and teacher ratings between the 5-7, 8-12, or 13-18 year age groups. Internal consistency was strong for 16-item Teacher (coefficient alpha $r=0.91$) and 19-item Parent (coefficient alpha $r=0.81$) forms. Rank order correlations of symptom frequencies for the Parent and Teacher forms revealed a significant relationship (Parent-Teacher $r=0.527$, $p=.006$).

Conclusions: Parent and teacher versions of the PCSI exhibit appropriate initial psychometric properties. Parent and teacher symptom report base rates are generally low in a typical sample. The parent and teacher PCSI scales are moderately correlated, reflecting reasonable similarities between forms yet also unique information. Inclusion of symptom reports from the home and school settings by parents and teachers provides a more complete understanding of concussion outcomes and recovery in the child and adolescents' real-world settings.

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P.C. GLASIER, K.O. YEATES, H.G. TAYLOR, B. BANGERT, A. DIETRICH, K. NUSS, J. RUSIN & M. WRIGHT. Illness Behavior Encouragement as a Predictor of Post-Concussive Symptoms after Mild Traumatic Brain Injury in Children.

Objective: The present study's goal was to examine the relationship of illness behavior encouragement (IBE) to post-concussive symptoms (PCS) following mild traumatic brain injury (mTBI) in children. IBE by parents is associated with the facilitation of symptoms in children with medical illnesses, and therefore may help account for PCS after mTBI.

Participants and Methods: Participants were recruited prospectively, and included 186 children with mTBI and 99 children with orthopedic injuries (OI), from 8 to 15 years of age when injured. Parents and children completed the Illness Behavior Encouragement Scale (IBES) within 2 weeks post-injury (baseline), as well as the Post-Concussive Symptom Interview (PCSI) at baseline, 1 month, 3 months, and 12 months post-injury. Repeated-measures analyses were to determine whether ratings on the IBES predicted ratings on the PCSI.

Results: The groups did not differ on the IBES. As expected, higher child and parent ratings on the IBES were associated with higher child ratings of PCS at follow-up, for both the mTBI and OI groups. Surprisingly, higher parent ratings on the IBES were associated with lower parent ratings of PCS at follow-up, again in both groups. Child ratings on the IBES were not related to parent ratings of PCS.

Conclusions: The findings suggest that IBE may promote PCS in children following minor injuries. However, parents actually endorse fewer PCS when they report more IBE, suggesting that parents who are more tolerant of PCS may experience them as less severe than parents who are less tolerant.

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C. HAJEK, K. GANESALINGAM, K. YEATES, G.H. TAYLOR, B. BANGERT, A. DIETRICH, K. NUSS, R. JEROME & M. WRIGHT. Relationships among Postconcussive and Posttraumatic Stress Symptoms in Children Following Mild Traumatic Brain Injury.

Objective: To investigate the occurrence and overlap of post-concussive symptoms (PCS) and post-traumatic stress symptoms (PTSS) in children following mild traumatic brain injuries (mTBI).

Participants and Methods: Children were recruited prospectively, and included 186 with mTBI and 99 with OI, from 8 to 15 years old when injured. As part of a longitudinal study, parents rated children's PCS and PTSS at 2 weeks, 3 months, and 12 months post-injury. Parents completed two measures of PCS, an interview based on DSM-IV research criteria for postconcussional disorder and a longer rating scale. Parents rated PTSS using the PTSD Checklist for Children-Parent Report (PCL/C-PR).

Results: Total PCS and PTSS were highly correlated at each assessment (r from .60 to .61). Inter-item and inter-scale correlations also indicated significant relationships among the PCS and PTSS measures. At 3 months post-injury, 76 (41%) mTBI children and 24 (24%) OI children met DSM-IV symptom criteria for postconcussional disorder. However, only 15 (8%) mTBI children and 6 (6%) OI children met DSM-IV symptom criteria for PTSD. Controlling for PCS, the OI group displayed significantly more PTSS than the mTBI group at baseline, but no group differences were significant thereafter. Controlling for PTSS, the mTBI group demonstrated significantly more PCS than the OI group at all occasions, although the magnitude of group differences diminished with time.

Conclusions: Although PCS and PTSS are highly correlated, significantly more children with mTBI display PCS than PTSS. PTSS do not account for the elevated occurrence of PCS following mTBI in children. Correspondence: *Christine Hajek, The Ohio State University, 314 Buttes Ave., Columbus, OH 43215. E-mail: hajek.11@osu.edu*

J.G. HALLDORSSON, K.M. FLEKKOY, K.R. GUDMUNDSSON, G.B. ARNKELSSON & E.O. ARNARSON. The Incidence of Pediatric Traumatic Brain Injuries in a Nationwide Sample.

Objective: To estimate differences in the incidence of recorded traumatic brain injuries by gender, age, severity and geographical area.

Participants and Methods: The study was prospective and nationwide. Data were collected from all hospitals, emergency units and health care centers in Iceland regarding all Icelandic children and adolescents 0-19 years old consecutively diagnosed with traumatic brain injuries (N=550) during a one-year period.

Results: Annual incidence of minimal, mild, moderate/severe, and fatal brain injuries (ICD-9 850-854) was 6.41 per 1000, with 95% confidence interval (CI) 5.9, 7.0. Annual incidence of minimal brain injuries (ICD-9 850) treated at emergency units was 4.65 (CI 4.2, 5.1) per 1000, mild brain injuries admitted to hospital (ICD-9 850) was 1.50 (CI 1.3, 1.8) per 1000, and moderate/severe non-fatal injuries (ICD-9 851-854) was 0.21 (CI 0.1, 0.3) per 1000. Death rate was 0.05 (CI 0.0, 0.1) per 1000. Young children were at greater risk of sustaining minimal brain injuries than older ones. Boys were at greater risk than girls were. In rural areas, incidence of recorded minimal brain injuries was low.

Conclusions: Use of nationwide estimate of the incidence of pediatric brain injury shows important differences between urban and rural areas as well as between different age groups.

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G. HORNEMAN & I. EMANUELSON. Cognitive outcome in children and young adults who sustained severe and moderate brain injury ten years earlier.

Objective: This study is a population-based, retrospective follow-up study of neuropsychological functions after severe and moderate TBI.

Participants and Methods: One hundred and sixty-five survivors of TBI injured in 1987-1991 in the 0- to 17-year age group were identified. Of the traceable individuals (149), 53 patients who sustained injury at a mean of 9.96 years (SD 5.10; range 0.27-17.15) participated in a neuropsychological investigation ten years post injury. A control group of 40 healthy subjects, matched for age and sex was chosen. An extensive neuropsychological test battery was used.

Results: The TBI group put in a significantly poorer performance in tests of intellectual function, with substantially lower results in verbal tests and poorer performance in tests of verbal learning and memory, visuo-constructive ability and executive functions.

The severely injured group showed substantial recovery. Poor results in visuo-constructive tests and tests of executive functions remained.

Conclusions: Severity of injury is an important factor when assessing outcome even ten years after TBI in childhood and adolescence. Evaluations of final outcome should not be made before the subjects reach adulthood.

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J. JANUSZ, G.A. GIOIA, D. VINCENT & D. GOLDBERG. Examination of the Everyday Situations Survey (ESS) in Children and Adolescents.

Objective: Following a concussion, it is important to assess not only the presence of a child's symptoms but also the extent of their manifestation in the home and school settings. The Everyday Situations Survey (ESS) was developed to assess problems with memory, processing speed, and attention in everyday activities. This study provides initial evidence of the measure's reliability and validity.

Participants and Methods: Parents (n=620; 452 boys, 168 girls) and teachers (n= 69; 33 boys, 36 girls) of children age 5-18 completed the ESS-Home Version or ESS-School Version, Post-Concussion Symptom Inventory (PCSI) and Behavior Rating Inventory of Executive Function (BRIEF). We explored the internal consistency reliabilities, correlations between the parent and teacher ESS, and its relationship with the PCSI and BRIEF.

Results: Internal consistency reliabilities were acceptable for the ESS-Home Version (Attention Problems coefficient alpha $r=0.87$; Memory Problems coefficient alpha $r=0.82$; Task Completion coefficient alpha $r=0.77$; Total Scale coefficient alpha $r=0.93$) and ESS-School Version (Attention Problems coefficient alpha $r=0.95$; Memory Problems coefficient alpha $r=0.71$; Task Completion coefficient alpha $r=0.87$; Total Scale coefficient alpha $r=0.88$). The ESS-Home and School Versions were not significantly correlated. Most Parent and Teacher ESS scales demonstrated moderate correlations with PCSI Cognitive symptoms and BRIEF composites ($r=0.40-0.75$), with stronger correlations found between certain ESS-School scales and the BRIEF ($r=0.80-0.87$).

Conclusions: Initial examination of the ESS reveals evidence of adequate internal consistency reliability and validity. Its moderate rela-

tionships with other measures suggests the ESS may provide the clinician with unique information regarding the extent of impact of post-concussive symptoms on a child's everyday functioning. Future research will focus on the clinical utility of the scale for monitoring functioning over time.

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M.R. PRASAD, P.T. CIRINO, S. SOBHAN, J. ALLOWAY & L. EWING-COBBS. Impact of the Caregiver-Child Interaction on Outcome in Infants and Toddlers with Traumatic Brain Injury.

Objective: The purpose of this study was to identify aspects of the caregiver-child interaction that may influence outcome in children with moderate and severe TBI.

Participants and Methods: Participants were 40 infants and toddlers with moderate to severe traumatic brain injury (n = 27 moderate injury; n = 13 severe injury), and 31 typically developing comparison infants and toddlers. Children ranged in age from 6 months to 48 months. The protocol developed by the NICHD Child Care Research Network to study caregiver-child interactions was closely followed. The interactions were scored for both caregiver and child variables. The Mullen Scales of Early Learning was used to assess outcome.

Results: Children with TBI performed significantly lower on all cognitive and motor subscales ($p<.01$). Children with TBI were significantly less attentive to their caregivers and toys than comparison children, $F(1,67)=9.31$, $p=.003$, and displayed more negative behaviors, $F(1,67)=5.46$, $p=.02$. Caregivers of children with TBI engaged in less stimulating play activities than the comparison group, $F(1,67) = 4.15$, $p < .05$, $d = +0.54$. Hierarchical regression revealed that caregiver stimulation was a significant predictor in most outcome domains, and child variables were also predictive of three of the seven outcome measures. In most of these final models, the group effect was not significant. There were no significant interactions of predictors with group.

Conclusions: Children with TBI were found to be less attentive and engage in more negative behaviors than comparison infants and toddlers. Likewise, caregivers of children with TBI engaged in less stimulating activities. Caregiver stimulation was predictive of most cognitive and motor outcomes, and child variables were also predictive of several outcomes. The behavior of children with TBI may adversely impact the caregiver-child interaction, decreasing the child's exposure to stimulating activities.

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J.C. SCHNEIDER, B.M. ELLIOTT, O. MILGROM & G.A. GIOIA. Parent and Self-Reported Changes of Emotional Functioning Post Concussion.

Objective: Emotional dysfunction is common following concussion, although the exact mechanisms (e.g., temporary brain compromise, secondary reaction to injury) are currently unknown. This investigation examines changes in emotional functioning early post-injury in adolescents who sustained concussions.

Participants and Methods: Adolescents (ages 12-18, mean=13 years), diagnosed with concussions, and their parents, presenting to a concussion clinic, completed retrospective pre-injury and post-injury (median days post-injury=10) forms of the Child Behavior Checklist (CBCL) (n=34), Youth Self Report (YSR) (n=28), and Profile of Mood States-Adolescent (POMS-A) (n=11).

Results: Adolescents and parents report increased emotional dysfunction early post-injury compared to retrospective pre-injury ratings with parents reporting greater change in post-injury emotional functioning than adolescent's ratings. Parent report a significant increase in emotional and behavioral functioning on the CBLC Withdrawn/Depressed Scale ($F=6.471$, $p=0.016$), Attention Problems Scale ($F=7.241$, $p=0.011$), and Aggressive Behavior Scale ($F=5.200$, $p=0.029$). Similarly, on the POMS-A, parents report significant increases in their child's emotional states on the Confusion ($F=7.932$, $p=0.017$), Fatigue ($F=9.707$, $p=0.010$), Depression ($F=5.500$, $p=0.039$), and Total Mood Disturbance scales ($F=9.171$, $p=0.011$), with declines on the Vigor scale ($F=11.477$, $p=0.006$). Compared to pre-injury ratings, early post-injury self-ratings revealed significant increases on the YSR Attention Problems scale ($F=11.800$, $p=0.002$) and significant declines on the POMS-A Vigor scale ($F=9.289$, $p=0.012$).

Conclusions: The present study revealed increased adolescent emotional and behavioral dysfunction and declines in energy early post-injury, compared to retrospective pre-injury emotional states. These findings have important implications for the adolescent's recovery. Assessment of emotional functioning post-injury should be part of the post-concussion evaluation to focus relevant interventions.

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J.C. SCHNEIDER, C. JOHNSON, M. SHAPIRO & G.A. GIOIA. Correlation Between Parent and Child Ratings of Emotional Functioning Pre and Post Injury.

Objective: Individuals often exhibit significant emotional dysfunction post-concussion. Currently, there are no measures that allow for informant report of current mood states. An informant report of the Profile of Mood States-Adolescent (POMS-A) was developed toward this end. We evaluate the relationship between and self- and parent- ratings of pre- and post-injury emotional functioning.

Participants and Methods: The POMS-A, a 24-item mood adjective checklist tapping 7 dimensions, was modified for parent ratings of the adolescent's emotional functioning, currently and retrospectively pre-injury. Parents and adolescents ($n=13$, ages 12-18, mean=13 years), presenting to a concussion clinic, completed the POMS-A twice, pre-injury and early post-injury (median days from injury=10).

Results: Parent and self-report ratings of retrospective baseline emotional dysfunction were uniformly low; therefore, simple linear correlations were not significant with this restricted score range. However, parent and adolescent ratings of emotional functioning early post-injury were significantly and positively correlated on 5 of 7 dimensions (Anger $r=0.710$, $p=0.007$, Depression $r=0.831$, $p=0.000$, Tension $r=0.807$, $p=0.001$, Vigor $r=0.664$, $p=0.017$, and Total Mood Disturbance $r=0.763$, $p=0.002$). Correlation on the Fatigue dimension approached trend level significance ($r=0.498$, $p=0.083$) with no significant correlation for the Confusion dimension ($r=0.452$, $p=0.121$).

Conclusions: Parents and adolescents demonstrate agreement in reporting low levels of pre-injury emotional dysfunction. They also demonstrate strong agreement in early post-injury reports of anger, depression, tension, lowered energy, and overall mood. Together, these findings suggest that the parent version of the POMS-A demonstrates evidence of concurrent validity and may therefore be a useful additional tool for evaluating adolescents' emotional states post-concussion.

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M. SHAPIRO & G. GIOIA. Documenting Recovery Trajectories in Child/Adolescent Concussion.

Objective: Assessment of the impact of concussion in children and adolescents includes both symptom survey and neurocognitive assessment. Computerized measures of neuropsychological functioning can be useful in detecting subtle improvements in neurocognitive functioning over time. The objective of this paper is to examine the utility of a battery of computerized measures of memory, reaction time, and processing speed in capturing the nature and trajectory of the recovery process of children and adolescents who have sustained a concussion.

Participants and Methods: Participants included 122 children and adolescents ages 11 to 19 referred to a hospital-based concussion clinic over a 4 year period. Most participants were seen for 2-3 visits, with the first visit typically within a month of the injury. ImPACT was administered at each visit (using alternate forms). Parent and patient symptom inventories were also included at each visit.

Results: After accounting for variance in outcome due to the effects of time (linear and quadratic change), we developed growth curve models accounting for significant proportions of remaining variance in ImPACT composite scores (verbal and nonverbal memory, reaction time, and visual motor speed). Improvements over time were fairly linear. Gross categories of cause of injury accounted for far more variance in outcome over time than such traditional factors as the presence of LOC, anterograde amnesia or retrograde amnesia. Baseline symptom reports explained only minimal amount of variance in outcome scores.

Conclusions: A multi-dimensional assessment model that includes both symptom report and computerized neuropsychological evaluation provides a comprehensive analysis of recovery trajectories after child and adolescent concussion.

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C. VAN HEUGTEN & S. RASQUIN. Screeningtool for cognitive, emotional, and behavioural problems after paediatric brain injury: feasibility, reliability and validity.

Objective: To develop a screeningtool for the neuropsychological consequences of ABI in children which can be used by teachers at (special) schools because the non physical consequences of ABI are not always acknowledged or recognized. Feasibility, reliability and validity of the new tool are investigated.

Participants and Methods: 52 children with ABI from special schools, a rehabilitation centre and an outpatient neurology clinic and 36 matched controls without ABI. The new screeningtool was administered by parents and teachers. All children were tested neuropsychologically. Internal consistency, intra-rater and inter-rater reliability, concurrent validity and discriminant validity were examined. Feasibility was established with a questionnaire for the parents, teachers and interviewers.

Results: ABI children were mostly traumatic, 9.7 years old at assessment and 64% were boys. Most frequent complaints rated by parents were sustained and divided attention and short term memory; perceiving time and fatigue. Cronbachs alpha was 0.80. Percentage agreement between measurements 2 weeks apart varied between 75 and 100%. Percentage agreement between parents and teachers varied between 48 and 86%. It took parents and teachers 14 minutes to administer the screeningtool and they rated its usefulness positively.

Conclusions: The new screeningtool has good quality and its feasibility is high. Teachers can use this tool for adequate referral to neuropsychologists for further assessment and possibly rehabilitation.

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C.G. VAUGHAN, G. GIOIA & D. VINCENT. Initial Examination of Self-reported Post-concussion Symptoms in Normal and mTBI Children Ages 5 to 12.

Objective: The self-report of symptoms of mild traumatic brain injury (mTBI) in young children is not often studied. Our study's purpose was two-fold: 1) evaluate the psychometrics of age-specific symptom reports of non-concussed children, 2) identify key symptom clusters that differentiate children with and without concussions.

Participants and Methods: The Post-Concussion Symptom Inventory (PCSI) is a self-report inventory used to assess cognitive, somatic, emotional and sleep symptoms. Eighty six normal children and 25 children with mTBI ages 5 to 7 completed the 13-item PCSI, and 250 normal and 82 children with mTBI ages 8 to 12 completed the 25-item PCSI.

Results: Internal consistency reliability of the PCSI was good for both age groups ($\alpha=0.793$, ages 5-7; $\alpha=0.911$, ages 8-12). Appropriate scale membership was indicated by item-total correlations for all (13) items in the younger group and 23 of 25 items in the older group. Both normative age groups endorsed fatigue (48.1%), numbness (43.7%), and headaches (34.8%) most frequently, and vomiting (4%), diplopia (7.5%), and difficulty tying shoes (7.9%) least frequently. Discriminant function analyses significantly predicted ($p < .05$) group membership (normal vs. concussion). The symptom of headaches predicted membership in the younger group, and the symptom cluster of thinking slowly, numbness, moving slowly, sleeping more, difficulty remembering, and difficulty concentrating predicted membership in the older group.

Conclusions: We demonstrate adequate internal scale structure of a pediatric self-report measure of concussion symptoms with initial results identifying symptoms useful for predicting concussion group membership compared with controls.

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Child - Developmental Disorders

C.J. BALLANTYNE, M. NUNEZ & L.M. RIBY. Visuo-Spatial Attentional Biases in Children with Fragile X Syndrome and Autism.

Objective: The genetic aetiology of fragile X syndrome (FXS) is well documented, whereas the exact genetic origin is unclear in autism (ASD). However despite the differences within their genetic profiles, the two developmental disorders have similarities in their neuro-cognitive attributes. These include problems in executive control and there is evidence towards dorsal stream dysfunction. In order to assess these similarities, the current study used adapted versions of the Navon task to assess the hierarchical visuo-spatial biases of these two groups of children.

Participants and Methods: Five groups of children took part in the study; an FXS group (21 children), an FXS group of 19 children that also fitted the criteria for ASD (AFXS), a group of 20 high functioning autistic children (HFA), 20 low functioning autistic children (LFA) and 80 typically developing children (TYP). The Navon task consisted of the typical Navon task, and adapted versions using geometric shapes and everyday objects.

Results: Developmental trajectories were used to compare performance of the atypical groups against the TYP group. It was found that the HFA group outperformed the TYP group until the age of eleven, when differences disappeared. As expected, the other three groups all performed worse than the TYP group in relation to age. However, the FXS groups displayed more problems when their attention was not directed to a particular hierarchical level.

Conclusions: These results suggest that the atypical groups have difficulties with frontal lobe function, namely executive attentional control, as well as dorsal stream dysfunction. However, very different visuo-spatial processing styles are also shown.

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M.S. BANKS, S.M. MCMANUS, M.A. MUMAW, T.Z. KING & D.L. ROBINS. Reaction Time Disparities Between Individuals With Autism Spectrum Disorders and Typically-Developing Controls in Response to Congruent and Incongruent Emotional Movies.

Objective: Individuals with autism spectrum disorders (ASD) consistently exhibit slower processing rates to basic emotional information (e.g. facial expression, prosody). However, it is unknown whether integration of prosody and facial emotional cues is more difficult for individuals with ASD than typically-developing individuals (TDs).

Participants and Methods: Eight TD and 13 ASD participants were recruited for a larger study. When presented with an emotion word (e.g. happy), participants assessed if it correctly represented the emotion expressed in the subsequent movie clip. Stimuli were dynamic, emotional movies with affective cues in facial expression and prosody in both congruent (i.e. happy face, happy voice) and incongruent (i.e. happy face, angry voice) forms.

Results: A repeated-measures ANOVA was conducted to investigate reaction time differences between ASD and TD groups when assessing congruent versus incongruent movies. Movie type by diagnostic group interaction was not significant; however, the moderate effect size ($\eta^2=0.40$) suggests that, with a larger sample, this interaction may reach significance. The ASD group exhibited significantly longer reaction times when assessing stimuli ($M=3727.5ms$) than did the TD group ($M=2318.42ms$), $F=5.03, p=.037, \eta^2=0.83$. There was no significant main effect for movie type; however, the large effect size ($\eta^2=0.75$) suggests significant findings with a larger sample.

Conclusions: Findings corroborate previous results that individuals with ASD have slower response times when assessing emotional information using dynamic, ecologically valid stimuli. Although both groups took longer to assess incongruent emotion movies, individuals with ASD showed greater discrepancies in time to evaluate incongruent versus congruent stimuli; preliminary results that may represent increased difficulty interpreting ambiguous emotions.

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J. BAUMGARDNER, M. GIBBS, P. POWELL, L. NOLL & T. LYLE-LAHROUD. Neurocognitive Contributions to Parenting Stress.

Objective: Children with Autism Spectrum Disorder (ASD) evidence a myriad of behavioral symptoms. The role of executive dysfunction in contributing to the behavioral symptoms observed in ASD is not clear. This is particularly the issue in the 3-5 year old age range. Parents of preschoolers who are diagnosed with an ASD report higher levels of stress than do parents of many other severely impaired populations. Previous research has shown that intellectual disability and lower adaptive functioning both negatively impact parenting stress. The purpose of this study was to explore the potential relationship between parent stress and executive dysfunction in preschool children with ASD.

Participants and Methods: A clinically referred group of children with ASD ($N=26$) were administered a test battery including measures of intellectual ability. The parents of children completed the Parenting Stress Index, Behavior Rating Inventory of Executive Function (BRIEF), and measures of adaptive functioning.

Results: Multiple regression analysis supported previous findings that general intellectual functioning (FSIQ) accounts for significant amounts of parenting stress ($R^2=.29; p=.02$). Global executive dysfunction was found to account for a significant amount of the Total Parenting Stress after controlling for general adaptive behavior ($R^2=.22; p=.01$) but not intellectual functioning ($R^2=.15; p=.07$).

Conclusions: Executive dysfunction during the preschool ages contributes uniquely to parenting stress. Further delineation of the characteristics of executive dysfunction that contribute to parental stress and their relationship to intellectual and adaptive functioning appears warranted.

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D.O. BLACK, G.L. WALLACE, B. HARRISON, A. DELLA ROSA, J. SILVERS & L. KENWORTHY. Cognitive Profiles Predicts Social Symptoms and Impairments in High Functioning Children with Autism Spectrum Disorders.

Objective: Previous research has supported distinguishing individuals with autistic spectrum disorders (ASD) on the basis of their cognitive profiles. Joseph and colleagues (2002) found that ASD children with significantly better (≥ 9 points) nonverbal (NVIQ) than verbal IQ (VIQ) have more social symptoms on the ADOS than children with either evenly developing VIQ and NVIQ or better VIQ than NVIQ.

Participants and Methods: We sought to replicate and extend these findings in a sample of children (mean age = 9.6) with ASD, average to high average IQs, and either a discrepantly high VIQ ($n=25$) or discrepantly high NVIQ ($n=26$) from a larger sample of 89 children with an ASD. A composite score of the ADOS and ADI social domains was used to estimate social symptoms and the Vineland Adaptive Behavior Scales (VABS) Socialization domain was used to index social impairment.

Results: Replicating Joseph et al., children with discrepantly high NVIQ had more social symptoms on the ADOS/ADI than children with discrepantly high VIQ ($F[1,49] = 5.0, p = .03$). We found no differences on VABS Socialization ($F[1,35] = 2.51, p = n.s.$). Using the full sample ($n=89$), VIQ ($r = -.23, p = 0.03$) and the discrepancy between VIQ and NVIQ ($r = -.22, p = .04$) were correlated with the ADOS/ADI composite social score indicating that lower VIQ and discrepantly lower VIQ than NVIQ were associated with more social symptoms.

Conclusions: Our results replicate Joseph et al.'s findings in school-aged children and support previous evidence that better verbal ability is associated with fewer autism symptoms.

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H.C. BOORSTEIN, A. VERBALIS, L. WILSON, M. BARTON, S. HODGSON, T. DUMONT-MATHIEU & D. FEIN. Diagnostic Stability in Young Children with PDD-NOS: Examining Early Characteristics and Differences.

Objective: Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS) is a diagnosis given to individuals who exhibit some characteristics of autism but not of sufficient quantity or quality to diagnose autistic disorder. This study examines early characteristics of 2 groups who received a diagnosis of PDD-NOS at age 2: those who, 2 years later, remained on the autism spectrum and those who no longer met criteria for an ASD diagnosis.

Participants and Methods: Participants were evaluated after screening positive on the Modified Checklist for Autism in Toddlers (M-CHAT). These children were seen for a developmental evaluation that examined cognitive, communication, and adaptive skill development, as well as autistic symptoms. 38 children were diagnosed with PDD-NOS. At re-evaluation at age 4, 21 of these children received an ASD diagnosis while 17 did not.

Results: Scores at age 2 were compared for differences between the groups. There were no significant differences in motor skills, receptive or expressive language, nonverbal problem solving, or ADLs. Vineland Socialization scores showed a trend ($p=.08$). There were no significant

differences on measures of autistic symptoms (ADOS and CARS). However, there were some differences in specific DSM-IV symptoms, including lack of seeking to share experiences ($p=.07$) and motor stereotypies ($p<.05$). There were some differences on M-CHAT items: pointing to request ($p=.06$), imitation ($p=.10$), finger movements near face ($p<.01$), and staring or wandering ($p=.09$). Children who remained on the spectrum were more likely to have a score suggestive of ASD.

Conclusions: These data suggest that there is variability in the profiles of children who are diagnosed with PDD-NOS at a young age. Those who do not retain their ASD diagnosis tend to have stronger initial socialization skills, imitation, and pointing, and fewer stereotypies.

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S. CRAWFORD & D.M. DEWEY. Are visual perceptual and visual motor deficits shared cognitive risk factors for children with developmental coordination disorder, attention deficit hyperactivity disorder and reading disability?

Objective: Preliminary research evidence suggests that the co-occurrence of developmental coordination disorder (DCD) with attention deficit hyperactivity disorder (ADHD) and/or reading disability (RD) is significantly more frequent than would be expected if they had independent etiologies. In this study, visual perceptual and visual motor skills were used to examine models of co-occurrence of DCD, ADHD and RD.

Participants and Methods: Participants were 202 children (mean=11.5 years): 27 children with DCD only; 11 children with ADHD only, 14 children with RD only; 14 with ADHD+RD; 15 with DCD+ADHD, 28 with DCD+RD, 20 with DCD+ADHD+RD, and 73 typically developing controls. Visual perceptual skills were assessed using the Test of Visual Perceptual Skills (TVPS), Test of Visual Motor Integration (VMI), and visual motor skills were assessed with the Rey Osterreith Complex Figure (ROCF) and the Beery Test of Visual Motor Integration (VMI).

Results: On the TVPS perceptual quotient ($F(7,193)=2.88, p=.007$), the VMI ($F(7,188)=4.76, p<.001$) and ROCF ($F(7,193)=3.62, p=.001$), children with DCD+RD or DCD+ADHD+RD were more impaired than typically developing children or children with a single diagnosis. Examination of effect sizes to determine if underlying risk factors may be shared among these three disorders indicated that visual perceptual deficits were underadditive for ADHD+RD.

Conclusions: This suggests that visual perceptual deficits in children with DCD, ADHD and RD appear to be due to neurological mechanisms that are not shared among the three disorders.

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G.M. DANCEL, L. WILSON, E. TROYB, A. VERBALIS, T. DUMONT-MATHIEU & D. FEIN. Ethnic Differences in Performance on the M-CHAT.

Objective: There is relatively little information on minorities with Autism Spectrum Disorders, including performance on ASD screeners. Parents of children aged 16-30 mos. completed the Modified Checklist for Autism in Toddlers (M-CHAT). Minority and non-minority children were compared to determine if there were any group differences in performance on individual M-CHAT items and overall M-CHAT score.

Participants and Methods: Participants included 415 children (23.8% Minority; 76.2% non-minority) who screened positive and were evaluated. 70.3% of the non-minority children were diagnosed with an ASD, 26.2% were diagnosed with other developmental delays, and 3.5% were found to be typically developing. In the Minority sample, 57.1% of children received ASD diagnoses, 40.8% received other diagnoses, and 2% were typically developing (ns).

Results: Comparisons of M-CHAT scores from Minority and non-minority samples indicate that total M-CHAT score did not differ significantly between these two groups. However, there were significant differences on six items (all p -values $<.05$). The non-minority sample failed three items including pointing to request, pointing to express interest, and response to joint attention more often than the Minority sample. Conversely, the Minority sample failed three other M-CHAT items (unusual finger movements, attracting attention to own activity, and eye contact) more often than the non-minority sample.

Conclusions: Results are consistent with the possibility that cultural and linguistic factors influence the ways in which underrepresented groups interpret and respond to the M-CHAT items. Alternatively, there may be variations in the signs/symptoms that predominate across cultures. Future research will examine features of behavior in the children to examine these possibilities, as well as control for socio-economic factors.

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J. DAVIS. What is NVLD?

Objective: This paper will provide a brief historical context for the diagnosis of nonverbal learning disabilities. The history will be traced back to Gerstmann's initial contributions, to Myklebust and Johnson's seminal work, and to Byron Rourke's research and current position, which is generally considered the most utilized definition. NVLD has come to be conceptualized as difficulties with mathematics often in juxtaposition to reading problems, a split between verbal and performance abilities on the WISC, visual-spatial difficulties, and bilateral tactile and motor problems with commonalities to some genetic disorders. In addition, the diagnoses of Asperger's disorder and high functioning autism show some similarities to NVLD. These similarities and differences will be discussed in this paper. A discussion of the research and writings about the early understanding of NVLD will be provided during this paper. In addition, a discussion of the difficulties that is present when a child is diagnosis with NVLD as far as obtaining educational services given that NVLD has not been accepted as a diagnosis by DSM IVTR or by IDEA. An illustrative case study using the initial diagnostic criteria suggested by Rourke will be provided during this paper followed by a discussion of what types of interventions in the school or by private neuropsychologists may be provided.

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J.G. FINE. Empirical Bases for NVLD.

Objective: In this paper, the theoretical and empirical basis for NVLD will be discussed. Studies over the past two decades have indicated that social understanding and visual-perceptual difficulties characterize children with NVLD, while deficits in motor, tactile and bilateral sensation have not been supported. Current research suggests that visual-spatial difficulties may well be most important for understanding NVLD. At the same time, the diagnostic criteria for a diagnosis of NVLD are unclear and consensus regarding the relative importance of visual-spatial deficits, social problems and/or mathematics disability has not been reached. This paper will critically examine the research surrounding the NVLD diagnosis. Work exploring comorbidity with ADHD, anxiety, and depression will also be discussed. Suggestions for areas critical to assessment will be provided, along with supporting theoretical underpinnings. The relation of NVLD to other similar disorders in the literature will also be addressed. Finally, findings from a large scale study of variables related to functioning on neuropsychological measures will be presented with emphasis on the most statistically significant variables found.

Participants and Methods: The study included 98 children (30 typical, 43 ADHD, 32 Social Competence Deficits (SCD) including NVLD, AS and PDD).

Results: The result of discriminant analysis indicated that a combination of fluid reasoning, a direct measure of social perception, and math operations best classified the SCD group from the others. In contrast, BASC Social Skills (Parent) discriminated controls from ADHD/SCD.

Conclusions: Although children with ADHD and autism spectrum disorders/NVLD most likely have differing neural pathways to social difficulties, they may appear similar behaviorally.

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M. SEMRUD-CLIKEMAN, J.G. FINE & B. FORREST. A Meta-Analysis of the Diagnosis of NVLD.

Objective: Studies over the past two decades have indicated that social understanding and visual-perceptual difficulties characterize children with NVLD, while deficits in motor, tactile and bilateral sensation have not been supported. Current research suggests that visual-spatial difficulties may well be most important for understanding NVLD. This paper will critically examine the research surrounding this diagnosis using a meta-analysis.

Participants and Methods: A review of the literature from the years 1985-2003 was conducted using research studies assessing children with NVLD. There were approximately 25 studies during this time period that fit the criteria for this study.

Results: The results of this analysis found that children with NVLD were diagnosed through the use of a verbal-performance IQ split, tactile and motor deficits, math difficulties, and social problems. Difficulty with social problems was found to be the primary aspect common for this diagnosis. Comorbidity with ADHD was also found.

Conclusions: Assessment of NVLD needs to be multifactorial and multimethod to assure an appropriate diagnosis. Appropriate instruments for such a diagnosis will also be presented.

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M. SEMRUD-CLIKEMAN. Interventions for NVLD.

Objective: A program designed for remediation of difficulties with social processing will be presented. Preliminary results from our study have indicated improvement for children with AS or NVLD. One theory holds that children demonstrating difficulties in social interactions may suffer from perceptual problems as well as specific social skill deficits. This theory is specifically tied to studies suggesting an association between emotional perceptual and visual spatial perceptual deficits and nonverbal learning disabilities. Under this theory, social skills training will be insufficient unless perceptual and interpretive processes are addressed as well as social skills deficits. One of the other difficulties of many social skills programs is the failure of the skills to generalize to naturalistic settings.

Participants and Methods: There were 21 children aged 9-16 with diagnosis of ASD, NVLD, or PDD who participated in the program. The presented program provides a multisensory intervention to address perceptual deficits as well as a metacognitive component to aid in interpretation and generalization. In this program, exercises have been adapted that are used in theatre classes to teach the skills related to social competence. In addressing the processes involved in social interaction, the exercises are structured to move from perception or emotions (input), to interpretation (or integration) and then to response (or output).

Results: Qualitative and quantitative analysis of pilot data indicates that the program was successful for children with NVLD. Improvements were found in social contacts, number of friendships, and self-concept.

Conclusions: The audience will be given an opportunity to experience and practice some of the tasks. Children with social perceptual difficulties respond best to interventions that are tailored to their perceptual difficulties.

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C. DEMOPOULOS, T. HITSMAN, J. DORFLINGER & A.V. DAVIS. Social Skill Patterns in Children with Autism Spectrum Disorders and Nonverbal Learning Disabilities.

Objective: Children with neurobehavioral disorders such as Nonverbal Learning Disabilities (NLD) and Autism Spectrum Disorders (ASD) exhibit difficulty in their social interactions with others.

Participants and Methods: This study examined the performance of 52 children with diagnoses of either NLD (n=25) or ASD (n=27) on measures of receptive and expressive social abilities. Measures included the Diagnostic Assessment of Nonverbal Accuracy - Second Edition (facial and vocal affect identification), Immediate Memory for Faces from the Children's Memory Scale, the Pragmatic Judgment scale from the Comprehensive Assessment of Spoken Language, and the parent-report of the Behavior Assessment System for Children - Second Edition (BASC-2; Social Skills and Leadership Skills scales).

Results: Although no significant differences were found between the two groups, both groups performed significantly worse across measures relative to normative sample means. Specifically, the ASD group performed worse on all social expression measures ($p < .001$ for Pragmatic Judgment, BASC Social Skills, and Leadership Skills) and several measures of social perception ($p < .001$ for Immediate Memory for Faces, and Child Facial Affect Recognition; $p = .021$ for Child Vocal Affect Recognition). Compared to the normative sample mean the NLD group performed significantly worse on only the BASC scales with regards to social expression ($p < .001$ Social Skills scale; Leadership scale) and followed the same pattern of deficits as the ASD group on measures of social perception, (Immediate Memory for Faces, $p = .001$; Child Facial Affect Recognition, $p = .002$; Child Vocal Affect Recognition, $p = .010$).

Conclusions: Findings are discussed in terms of conceptual diagnostic implications as well as clinical significance.

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D. DEWEY & S.G. CRAWFORD. Neurodevelopmental Trajectories in Children with Autism Spectrum Disorders.

Objective: To examine the developmental trajectories of intellectual, language, and motor abilities over a two-year period in children with autism spectrum disorders (ASD), children with developmental delays (DD) and typically developing children.

Participants and Methods: Thirty-nine children with ASD, 18 with DD, and 23 typically developing children participated (5 to 18 years). Children were assessed on standardized measures of intellectual, receptive and expressive language and motor functioning.

Results: Analyses of change in standard scores from time 1 and time 2 showed delayed onset of intellectual and receptive and expressive language skills in the children with ASD and DD compared to the typical children, but similar developmental trajectories for all groups. For motor skills, however, delayed onset and delayed rate of development were noted in children with ASD and DD. There were no differences between the ASD and DD groups in intellectual and receptive and expressive language skill development; however, there was a trend for children with ASD to display poorer motor skill development.

Conclusions: Children with ASD and children with DD performed at lower levels than typically developing children on standardized measures of intellectual, language and motor skills. In children with ASD,

developmental trajectories for intellectual and receptive and expressive language skills were similar to those displayed by typically developing children and children with DD; however, motor skills showed a delayed rate of development, suggesting that this may be a particular area of developmental vulnerability.

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J.F. GAMINO, S.B. CHAPMAN, L.G. COOK, M. BURKHALTER & S. VANEGAS. Strategic Learning in Children with Attention Deficit Hyperactivity Disorder.

Objective: The ability to strategically select and integrate important information while disregarding or inhibiting irrelevant information is believed to be a fundamental process underlying successful learning and comprehension. Thus, adept strategic learning ability is postulated to be a contributor to academic success. Children with attention deficit hyperactivity disorder (ADHD) often struggle academically despite having normal intelligence. There is no known evidence regarding strategic learning abilities in children with ADHD. This study investigated the ability of children with ADHD to strategically learn important information from a text compared to typically developing control children. We hypothesized that children with ADHD would demonstrate strategic learning deficits.

Participants and Methods: The participants for this study included 40 children with ADHD and 40 control children. The participants read narrative texts and then produced summaries of the information. Trained raters scored the summaries according to selection of important information.

Results: Our preliminary findings suggest that while children with ADHD remember a comparable amount of facts overall, they demonstrate a significantly reduced ability to strategically select important facts over unimportant details. Our results suggest that children with ADHD show a pattern of decreased selectivity in learning and integrating new information.

Conclusions: Implications of these findings are: 1) a potential for developing therapeutic intervention to train children with strategic learning deficits, 2) modification of educational curriculum to enhance strategic learning, and 3) improved ability to detect strategic learning deficits in impaired populations. This work is part of the Center for Advanced ADHD Research, Treatment, and Education (CAARTE).

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A.E. GERRARD-MORRIS, S. HARTLEY, T.A. HALL & D.M. SIKORA. Neurocognitive Profiles of Children with Autism Spectrum Disorder.

Objective: Diagnosing high functioning individuals with Autism Spectrum Disorder (ASD) presents a unique set of challenges for clinicians. Children with High Functioning Autism (HFA) and Asperger's Disorder exhibit subtle differences, particularly in the area of language. There is also research that supports cerebral differences. Careful differential diagnosis is warranted as the diagnosis could potentially determine differences in intervention and prognosis. The goal of this paper is twofold: 1) to examine the neurocognitive differences between the two groups and 2) to examine the influence of the potential differences in social-communication.

Participants and Methods: The neurocognitive and social profiles of forty-one participants ages 6-18 were examined. In addition to meeting DSM-IV criteria for Autism or Asperger's Disorder, all participants met ASD criteria on the Autism Diagnostic Observation Schedule (ADOS-

G). A series of ANOVAs and MANOVAs were conducted to determine significant group differences on neurocognitive measures and the ADOS. Additional Chi Square analysis was conducted to determine significant differences in the probability of significant discrepancies between cognitive index scores between the two groups.

Results: Results indicate that children with Asperger's outperformed children with HFA on all neurocognitive measures with the exception of visual-motor skills. There were no differences between groups in the direction of the cognitive profile or performance on the ADOS-G.

Conclusions: Despite higher IQ and language skills, individuals with Asperger's show the same level of impairment in social-communication as children with Autism. These findings implicate the need for different intervention strategies that build on the neurocognitive strengths of each of these diagnostic groups.

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M. GIBBS, M. POWELL, L.M. NOLL, T.M. LYLE-LAHROUD & J.T. BAUMGARDNER. Inhibitory Functioning in Children with Autism.

Objective: Most studies of children with autism spectrum disorders (ASD) have not shown inhibitory deficits on neuropsychological measures, but parents of children with ASD report elevated concern with inhibitory deficits in children's everyday behavior. Parent report of inhibitory difficulties in children with ASD may be context specific, related to social-emotional factors, and not easily assessed by many neuropsychological measures of inhibition. We hypothesized that the performance of children with ASD inhibiting impulsive responding on a go/ no-go task utilizing an emotionally laden auditory stimulus would be related to parent report of children's inhibition in everyday behavior.

Participants and Methods: Parents of clinically referred high functioning children with ASD (n=35; mean age=9; 31 male; Full Scale IQ=105) completed the Behavior Rating Inventory of Executive Function (BRIEF) and children completed a neuropsychological test battery including the Walk/ Don't Walk subtest from the Test of Everyday Attention for Children (TEA-Ch). The Walk/ Don't Walk subtest is an auditory go/ no-go task that utilizes an emotionally laden stimulus (i.e., scream) in the no-go inhibitory condition. Bivariate correlation was used to investigate the relationship between scores from the BRIEF Inhibition scale and the Walk/ Don't Walk subtest.

Results: A moderate negative correlation ($r = -.51, p = .002$) was found between the variables.

Conclusions: Findings indicate that in this sample of children with ASD performance on the Walk/ Don't Walk subtest was moderately associated with parent report of children's inhibitory functioning in everyday behavior.

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M. HELT, K. MARKOFF, I. EIGSTI, P. SNYDER & D. FEIN. Are Children with Autism Susceptible to Contagious Yawning?

Objective: Platek, Critton and Myers (2003) postulated that contagious yawning may be dependent upon the ability to understand what others feel. Using fMRI, researchers have discovered that contagious yawning activates neural areas responsible for unconscious processing of social information (Platek, Mohammed, & Gallup 2005; Schurmann et al. 2005).

Participants and Methods: Given that children with autism spectrum disorders (ASD) have difficulty processing implicit social cues, as well as understanding the mental states of others, we hypothesized that children with ASD may be less susceptible to contagious yawning than their

typically developing peers. We exposed children with ASD (n=20) (mental ages from 4 years;8 months to 13 years;4 months) and typically developing children (n=40) between the ages of four and twelve to a yawning stimulus by reading them a story, during which the reader would pause to yawn several times.

Results: Typically developing children were individually matched with ASD children for chronological age (CA-TD) and mental age (MA-TD), respectively, resulting in two comparison groups. In contrast to the 40% rate of contagious yawning (i.e., yawning that followed the reader's yawn within 90 seconds) exhibited by the CA-TD group and the 35% rate in the MA-TD group, only 10% of the children with ASD showed contagious yawning.

Conclusions: Findings demonstrate that children with ASD are less likely to show contagious yawning, a difference which may be related to impairments in implicit processing of social information. Specifically, we hypothesize that children with ASD may experience reduced salience of affective cues due to amygdala dysfunction.

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S.A. JOHNSON, L.M. BLAHA, R.R. MURPHY, J.T. TOWNSEND & J.C. STOUT. Lack of Local Bias during Selective Attention Global-Local Processing in Autism Spectrum Disorders.

Objective: Previous studies of global-local (GL) processing in autism spectrum disorders (ASD; Rinehart et al., 2000; Plaisted et al., 1999) found a lack of both global advantage and global interference. However, their methods differed fundamentally (including unlimited stimulus presentation time, lack of spatial uncertainty, few trials) from traditional designs of GL studies. Studies of controls have indicated that such changes in GL task parameters significantly alter performance (Kimchi, 1992). In the current study, we characterized GL processing in ASD using traditional cognitive science methods.

Participants and Methods: Sixteen high-functioning individuals with an ASD and 16 age- and IQ-matched comparison subjects completed eight selective attention GL tasks. Four tasks used hierarchical letter stimuli and four used number stimuli. For each type of stimulus, we employed two methodologies: 1) replication of methods used in previous ASD GL studies, but with a greater number of trials and 2) methods consistent with traditional designs of GL studies, incorporating brief presentation times, spatial uncertainty, and backward masking.

Results: Repeated measures ANOVA revealed a main effect of attended dimension with faster response times for the global versus local dimension for both groups on all tasks. Contrary to previous ASD studies, global interference effects were demonstrated by both groups for both replication and traditional GL tasks, and neither group demonstrated local interference.

Conclusions: We found typical GL processing in high-functioning ASD participants. Both control and ASD groups demonstrated global advantage, global interference, and a lack of local interference. Findings are discussed in light of cognitive theories of ASD and methodological considerations.

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M.Y. KIBBY, A. JOHNSON, S.J. BRAUN & G.W. HYND. Relationship between Pars Triangularis Morphology and Phonological Processing.

Objective: Limited research has examined the pars triangularis in dyslexia. That conducted thus far has found a relationship between pars triangularis size and reading ability. Hence, the goal of our project was to examine the relationship between pars triangularis morphology and phonological processing.

Participants and Methods: Participants included 20 children with dyslexia, 16 controls, and 20 children with ADHD; children with comorbid dyslexia and ADHD were excluded. As part of a larger study (R01 HD26890), participants underwent a neuropsychological evaluation which included the WASI, WJ-III and CTOPP, as well as an MRI scan. Groups did not differ in age, FSIQ, SES, gender, or handedness. The pars was categorized with one of four structural typologies (V/U, Y, I, J) following the Cunningham and Eberstaller classification system as part of a smaller project (R03 HD048752). Groups did not differ significantly in right or left typology when using Chi square; thus, correlations were assessed between typology and various aspects of phonological processing in the total sample using Spearman's rho.

Results: Left pars typology approached significance with digit span. Right pars typology was significantly correlated with Word Attack/decoding, Elision, rapid letter naming, digit span, and verbatim sentence repetition. All of these correlations were negative, indicating less typical typologies were associated with worse performance.

Conclusions: Right pars triangularis morphology may play an important role in both phonological processing and reading ability. Further research on pars triangularis typology in dyslexia is warranted.

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M.Y. KIBBY, A. LAMACCHIA, S.J. BRAUN, A. JOHNSON & G.W. HYND. Relationship between Brain Structure and the Double Deficit Model of Dyslexia.

Objective: Few studies have compared multiple brain regions in terms of how well their volumes predict reading and phonological processing performance. Hence, this was the goal of our project.

Participants and Methods: Participants included 20 children with dyslexia, 20 children with ADHD, and 16 controls; those with comorbid dyslexia and ADHD were excluded. These children underwent a neuropsychological battery including the WASI, WJ-III and CTOPP, as well as an MRI scan, as part of a larger study (R01 HD26890). Groups were commensurate in age, FSIQ, handedness, gender, and SES. The pars triangularis, ascending (AA) and horizontal rami (AH); pars operculum (POP); planum temporale, temporal (PT) and parietal (PP) banks; and supramarginal gyrus (SMG) were measured as part of smaller project (R03 HD048752). Groups did not differ on these volumes when using MANOVA. Thus, all volumes from the total sample were used to predict phonological processing and reading measures via Backward regression.

Results: Both word identification and Word Attack/decoding were predicted exclusively by left POP volume. Elision was predicted by left POP and right SMG, whereas rapid letter naming was predicted by left PT and PP. Digit span was predicted by left POP and PP, and verbatim sentence repetition was predicted by left POP.

Conclusions: The left POP appears to play a role in decoding, phonological awareness (Elision) and phonological short-term memory. In contrast, the left posterior perisylvian region appears to be important for rapid naming. Given phonological awareness and rapid naming were predicted by different brain regions, this study supports the double deficit model of dyslexia.

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D. LARKIN, B. HANDS, H. PARKER & E. ROSE. Difficulties with the Recognition of Motor Coordination Problems.

Objective: Parents of children with developmental coordination disorder (DCD) often express frustration about the number of health professionals they see before the DCD is diagnosed. In this study we explored parent reports of coordination problems in children with mild and severe DCD, in an effort to better understand their concerns.

Participants and Methods: The sample was a subset of the West Australian longitudinal (Raine) study, identified with mild or severe DCD

at the age of 10 years using the McCarron Assessment of Neuromuscular Development battery (MAND). The mild DCD group (boys, $n = 201$ and girls, $n = 135$) scored between the 6th and 15th percentile on the MAND and the severe DCD group (boys: $n = 38$; girls: $n = 25$) scored at or below the 5th percentile.

Results: The Group x Gender ANOVA of the MAND score confirmed a significant effect for group, but not gender. Only 24% of boys and girls with severe DCD had a diagnosed coordination problem, while 4% of the boys and 1.5% of the girls in the mild group had this diagnosis. Parents reported that 51% of the boys and 32% of the girls in the severe group and 15% of the boys and 20% of the girls in the mild group had coordination difficulties. Few parents (5.3%) expressed dissatisfaction with their child's coordination and development progress.

Conclusions: There is a clear discrepancy in the number of children recognized with coordination difficulties using the MAND assessment of DCD and parent reports. It appears that many parents, as well as child health professionals, are not cognizant of the motor difficulties children have, and the possibility of associated developmental problems. Community based education would be appropriate to promote a better understanding of DCD and the long-term implications.

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V.J. LOZANO, H.J. HANNAY, P.T. CIRINO & J.M. FLETCHER. Memory, Commissural Dysgenesis, and Spina Bifida Meningomyelocele.

Objective: The role of commissural abnormalities in memory of verbal and visuospatial material by children with Spina Bifida Meningomyelocele (SBM) was investigated. Performance on these memory tasks was expected to vary according to status of the corpus callosum (CC) splenium, status of the hippocampal commissure (HC), different combinations of CC splenial and HC status, and spinal lesion level.

Participants and Methods: Performance on the California Verbal Learning Test-Children's Version (CVLT-C) and the Stanford Binet Bead Memory Test gathered from 212 participants (SBM = 170, normal controls = 42) who were recruited as part of a larger study were analyzed. No child was included in the study if he/she had a neurological disorder unrelated to SBM, severe psychiatric disorder, uncontrolled seizure disorder, uncorrected sensory disorder, or an inability to control the upper limbs. Children were also excluded if they did not have MRI data, were unable to complete the Stanford Binet, were under seven years of age, or were over the age of 16 years at testing.

Results: Children with SBM demonstrated significant memory problems on the CVLT-C, and the pattern of performance suggests relatively more problems with retrieval rather than retention. These children also evidenced significant problems on the Bead Memory test. On the CVLT-C, children with a hypoplastic splenium performed better than children with an absent splenium, and children with a normal HC performed better than children with a hyperplastic HC. When status of the splenium and HC were combined, however, they did not significantly interact. Finally, children with SBM and higher-level (> T12) spinal lesions performed significantly worse on the CVLT-C and Bead Memory test than children with lower-level (< L1) lesions.

Conclusions: The present study supports previous findings of verbal and visual memory problems in children with SBM and shunted hydrocephalus. Furthermore, the degree of impairment on verbal memory is related to status of the CC splenium and HC.

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S.M. MCMANUS, M.S. BANKS, M.A. MUMAW, T.Z. KING & D.L. ROBINS. Face Bias During an Audio-Visual Emotion Perception Task Absent in Autism Spectrum Disorders.

Objective: The accurate perception of facial expression and prosody are critical for successful social interactions. When information is perceived from multiple modalities, typically-developing individuals (TD) consistently show a bias toward facial emotion. Studies have shown that individuals with autism spectrum disorders (ASD) have difficulties understanding emotions expressed by others. In particular, ASD individuals have been shown to be less efficient than TD in identifying emotions with visual-only and auditory-visual stimuli. The current study examines whether individuals with ASD, like TD individuals, are biased toward information from the visual modality when presented with conflicting emotional information from the auditory modality.

Participants and Methods: TD ($n=8$) and ASD ($n=13$) participants were recruited for a larger study. Participants were presented with an emotion word cue (e.g. happy, angry) and asked to assess whether or not it correctly described the affect portrayed in the subsequent movie clip. Congruent and incongruent movie (i.e. happy face, angry voice) stimuli were utilized.

Results: Paired-samples t-tests were conducted. Both groups made significantly more correct than incorrect responses ($p<.01$) when responding to congruent movies. When presented with incongruent movies, TD participants showed a strong bias towards the facial expression ($t=3.207$, $p=.015$, $\eta^2=.60$). The ASD group did not demonstrate such bias, instead responding comparably toward facial expression and prosody ($t=.487$, $p=.635$, $\eta^2=.02$).

Conclusions: Findings suggest that the impairments in emotion perception of individuals with ASD may result from an under-reliance on interpreting facial expressions. Failing to recognize subtle discrepancies between prosody and facial expression may play a role in the social difficulties in ASD.

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S. MORE, C. GOLDBERG, E. NANOS, C. RIBBENS GRIMM & M. BEST. Cognitive and Behavioral Functioning in Children Undergoing RV to PA Conduit Placement.

Objective: Children with congenital heart defects (CHD) have an increased risk of cognitive deficits. Multiple types of CHD require cardiopulmonary bypass (CPB) surgery for placement of a conduit from the right ventricle to the branch pulmonary arteries (RV to PA). Children with these types of CHDs may be at greater risk for cognitive deficits because of the need to replace the conduit every 2-10 years. The purpose of this preliminary study was to determine if children undergoing bypass surgery for RV to PA conduit replacement show deficits in cognitive and behavioral functioning following surgery.

Participants and Methods: 7 children, ages 4.6 to 17, with CHD undergoing RV to PA conduit placement were evaluated using the WPPSI-III (≤ 5 years), WISC-IV (6-16 years), or WAIS-III (17-18 years) before, and 1 year post surgery. Parents of participants completed the Behavior Rating Inventory of Executive Function (BRIEF). Paired t-tests comparing children pre and post surgery were performed on Wechsler indices and BRIEF scales.

Results: Paired t-tests showed no significant differences between pre and post surgery on the Wechsler Indices. Significant differences were found on the BRIEF Behavioral Regulation Index ($t=-3.763$, $p=.013$), Metacognition Index ($t=-4.076$, $p=.010$), and Monitor scale ($t=-2.927$, $p=.0438$), suggesting greater behavior problems following surgery.

Conclusions: Short term effects of CPB for conduit replacement suggest no significant changes in cognitive functioning. However, parents reported changes that may be significantly affecting children's behavior at home and at school. Follow up studies are needed to assess this further.

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K. NASH & J. ROVET. The Neurobehavioral Profile of Children with Fetal Alcohol Spectrum Disorder (FASD): A Comparison with Attention Deficit Hyperactivity Disorder (ADHD) and Oppositional Defiant/Conduct Disorder (ODD/CD).

Objective: No study to date has compared children with FASD to both children with ADHD and with ODD/CD, a seemingly crucial endeavor since diagnosis of the disorder typically relies on patterns of impairments often seen in other childhood disorders. Additionally, because each of these conditions supposes abnormal frontal lobe functioning, understanding the behavioral profiles unique to each disorder, is an important first step in identifying potential neuroanatomic biomarkers. Therefore, our aim is to identify the distinctive behavioral phenotype in children with FASD.

Participants and Methods: Four groups of 50 children aged 6 to 17 were studied: FASD, ADHD, CD/ODD, and typically developing controls. All parents or caregivers completed the Child Behavior Checklist (CBCL) and results were analyzed using MANOVA. Multiple linear regression was used to examine the impact of background factors.

Results: Children with FASD presented with a more disturbed behavioural profile than children with ADHD and controls, reflecting elevated levels of oppositional and conduct problems (e.g., lying, cheating, stealing, lacking guilt). Compared to ODD/CD, children with FASD demonstrated lower levels of anxiety and depression with similar levels of other conduct and attention problems. Additionally, while severity of behavior problems in FASD and ADHD was not related to familial or background factors, background factors significantly influenced the behavioral profiles of children with ODD/CD.

Conclusions: These findings have the potential for identifying critical behavioural biomarkers for FASD, an endeavor that may ultimately aid in the diagnostic process. The behavioral profile of FASD identified in the current study is characteristic of orbitofrontal impairment in this population.

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C. NUNEZ, L. LU, S. BOOKHEIMER, S. HOUSTON, S. MATTSON, M. O'CONNOR, E. O'HARE, L. SMITH & E. SOWELL. Attention Performance in Children Prenatally Exposed to Methamphetamine.

Objective: Few published studies have examined neurocognitive consequences of prenatal methamphetamine exposure. The purpose of this study was to examine whether children prenatally exposed to methamphetamine demonstrate deficits in attention when compared to non-exposed children. Because many methamphetamine-exposed children are additionally exposed to alcohol prenatally, a comparison group of alcohol-exposed children was also evaluated to account for effects of mild-moderate alcohol exposure.

Participants and Methods: Forty-six children (21 females) participated in a study of the effects of prenatal alcohol and methamphetamine exposure on neurocognitive development. Fourteen children were in the methamphetamine exposed group (MA), with 10 exposed to alcohol. Ten children with mild-moderate symptomatology associated with prenatal alcohol exposure comprised the alcohol exposed group (ALC). None met criteria for Fetal Alcohol Syndrome. Twenty-two children were in the non-exposed group (CO). No differences in age or gender were observed among groups. Participants were administered attention measures as part of a neuropsychological battery, including the Test of Variables of Attention (TOVA), WISC-IV Digit Span, and WISC-IV Letter-Number Sequencing.

Results: Group mean performances on attention measures were compared utilizing ANOVA. Results indicated group effects on TOVA Omission Errors and TOVA Response Time Variability ($p < 0.01$), and post-hoc analyses indicated that the MA group performed significantly worse than both the ALC and CO groups ($p < 0.05$) with no ALC-CO difference.

Conclusions: In the current study, children prenatally exposed to methamphetamine performed worse than non-exposed and alcohol-exposed children on measures of sustained attention. Findings suggest that these children experienced difficulty with attention that cannot be fully accounted for by alcohol exposure.

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J. PANDEY, A. VERBALIS, L. WILSON, S. HODGSON, T. DUMONT-MATHIEU, J. GREEN, M. BARTON & D. FEIN. Screening, Developmental, and Diagnostic Differences Between Younger and Older Toddlers Using the Modified Checklist for Autism in Toddlers (M-CHAT).

Objective: Early diagnosis of ASD allows children access to intervention, necessitating screening and evaluation at younger ages. The current study examined a subset of children screened through the larger M-CHAT study to

explore the optimal age for autism screening, and examined differences in functioning for a subset of children who were evaluated.

Participants and Methods: To assess screening characteristics, children were designated as high-risk (screened by early intervention) or low-risk (pediatric general screening), resulting in four groups: younger/high-risk ($n = 319$, mean age = 20.8 months), younger/low-risk ($n = 3,503$, mean age = 18.7 months), older/high-risk ($n = 403$, mean age = 27.5 months), older/low-risk ($n = 1,484$, mean age = 24.9 months). To address diagnostic and developmental functioning, 106 younger children (mean age = 20.5 months) who failed the screening and were evaluated were compared to 114 evaluated older children (mean age = 27.6 months).

Results: Positive predictive power was: younger/high-risk (.77), younger/low-risk (.47), older/high-risk (.79), older/low-risk (.66). Results suggest that positive predictive power is lowest with the younger/low-risk children. Evaluations indicated that the groups were similar in severity of autism and on the M-CHAT. However, the younger age group scored higher than the older group in cognitive development (Mullen Visual Reception and Fine Motor) and all domains of adaptive functioning (Vineland Communication, Socialization, Daily Living, and Motor domains).

Conclusions: Results suggest that older and younger toddlers detected by autism screening have a similar degree of symptomatology, which is sufficient for diagnosis at either age, but that PPV is better for the older group. Clinical decision making about age of screening should balance the earliest possible identification against the possibility of unnecessary referrals for each clinical application.

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S.E. PARLOW & S.J. ROBERTSON. Anomalous Hand Preference Observed for Bimanual Tasks in Unaffected Siblings of Children with Autism.

Objective: Autism spectrum Disorder (ASD) is associated with an increased rate of ambiguous handedness (Hauck & Dewey, 2001). In the context of a broader phenotype (Bailey et al., 1998), we speculated that ambiguous handedness might also characterize clinically unaffected siblings.

Participants and Methods: Unimanual and bimanual hand preference was investigated in 75 children aged 3-12 years ($M = 8.2$ yr), including 25 with ASD, 25 clinically unaffected siblings, and 25 unrelated,

neurotypical children without family histories of ASD. Groups were matched for age and parental sinistrality; siblings and unrelated controls were also matched for gender. Measures included the Hand Preference Demonstration Test (Soper et al., 1986), the WatHand Cabinet (Roy & Bryden, 2004), and a novel beading test. Standard laterality quotients (LQ) were calculated for unimanual tasks; scores between -90 and +90 indicated ambiguous handedness (Hauck & Dewey, 2001). The Global Bimanual Laterality Index (GBLI) was calculated for bimanual tasks; scores between 25% and 75% indicated ambiguous handedness (Fagard & Marks, 2000).

Results: GBLI scores but not LQ scores showed the expected pattern. High rates of ambiguous handedness for bimanual tasks characterized ASD (21%) and sibling (24%) groups, but not controls (9%), $p < .01$. LQ scores were lower for the ASD group at $p < .05$ (see Parlow & Harris, 2007), but did not differentiate between siblings and controls.

Conclusions: This study is the first to report on bimanual hand preference in this population. The high rate of ambiguous handedness observed among siblings of children with ASD supports the broad phenotype concept.

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K. PHILLIPS & B.P. KLEIN-TASMAN. Executive Functioning in Children and Adolescents with Williams Syndrome: Performance on Experimental Measures and Comparison to Parental Report.

Objective: Williams syndrome (WS) is a rare genetic neurodevelopmental disorder resulting from a hemizygous microdeletion on chromosome 7q11.23. Previous research (Gaffrey et al., 2007) indicated that children with WS exhibit deficits in most aspects of executive functioning (EF), per parent report. However, few studies have examined these abilities using experimental measures or related performance to parent report. The purpose of the present study was to evaluate EF in children and adolescents with WS.

Participants and Methods: Participants were 30 children with WS, aged 8-15. Children completed the D-KEFS Verbal Fluency and Sorting subtests (Delis et al., 2001), and the TAPS Auditory Number Memory subtest (Gardner, 1998). Parents completed the BRIEF (Gioia et al., 2000) about their children.

Results: Performance on EF tasks ranged from average to far below average, with stronger performance on fluency than on sorting. The majority of participants (73%) did not exceed 2 on TAPS longest backward recall. Correlations were found between verbal and category fluency ($r = .44$, $p = .009$) and between category fluency and working memory ($r = .73$, $p < .001$). Age correlated with verbal fluency raw score ($r = .63$, $p < .001$), category fluency raw score ($r = .62$, $p < .001$), and TAPS digits backward raw score ($r = .69$, $p < .001$). Intellectual functioning was correlated with TAPS ($r = .63$, $p = .001$) and category fluency ($r = .42$, $p = .014$). Few relationships were evident between experimental measures and the BRIEF; they were accounted for by age and IQ.

Conclusions: Overall, children with WS had difficulty with EF tasks, and performance on measures did not correlate with parent report. The implications of these findings for the understanding of neuropsychological functioning of children with WS will be discussed.

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K. RADONOVICH, T.N. HOLTZCLAW & J.W. BODFISH. Motor Impairments in School-aged Children with Autism.

Objective: Individuals with autism are often described as "clumsy." Previous research in autism spectrum disorders (ASD) has suggested that movement disturbances could be one of the earliest signs of autism. The presence of neuromotor deficits in autism may be an indication of underlying neurobiological factors involved in the disorder.

Participants and Methods: We examined children 6 to 18 years of age on two batteries of motor functioning. Children were diagnosed with ASD according to ADI-R, SRS, and clinical impression.

Results: Compared with TD controls (ASD: $n=30$; TD: $n=26$) an ANCOVA (nonverbal IQ as covariate) found that ASD children scored significantly worse than TD on the Bruininks-Oseretsky Test of Motor Proficiency Overall Score ($p=0.000$). Additionally, we assessed abnormal movements, such as tics, dyskinesia, and Parkinsonian symptoms based on the Dyskinesia Inventory System Condensed User Scale & Exam (DISCUS) and the Akathisia Ratings of Movement Scales (ARMS). Results from an ANCOVA found that ASD children performed significantly worse on the DISCUS total score ($p=0.02$), ARMS total score ($p=0.04$), and Parkinsonian total score ($p=0.02$). There was a trend toward significance for presence of stereotypies ($p=0.06$). The two groups did not differ on presence of tics, self-injury, or self-restraint. Motor problems were also correlated with levels of restricted, repetitive behavior on the RBS-R.

Conclusions: These results are consistent with previous findings on motor impairment in ASD. Results begin to delineate specific types of motor problems (i.e., Parkinsonian/subcortical). More refined testing can help determine whether certain neurobiological systems are involved in ASD overall, or in specific subgroups of children with ASD.

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C.I. KIMBERG & K.J. RADONOVICH. Relationship of Executive Functions and Repetitive Behavior in Preschoolers with Autism.

Objective: Despite the clinical significance of restricted repetitive behaviors (RRBs) in autism, relatively little is known about their phenomenology, development, and associated neurocognitive abilities. Executive function (EF) skills are defined as self-regulatory skills that coordinate specific cognitive processes to achieve goal-oriented behavior and appropriate emotional responses. Aspects of EF impairment have been demonstrated, even in high-functioning individuals with autism. Individuals with autism have demonstrated impairments on tasks that measure the ability to shift flexibly and adaptively from one activity or stimulus to another. Recently, Lopez et al. (2005) found that several executive processes (cognitive flexibility, working memory, and response inhibition) were highly related to RRBs in a sample of adults with high functioning autism, while controlling for IQ. To date, few studies have focused on the relation of RRBs to specific cognitive or neuropsychological deficits in autism.

Participants and Methods: We examined children with autism spectrum disorder (ASD) and typically developing controls (TD) 3 to 6 years of age on the Repetitive Behavior Scale-Revised (RBS-R) and BRIEF-P. A brief nonverbal IQ score was also obtained. Children were diagnosed with ASD according to ADOS, CARS, and clinical impression.

Results: Initial results (ASD: $n=11$; TD: $n=6$) on an ANCOVA (nonverbal IQ as covariate) found that ASD children scored significantly worse than TD on overall executive function (General Executive Composite, $p=0.000$) and on the Flexibility scale ($p=0.002$). In children with ASD, significant correlations were found between several RBS-R scales and scales on the BRIEF-P.

Conclusions: Results are consistent with findings for EF impairment in older individuals with autism, particularly on tasks requiring the ability to shift focus adaptively and flexibly. It also appears that higher levels of repetitive behaviors are associated with greater EF impairment. Correspondence: *Krestin Radonovich, PhD, University of Florida, 9402 SW 90 ST, Gainesville, FL 32608. E-mail: kradonor@ufl.edu*

K. RANDALL & K. KERNS. Inhibition in Children with ADHD: How Efficient are They?

Objective: Casey (2001) described components of inhibition utilizing basal ganglia-thalamocortical circuits and revealed children with ADHD

were impaired on tasks of stimulus selection (inhibition of a salient, but irrelevant stimulus attribute), with preserved ability to perform tasks of response selection (inhibition of a competing 'prepotent' response). As this distinct pattern of deficits has not been replicated, the current study re-examined the stimulus and response selection proponents of Casey's model in children with ADHD using an efficiency analysis in an attempt to clarify these intriguing results.

Participants and Methods: Computerized tasks used to assess inhibition were administered to 62 male children ages 7 to 12 (31 controls, 31 ADHD). The tasks utilized location and color cues to measure stimulus selection and response selection dimensions of inhibition. Participants were required to press a button to match either block location or color.

Results: Efficiency scores were assessed based on latency and accuracy data. Results indicate that children with ADHD are less efficient than control children on stimulus selection tasks in a block location task ($t(62)=2.9$, $p<.01$; Partial Eta squared =.60), but not a response selection task. On the color matching task ADHD children exhibited significantly lower efficiencies ($p<.01$; Partial Eta squared ranges: .40 to .58) on both stimulus selection and response selection tasks.

Conclusions: Results replicated Casey's findings in children with ADHD on a block location task, but revealed inhibition deficits on both stimulus and response selection in a color matching task. These results highlight the utility of analyzing efficiency data and foster an increased understanding of inhibitory functioning in the clinical population of children with ADHD.

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J. SUMMERS, D. LARKIN & D. DEWEY. Activities of Daily Living in Children with Developmental Coordination Disorder: Dressing, Personal Hygiene and Eating Skills.

Objective: Developmental coordination disorder (DCD) is a significant developmental disability for 6 - 13 % of school age children. Children with DCD display a marked impairment in the development of motor coordination that significantly interferes with activities of daily living. The objective of this study was to better understand how problems in motor coordination impact the performance of activities of daily living in children with DCD.

Participants and Methods: Focus groups and interviews with Australian and Canadian parents ($N = 87$) were used to examine activities of daily living of younger (5 to 7 years of age) and older (8 to 9 years of age) children with and without DCD.

Results: In comparison to their typically developing age group, children with DCD had more difficulty with dressing, personal hygiene and eating skills. Difficulties with postural control and fine motor skills were reported to contribute to poorer performance of activities of daily living. As expected, competence in the performance of activities of daily living improved in the older children with and without DCD and there were few differences in the performance of daily living tasks between typical children in Australia and Canada.

Conclusions: The motor problems of children with DCD had a significant impact on their performance of daily activities. Children with DCD generally needed much more parental support and assistance than their same aged peers in order to successfully perform basic self maintenance activities.

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S. TEK, R. JAFFERY, D. FEIN & L. NAIGLES. Predictors of Language Development in Young Children with Autism.

Objective: Research has established that early social abilities of children with autism (ASD) predict their later levels of language development. Little is known about which other aspects of early presentation

are predictive. However, as children with ASD develop they optimally should exploit motor and cognitive abilities to learn language. We hypothesized that ASD children's language scores would correlate with their social, motor, and cognitive abilities measured at earlier points in development.

Participants and Methods: In an ongoing longitudinal study, we tested 14 children with autism at 4 time points four months apart (mean age = 30 months at the onset of the study). At Visit 1, the ADOS/CARS and the Vineland (social), Mullen (motor, visual reception, language), and CDI (language) tests were administered. At Visits 2 and 3, the CDI and Vineland were administered. At Visit 4, the CDI, Vineland, and Mullen (visual reception) were administered.

Results: Motor development at earlier visits (Mullen, Vineland) consistently correlated with the CDI (language) scores at later visits across all time points. Cognitive development (Mullen visual reception) and social development (ADOS/CARS, Vineland) scores also were correlated with the CDI at later visits. Regressions revealed that social ability, cognitive ability, and motor ability at Visit 1 each significantly predicted CDI scores at Visit 3 (total variance accounted for = 75%); only motor ability at Visit 1 predicted CDI scores at Visit 4.

Conclusions: Fine-motor ability, social ability, and cognitive ability are all strong predictors of later language development in young children with autism. Correspondence: *Saime Tek, Psychology, University of Connecticut, 406 Babbidge Road, Unit 1020, Storrs, CT 06269. E-mail: saime.tek@uconn.edu*

C. TOLEDO-PIZA, E.C. MACEDO & A. CAPOVILLA. Performance of Dyslexics and ADHD Brazilian Children in Single Word Reading Tasks.

Objective: The analysis of reading skills in single word reading tasks, can help us better understand the difficulties faced by children with Dyslexia and Attention Deficit Hyperactivity Disorder (ADHD). The objective of the present study was to compare the type of error, reaction time and speech (locution) speed of dyslexics and ADHD children.

Participants and Methods: Eight dyslexics (M=10;05 years of age, SD=1,54) and eight ADHD children (M=10;51 years of age, SD=1,12), paired by sex and school year, have been evaluated. A list containing 191 words and pseudowords was presented in a computer screen. Subjects were required to read the words (in Portuguese) out-loud. The psycholinguistic variables controlled in the list were: regularity (regular, irregular, rule), frequency (high and low) and lexicality (real words and pseudowords). The words read out-loud (locutions) were recorded in digital files and the analysis of errors was done from the phonetic transcription, considering the following types of errors: omissions, exchange, inversion and additions of phonemes.

Results: Results indicated higher error frequencies ($t[14]=2,227; p=0,043$) in the dyslexics single word reading skills (M=118,00; SD=27,11), when compared to those with ADHD (M=148,38; SD=27,45). Data also indicated that dyslexics were more likely to make errors when reading irregular words ($t[14]=2,576; p=0,022$) and pseudowords ($t[14]=2,184; p=0,046$), however no significant differences were observed in other items.

Conclusions: Studies comparing reading performance can also assist in clinical differential diagnosis and in the identification of comorbidities, frequently observed in the learning disabilities.

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E. TROYB, H. BOORSTEIN, M. HELT, K. CARR, T. DUMONT-MATHIEU, S. HODGSON, M. BARTON & D. FEIN. Parental Age as a Risk Factor for Autism.

Objective: Recent studies have suggested that advanced paternal age increases the risk of a child developing an Autism Spectrum Disorder (ASD). This study examined whether a difference in parental age exists between children with ASD and children with other developmental disorders, and investigated the relationship between parental age and the severity of symptoms.

Participants and Methods: Children were diagnosed after screening positive on the Modified Checklist for Autism in Toddlers. Parental ages for children with ASD (n=206) were compared with those with a non-autistic developmental delay (n=96). The average age of mothers in the sample was 32.1 (SD=6.0) and of fathers was 34.1 (SD=6.8).

Results: An independent samples t-test revealed a significant difference in maternal age ($t(300)=-2,124, p<.05$). However, this difference did not remain significant when controlling for paternal age ($F(1)=1,532, n.s.$). No significant difference was found between paternal ages ($t(295)=-1,429, n.s.$). A small but significant association was found between maternal age and the total score on the ADOS ($R^2=.140, p<.05$), as well as the total score on the ADI ($R^2=.146, p<.05$). When these children were re-evaluated 2 years later, the association between maternal age and the total score on the ADOS remained significant ($R^2=.162, p<.05$). No associations were found between parental age and scores on measures of cognitive or adaptive level.

Conclusions: Results indicate that increased paternal age may be a non-specific risk factor for developmental disorders in general, rather than autism in particular. Additionally, these results imply that maternal age may have a small but significant association with severity of autistic symptoms.

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L.E. VAURIO, E.P. RILEY & S.N. MATTSON. Comparison of Neuropsychological Performance in Children with Heavy Prenatal Alcohol Exposure and IQ-Matched Controls.

Objective: One major objective in current research on individuals with Fetal Alcohol Spectrum Disorders (FASD) is to identify neurobehavioral profiles that might distinguish these individuals. Much of this work has focused on comparisons with typically developing controls, where differences in many domains have been identified. However, these differences are typically confounded by lower IQ scores in the FASD group. Therefore, children with FASD were compared to matched-IQ non-exposed controls on several measures of neurobehavioral function.

Participants and Methods: Children (6 to 16 years) were administered a broad neuropsychological battery (PPVT-III, BNT, COWA Verbal Fluency, CVLT-C, TOVA, VMI, Grooved Pegboard, WRAT-3, WCST, CBCL). From a larger sample, 55 children with FASD were matched to 55 non-exposed controls (CON) on FSIQ (within 5 points) as measured by the WISC-III. IQ scores of these pairs ranged from 49 to 128. Demographic data were analyzed using ANOVA and Chi-Square statistics. Measures of neurobehavioral function were analyzed using MANOVA. FSIQ was included as a covariate when appropriate.

Results: Given that the groups were matched, they did not differ on FSIQ (M = 92, SD = 16.6), nor did they differ on race/ethnicity, age or socioeconomic status. Group differences (FASD < CON) were found in some domains of the neuropsychological battery, including verbal learning/recall (CVLT-C) and parent-rated behavior problems (CBCL).

Conclusions: Neurobehavioral consequences of FASD cannot be explained only by diminished IQ. Impairments in some cognitive domains may be characteristic of lowered intellectual function; other impairments may be more specifically associated with FASD (i.e., verbal learning/recall and behavior problems).

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A.D. VERBALIS, H. BOORSTEIN, S. SUTERA, S. HODGSON, T. DUMONT-MATHIEU, M. BARTON & D. FEIN. Symptom Expression Differences in High Functioning Autism and Autism with Cognitive Delay.

Objective: High Functioning Autism is defined as autism with a cognitive level within the average range (within 1.5 SD of the mean). Little research has determined whether there are symptom differences between children classified with High Functioning Autism (HFA) and children with autism who are cognitively delayed (CD).

Participants and Methods: Children were screened with the Modified Checklist for Autism in Toddlers at 16-30 months; those screening positive were evaluated, and reevaluated approximately two years later. Analyses were completed on 202 children (59 HFA; 143 CD) diagnosed with an ASD at the evaluation; 106 (40 HFA; 66 CD) were diagnosed with an ASD at the reevaluation. The HFA groups were evenly split between a diagnosis of PDD NOS and Autistic Disorder, while the CD groups were skewed towards an AD diagnosis.

Results: Statistical differences were found between the groups on age, suggesting that the HFA group is younger in our sample. On the DSM-IV diagnostic criteria, the HFA children were less likely to show impairment in nonverbal communication, lack of shared enjoyment, delay in speech, and lack of make believe play, according to chi square analysis. At reevaluation, the HFA group continued to show these differences, but also were significantly less likely to display a lack of emotional reciprocity, repetitive motor mannerisms, and preoccupations with parts of objects; the HFA group was more likely to show impaired conversation. There were no group differences on interest in peers, stereotyped language, restricted interests, and resistance to change.

Conclusions: Although cognitive ability is believed to be distinct from autism severity, there are consistent effects of ability level on symptom expression. Interestingly, some symptoms are seen in similar percents of children with HFA and autism with CD. This may help clarify symptoms in high functioning children, who may be difficult to diagnose due to lower overall severity.

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M.E. VILLALOBOS, H. COON, J.S. MILLER & W. MCMAHON. Social Abilities and IQ Profiles in Autism Proband and their Siblings.

Objective: Social abilities may be related to IQ profiles in Autism Spectrum Disorders (ASD). This study examined the relationship between IQ and social abilities in individuals with ASD and their siblings in order to identify possible intermediate phenotypes for future genetic studies.

Participants and Methods: Our participants included 123 affected individuals and 140 of their unaffected siblings (6 to 60 years). All participants were administered age- and ability-level appropriate intelligence tests. Composite Verbal, Nonverbal and Full-Scale scores were calculated for each participant. Only participants with Full-Scale IQ scores above 70 were included. Parents completed a 65-item questionnaire measuring social abilities related to characteristics of ASD, the Social Responsiveness Scale (SRS). Three groups were formed based on SRS scores (high moderate, or low social impairment).

Results: A MANOVA was conducted to determine effect of social impairment (high, moderate or low) on VIQ, NVIQ and FSIQ. Age, IQ test-type, gender, and family membership were used as covariates. A significant effect of SRS group was found for verbal ($F(3, 248) = 4.54, p < .05$) and full-scale ($F(3, 248) = 4.02, p < .05$) IQ scores such that low social impairment was associated with higher verbal and full scale IQ scores. Of the 4 covariates, only age had a significant effect on verbal, nonverbal and full-scale scores. Based on preliminary analyses of IQ discrepancy scores in SRS groups the most impaired group appeared to have greater discrepancies overall, but not in favor of verbal or nonverbal abilities. Further analyses will examine whether IQ discrepancy scores account for the VIQ findings.

Conclusions: Our findings indicate that higher verbal abilities are related to better social skills in siblings with ASD. Furthermore, siblings with higher full-scale scores also demonstrated better social skills. These findings, if replicated, could identify interesting phenotypes in family members useful for genetic studies.

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C. WAHLSTEDT. Independent Contributions and Interactions of Neuropsychological Dysfunctions to the Explanation of ADHD Symptoms.

Objective: Neuropsychological heterogeneity among children with ADHD symptoms is a common feature. However, few studies to date have taken into account several possible neuropsychological theories in the same sample. The aim of the present study was therefore to study independent and interactive effects of inhibitory control, delay aversion and state regulation in relation to hyperactivity/impulsivity and inattention.

Participants and Methods: The present study included 111 children (57 boys; $M = 6.7$ years; $SD = 0.8$ years) from a population-based sample of school children. Measures for inhibitory control: Stroop-like task and go/no-go task; delay aversion: Flower-delay task and Star-delay card game; state regulation: within subject variability in reaction time from the go/no-go task. ADHD symptoms were obtained by parents and teachers using a well-validated rating scale containing the items for ADHD as presented in DSM-IV.

Results: Regression models showed that inhibitory control and state regulation significantly explained variance in hyperactivity/impulsivity and inattention symptoms. However, delay aversion was neither significantly related to hyperactivity/impulsivity nor to inattention. A multiple regression model showed that it was only inhibitory control that significantly contributed independently to the explanations of ADHD symptoms. Interestingly, there were significant interactive effects of state regulation and delay aversion on hyperactivity/impulsivity and inattention that survived when controlling for inhibitory control.

Conclusions: Neuropsychological impairments that are related to ADHD symptoms are not mutually exclusive - inhibitory control and state regulation each was associated with high symptom levels. Further, problem with delay aversion was only important in combination with poor state regulation.

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R. WENIGER & W. ADAMS. The Discriminative Validity of the Wide Range Assessment of Memory and Learning, 2nd edition (WRAML2) for Children Diagnosed with Reading Disorders (RD), Attention-Deficit/Hyperactivity Disorder (ADHD), and Comorbid ADHD+RD.

Objective: The objective of this study was to examine the efficacy of the WRAML2 in discriminating between children diagnosed with RD, ADHD, and RD+ADHD.

Participants and Methods: Participants included 140 children, ages 7-14 ($M = 11.42, SD = 2.09$), distributed among four samples: RD ($n = 24$), ADHD ($n = 23$), RD+ADHD ($n = 23$), and normal controls ($n = 70$). Controls were randomly selected from the WRAML2's standardization sample and matched according to age and gender. Each participant was administered the WRAML2 in its entirety.

Results: Multivariate analyses of variance demonstrated significant group differences on 9/9 index and 11/14 subtest measures, with effect sizes ranging from .07-.24. Bonferroni-corrected post-hoc comparisons revealed that, relative to controls, RD children demonstrated selective deficits in the areas of immediate verbal and visual memory, ADHD children demonstrated selective working memory deficits, and RD+ADHD

demonstrated a generalized pattern of memory impairment. Multinomial regression analysis, with index and subtest scores entered as predictor variables, yielded significant results ($X^2=141.81$, $p<.001$, Nagelkerke $R^2=.74$) and correctly classified 75.4% of participants. Strongest classification accuracy was for the RD+ADHD (77.3%) and control (87.7%) samples. Poorest classification accuracy was for the RD (56.5%) and ADHD (55%) samples, with large percentages of RD (26%) and ADHD (33%) children misclassified as controls. However, only 4% of RD and 5% of ADHD children were misclassified one for the other.

Conclusions: RD, ADHD, and RD+ADHD children demonstrated differing and distinct memory profiles on the WRAML2. Overall, the WRAML2 demonstrated adequate classification accuracy in discriminating between RD, ADHD, and RD+ADHD children. While several RD and ADHD children were misclassified as normal controls, few were misclassified as other clinical disorders. Used in conjunction with standardized IQ, achievement, and behavioral measures, the WRAML2 may improve diagnostic accuracy of these disorders.

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N.J. WILDE & K.E. WALDIE. The Long-Term Consequences of Delayed Walking and Talking.

Objective: The short-term consequences of delayed developmental milestones such as walking unaided and speaking in sentences have been well-documented, but few studies have prospectively examined the long-term outcomes that may result from such delays. The goal of this study was to investigate the relationship between delayed milestones and a variety of schooling, employment and mental health outcomes in adults enrolled in a longitudinal birth cohort study.

Participants and Methods: Participants were enrolled in the Dunedin Multidisciplinary Health and Development Study (see Silva & Stanton, 1996). Milestone data were collected at the age 3 assessment ($N=1037$). Study members were dichotomised into normal and delayed ($>1SD$ below cohort mean) groups independently, according to the age at which walking (six steps unaided) and talking (six appropriate words) milestones were first achieved. Extreme outliers, those born prematurely, and those with suspected congenital abnormalities were excluded. Outcome variables included measures of mental health (anxiety, depression, and substance dependence; ages 18 & 21), academic qualifications, income, and employment status (age 26).

Results: Binary logistic regression analyses (controlling for sex and SES) were conducted on the walking and talking data separately. There was no significant relationship between either walking or talking and any of the mental health variables. However, both walking and talking were predictive of academic qualifications and income level in adulthood.

Conclusions: The data support the long-term prognostic value of early developmental milestones in predicting some measures of adult achievement and status (i.e., schooling and income level). However, delayed developmental milestones do not appear to increase the risk of adult mental health concerns.

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L.B. WILSON, H. BOORSTEIN, J. PANDEY, A. MALTEMPO, J. GREEN, T. DUMONT-MATHIEU, S. HODGSON, M. BARTON & D. FEIN. Differentiating ASD From Other Developmental Delays in Young Children.

Objective: Early intervention programs identify developmental delays that qualify for intervention but may not provide specific diagnoses that dictate the appropriate type and intensity of intervention. The purpose of this study was to identify specific behaviors exhibited by young children that may be useful in differentiating ASD from other developmental delays.

Participants and Methods: Participants included 328 children (78% male) referred for evaluation (mean age at evaluation = 26 months) after screening positive on the M-CHAT, a parent-report screener for ASD in toddlers. The Autism Diagnostic Observation Schedule, Module 1 (ADOS) and the Childhood Autism Rating Scale (CARS) were administered. 217 participants (66.2%) were diagnosed with an ASD, while 111 (33.8%) were diagnosed with non-ASD developmental delays. Individual M-CHAT, ADOS, and CARS items were examined with logistic regression to determine which items best differentiated ASD from non-ASD developmental delays.

Results: Logistic regression of M-CHAT items indicated significant predictors of diagnosis: pointing to request ($p=.001$), responding to name ($p=.002$), delayed walking ($p<.001$), and response to joint attention ($p=.061$). The ASD sample was more likely to fail all but delayed walking. Logistic regression of ADOS items revealed 4 items as significant predictors: Shared Enjoyment ($p=.009$), Showing ($p=.002$), Response to Joint Attention ($p=.003$), and Unusual Sensory Interests ($p=.002$). Logistic regression of CARS items indicated 4 items to be significant predictors: Emotional Response ($p=.037$), Fear or Nervousness ($p=.037$), Verbal Communication ($p=.044$), and General Impression of Autism ($p<.001$); the ASD group had more abnormal scores on each.

Conclusions: Several variables were found to differentiate young children with ASD from those with other developmental delays. Some were specific behaviors found in ASD (e.g., unusual sensory interests) but the strongest and most consistent differential signs related to impaired joint attention in ASD.

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J.R. WOZNIAK, M.A. FREERKS, B.A. MUELLER, R.L. MUETZEL, P. CHANG, E.E. WARD & K.O. LIM. Executive Function Correlates of Frontal White Matter Deficits in Children with Fetal Alcohol Spectrum Disorders: A DTI study.

Objective: Prenatal alcohol exposure has been shown to be associated with a wide range of macrostructural brain abnormalities including microcephaly and corpus callosum dysgenesis. Recently, we have demonstrated microstructural abnormalities in corpus callosum in children with FASD using Diffusion Tensor Imaging (DTI). These abnormalities were evident in partial FAS and full FAS. We extended this work to a new sample, examining frontal white matter integrity and neurocognitive and behavioral correlates.

Participants and Methods: DTI scans were collected on a Siemens 3T scanner on 32 children with FASD (23 partial, 9 full FAS) and 21 age and sex-matched controls, ages 10 to 17. White matter anterior to the genu and inferior to the AC-PC plane was analyzed. Participants were administered working memory subtests from the WISC-IV or WAIS-III as well as the Wisconsin Card Sorting Test (WCST). Parents completed the Behavior Rating Inventory of Executive Function (BRIEF).

Results: Fractional Anisotropy (FA) was lower and Mean Diffusivity (MD) was higher in the FASD group, suggesting less organized white matter in frontal regions. Within the FASD group, less organized white matter was associated with poor planning and organizing, poor attention shifting, and poor self-monitoring (BRIEF). White matter abnormality was also associated with poor performance on working memory tasks. No relationship with the WCST was seen. Full FAS was associated with more significant white matter abnormality than partial FAS.

Conclusions: DTI reveals frontal white matter abnormalities in children with FASD that are associated with executive functioning deficits reflected in behavior and performance on neurocognitive measures.

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B. YANG, R.C. CHAN, X. ZOU, J. JING, J. MAI & J. LI. Perceptual deficits in time discrimination in ADHD.

Objective: The present research aimed to study the pure time perception of children with ADHD by using a duration discrimination task.

Participants and Methods: A battery of tests that were specifically designed to measure time perception and other related abilities, such as inhibition, attention, and working memory, was administered to 40 children with ADHD and to 40 demographically matched healthy children.

Results: A repeated measure MANOVA indicated that children with ADHD showed significantly higher discrimination thresholds than did healthy controls, and there was an interaction effect between group and duration. Working memory (Corsi blocks task) was related to the discrimination threshold at a duration of 800 milliseconds (ms) after controlling for full-scale IQ (FIQ) in the ADHD group, but this did not survive the Bonferroni correction.

Conclusions: These findings indicated that children with ADHD may have perceptual deficits in time discrimination. They needed a greater difference between the comparison and target intervals to discriminate the short, median, and long durations reliably. This study provides further support for the existence of a generic time perception deficit, which is probably due to the involvement of a dysfunctional fronto-striato-cerebellar network in this capacity, especially the presence of deficits in basic internal timing mechanisms.

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Learning Disabilities/ADHD**A. WILKINSON & M. SEMRUD-CLIKEMAN. Motor Speed in Children and Adolescents with Nonverbal Learning Disabilities.**

Objective: The most commonly used model of nonverbal learning disabilities (NVLD) is the Rourke model. This model includes bilateral deficits in psychomotor skills as a primary neuropsychological deficit. However, the studies that established the Rourke model grouped participants based on performance on one test. In addition, children with ADHD, Primarily Inattentive Type (ADHD/PI) have not typically been included in research investigating children with NVLD, despite high comorbidity. This study investigated motor speed in children with NVLD, as defined by a cluster of characteristics, as compared to children with ADHD/PI and typically developing children. Hypotheses: 1) Children with NVLD would perform worse than typically developing children on measures of motor speed. 2) The motor speed deficits would be present beyond any effects of inattention.

Participants and Methods: This study included 45 children in 3 groups. For the NVLD group, children met 2 out of 3 of these criteria: 1) Poor social perception on the CASP, 2) Learning disability in mathematics on the WIAT-II, 3) Difficulties with visual-spatial perception on the JLO. Inclusion in the ADHD/PI group was based on parent report of DSM-IV criteria. Typically developing children comprised the third group. Dependent measures were the Finger Tapping Test and the Grooved Pegboard. Results were analyzed with an overall MANOVA and an ANOVA for each task.

Results: The results indicated that that significant differences between the groups were not present for either of the measures of motor speed used, including the Grooved Pegboard test, which is suggested by Rourke to be a useful measure to diagnose NVLD. Furthermore, the means were not in the expected direction, as children with NVLD actually performed faster than typically developing children.

Conclusions: Results suggested that measures of motor speed should not be used to identify children with NVLD, and that more research is needed to clearly identify diagnostic criteria.

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Other**M.T. ACOSTA, G. GIOIA, D. MARCUS, M. SHAPIRO, M. ROBERT, P. MOLINA, A. SILVA & R. PACKER. Lovastatin as Treatment for Neurocognitive Deficits in Children with Neurofibromatosis type 1 (NF1): Safety and Neuropsychological Data from Phase 1 Study.**

Objective: Neurofibromatosis type 1 is a genetic condition, affects 1/3000 individuals around the world. While higher risk of neural tumors is the main concern, 80% of patients with NF1 present academic difficulties. Cognitive deficits observed in a Nf1 +/- mice model available to study molecular and cognitive deficits are similar to those observed in patients with NF1. Lovastatin, a non-selective HMG-CoA reductase inhibitor, extensively used for treatment of hypercholesterolemia has been useful to revert the cognitive deficits in Nf1 +/- mice. The aim of this study is to examine safety of lovastatin for treatment of neurocognitive deficits in children 10-17 y/o with the diagnosis of NF1

Participants and Methods: Lovastatin was administered orally. Doses, 20, 30, 40 mg for a 12 weeks trial, with escalation doses in one month period. Physical examination, muscle strength, side effects check list and laboratory studies were evaluated. Extensive neuropsychological testing was performed before and after treatment.

Results: Results currently available for 15/16 patients. No toxicity or significant side effects were observed. Laboratory results were within normal limits for all parameters for all study patients. Total cholesterol levels decreased an average 17% across all groups and stayed within the normal limits. Descriptive statistics and intraindividual variability in different neuropsychological domains is presented.

Conclusions: Lovastatin was well tolerated. Cholesterol levels decreased in all patients, but levels stayed in the normal range. This trial does not demonstrate significant adverse effects in patients with NF1. Preliminary efficacy data is encouraging. Considerations in terms of metabolism, neuropsychological evaluation, number of patients and study design are discussed.

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Traumatic Brain Injury**B. ELLIOTT, R. FREID, J.C. SCHNEIDER, PH.D, G.A. GIOIA, PH.D & P. ISQUITH, PH.D. Gender Differences in Recovery from Post-Concussion Fatigue.**

Objective: Males and females differ in their recovery from concussion. Fatigue is an important and common post-concussive symptom that can manifest in different ways. The present study investigated gender differences in recovery of fatigue symptoms.

Participants and Methods: 23 male and 11 females ages 13-18 (Mean age=15.28, SD =1.5) completed the 18-item PEDS-QL Multidimensional Fatigue Questionnaire (Acute version) during 3 serial visits to a concussion clinic. At the first visit, participants also complete a retrospective baseline version of the PEDS-QL. Sleep/Rest, Cognitive, and General fatigue scales were examined.

Results: Repeated measures MANOVAs were conducted to examine changes in symptoms over time. At visit 1, males and females report

higher levels of fatigue than baseline. Females report significant cognitive ($F(1, 10)=6.71, p<.05$), sleep ($F(1, 10)=11.70, p<.05$), and general ($F(1, 10)=3.93, p=.079$) fatigue symptoms at visit 2, and sleep symptoms at visit three ($F(1, 10)=10.84, p<.05$). Males report general fatigue and cognitive symptoms to have returned to baseline by visit 3; sleep symptoms returned to baseline at visit 2, but then reemerged at visit three ($F(1, 33)=4.96, p<.05$).

Conclusions: Male and female adolescents experience significant post-concussive fatigue relative to baseline. While males report a more quick

recovery from cognitive and general fatigue, recovery from sleep symptoms appears to fluctuate. Females, in contrast, persist in their experience of fatigue symptoms longer than males, with sleep appearing to last the longest. Further examination is necessary to determine factors that might explain these gender differences.

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SATURDAY MORNING, FEBRUARY 9, 2008

Paper Session 9

9:00–10:30 a.m.

Alzheimer's Disease

J. TSCHANZ, L. COOK, C.D. CORCORAN, M.C. NORTON, M. MIELKE, P.V. RABINS, K.A. WELSH-BOHMER, K. TREIBER, T. BUCKLEY, J. BREITNER & C. LYKETSOS. Gender Differences in the Trajectory of Cognitive Decline in Alzheimer's Disease in the Cache County Population.

Objective: The rate of decline of Alzheimer's disease (AD) varies considerably, but few explanatory factors have been identified. In a population sample, we previously reported greater decline among females than males with AD on both the Mini-Mental State Exam (MMSE) and a functional measure (CDR) with no effect of APOE genotype. We extend this work and examine decline in individual cognitive domains.

Participants and Methods: Individuals with incident AD ($n=229$; mean(sd) age =85.4(6.5)) were followed for a mean of 4.9(2.1) years. The CERAD neuropsychological battery was administered at each visit. Linear mixed models (random slopes, intercepts) were fitted for each cognitive trajectory to examine the effects of gender, demographic variables and APOE genotype.

Results: Participants declined over time on all measures ($p=0.0001$). Controlling for baseline dementia duration, higher education was associated with better performance on all but verbal recall and recognition (all $p<0.01$). Compared to males, females declined more rapidly on praxis ($p=0.008$) and performed more poorly on semantic fluency, confrontation naming, praxis recall and word list recognition (all $p<0.01$). APOE genotype modified the effects of gender on rate of decline of verbal recall ($p=0.035$). Male APOE E4 carriers declined more rapidly than non-E4 carriers; among females, rate of decline did not vary by APOE status.

Conclusions: Results suggest that progression in AD differs by gender, and that the effects of APOE on decline are not uniform for all. Future studies will explore the role of additional factors as moderators of dementia progression in AD, and their interactions with APOE.

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M. SEIDENBERG, X. CHANG, J. WOODARD, K. NIELSON, S. DURGERIAN, A. GANDER, L. GUIDOTTI, P. AUTUONO, M. FRANZAK & S. RAO. Semantic Memory Activation in Individuals at Risk for Developing Alzheimer's Disease: Relationship to Family History and APOE ε4.

Objective: Possession of an APOE ε4 allele and/or a family history of dementia are considered risk factors for Alzheimer's disease (AD) and

there is interest in determining if patterns of fMRI activity correspond to their presence. We administered an event-related, semantic memory task (famous name recognition) to three groups: (1) negative ε4, negative family history (Controls), (2) negative ε4, positive family history (Family Hx), and (3) positive ε4 and positive family history (APOE ε4). Consistent with functional recruitment hypothesis, we predicted increased activation in groups with at-risk factors for AD.

Participants and Methods: Three groups ($n=16$ each) of healthy, cognitively intact adults (ages 65-85) discriminated famous from unfamiliar names. Whole-brain, event-related fMRI was conducted and deconvolution analysis (correct trials) used to extract hemodynamic response functions for famous and unfamiliar names at 4, 6, and 8 s post-stimulus onset.

Results: Groups did not differ in cognition, gray matter density, or accuracy/reaction time on the fMRI task. APOE ε4 group had the largest spatial extent of activation (Famous – Unfamiliar subtraction), followed by the Family Hx and Control groups. Compared to controls, the APOE ε4 group showed greater MR signal intensity in 14 of 18 functional ROIs while the Family Hx group showed significantly greater signal intensity in 12 of 18 regions. APOE ε4 group showed greater signal intensity relative to the Family Hx group in 2 of 18 regions.

Conclusions: Consistent with the recruitment hypothesis, asymptomatic older individuals with a risk factor (APOE ε4 allele or family hx) showed greater fMRI activation in spatial extent and magnitude of the BOLD signal when recognizing familiar names compared to a no risk group. Some evidence suggests that the Gene group showed increased activation relative to the Family Hx group. Longitudinal studies are needed to determine if increased fMRI activity is predictive of AD conversion. Supported by R01AG022304 and M01RR00058.

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S. CRAFT, G. WATSON, L.D. BAKER, B. CHOLERTON, P.S. GREEN, T. MONTINE, M.A. FISHEL, S. PLYMATE & S. KAHN. Insulin Resistance, Diabetes, and AD: Pathogenetic and Pharmacogenomic Mechanisms.

Objective: Insulin plays an important role in memory and other aspects of brain function. The insulin resistance syndrome, characterized by chronic peripheral insulin elevations, reduced insulin activity, and reduced brain insulin levels, is associated with age-related memory impairment and Alzheimer's disease (AD). A specific genetic subgroup of AD patients, those without the apolipoprotein E-ε4 allele, are most likely to display abnormalities of peripheral insulin metabolism, suggesting that such factors may increase the risk of AD for these patients. We have used an interdisciplinary approach to focus on specific pathogenetic mechanisms through which this association is forged.

Participants and Methods: We have conducted a series of studies using insulin infusion and pharmacologic intervention in normal older adults, insulin-resistant adults, and patients with AD.

Results: Our results show that excessive peripheral insulin invokes synchronous increases in levels of Aβ and inflammatory agents. Chronic in-

creases in peripheral insulin lead to downregulation of insulin transport across the blood brain barrier, ultimately resulting in deficient insulin signaling in brain. Treatments focused on preventing or correcting insulin abnormalities may thus be of therapeutic benefit for adults with AD. We have recently completed studies of two such treatments: 1) lowering peripheral insulin and enhancing insulin sensitivity with thiazolidinediones, and 2) normalizing CNS insulin through intranasal administration. Both treatments were beneficial to AD patients without the APOE- $\epsilon 4$ allele. In contrast, patients with the APOE- $\epsilon 4$ allele showed no benefit.

Conclusions: Our work suggests that factors relating to insulin resistance may be of particular pathogenetic significance for patients without the APOE- $\epsilon 4$ allele, supporting the importance of pharmacogenomic considerations in devising therapeutic strategies.

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A.M. BRICKMAN, N. SCARMEAS, L.S. HONIG, J. MURASKIN, M.A. RAMOS, M.S. ALBERT, J. BRANDT, D. BLACKER & Y. STERN. Cerebral Atrophy and White Matter Hyperintensity Burden Predict More Rapid Cognitive Decline in Alzheimer's Disease.

Objective: In the absence of definitive diagnostic instruments for Alzheimer's disease (AD), structural magnetic resonance imaging (MRI) has emerged as an important tool for the characterization of morphological changes associated with the disease. Although non-specific, cerebral atrophy and white matter hyperintensities (WMH) are features of the neurodegeneration associated with AD. The aim of the current study was to determine if baseline measurements of cerebral atrophy and WMH burden predict the rate of future cognitive decline in AD.

Participants and Methods: Data for the current analyses were drawn from the second cohort in the Predictors Study, a longitudinal, three-site study that evaluates mild AD patients every six months with neuropsychological testing that includes the modified Mini Mental State Examination (mMMS; 0–57). Eighty-four patients (mean age=73.24+/-8.02, 52% women, mean initial mMMS score=41.29 +/-7.11) received structural MRI with an average of 6 follow-up evaluations. MR images were analyzed to determine the severity of WMH (Scheltens Scale) and the degree of atrophy (bicaudate ratio). Separate generalized estimating equations (GEE) were used to determine whether the severity of baseline MRI measurements and their interaction predicted the rate of mMMS decline at subsequent visits; covariates included sex, education, APOE4, diabetes, hyperlipidemia, heart disease, and hypertension (dichotomous vascular risk factors at baseline).

Results: Average decline in mMMS was 3.45 points/year. GEE models demonstrated that degree of baseline atrophy ($p = 0.036$), severity of WMH ($p = 0.028$), and their interaction ($p = 0.018$) significantly predicted the rate of decline in mMMS scores.

Conclusions: Both degree of cerebral atrophy and severity of WMH are associated the rapidity of cognitive decline in AD. These associations appear to be independent of several baseline covariates. Further, atrophy and WMH may interact to have a synergistic effect on future decline.

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N.R. HORNE, B.C. SCHWEINSBURG, L. DELANO-WOOD, C.E. WIERENGA, K.J. BANGEN, D.P. SALMON & M.W. BONDI. Decreased White Matter Integrity in Later-Myelinating Fiber Pathways in Alzheimer's Disease: a Diffusion Tensor Imaging Study.

Objective: Diffusion tensor imaging (DTI) was used to examine whether the pattern of white matter (WM) changes in Alzheimer's disease (AD) is consistent with the retrogenesis theory. This theory posits that changes in WM follow an inverse pattern of myelogenesis. Consequently, greater

loss of WM integrity (e.g., lower values of fractional anisotropy; FA) was predicted in later-myelinating WM fiber pathways (e.g., association pathways) in AD patients relative to healthy older adults, whereas earlier-myelinating fiber pathways (e.g., sensory and motor pathways) were not expected to show group differences.

Participants and Methods: Sixteen AD patients and fourteen demographically-matched healthy older adults were included. Tract-based spatial statistics (TBSS; a method recently developed for multi-subject voxelwise comparison of FA data) were used to test for group differences in WM integrity.

Results: Permutation-based independent samples t-tests corrected for multiple comparisons revealed significantly lower FA values in AD patients compared to healthy older adults in later-myelinating fiber pathways (cingulum, superior longitudinal fasciculus, inferior longitudinal fasciculus, and uncinate fasciculus). No significant differences were seen in earlier-myelinating pathways. However, in the corpus callosum the results were inconsistent with the retrogenesis hypothesis in that the splenium showed significant differences across groups, whereas the earlier-myelinating genu did not.

Conclusions: In general, these results support the retrogenesis theory; differences were found in several later-myelinating fiber pathways whereas no differences were found in earlier-myelinating fiber pathways. However, the corpus callosum results were inconsistent, suggesting that AD related neuropathology may lead to superimposed decreases in WM integrity (possibly due to Wallerian degeneration) beyond that expected with a purely inverse-myelination process.

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Symposium 10

9:00–10:30 a.m.

Validation of an Endophenotype for Schizophrenia with Cross-Cultural, Psychological and Biological Correlates

Chair: Scot Purdon

S.E. PURDON, O. PINO, K. GODDARD, N.D. WOODWARD & S.E. PURDON. Validation of an Endophenotype for Schizophrenia with Cross-Cultural, Psychological and Biological Correlates.

Symposium Description: Delineation of a genotype for schizophrenia has been impeded by the absence of an endophenotype to address the heterogeneity and non-specificity of the clinical presentation. An endophenotype is an illness-associated intermediate heritable state-independent marker that co-segregates within families where it shows elevated rates of occurrence. Several state-independent measures have sensitivity, but specificity and familial coherence have been poor. Dr. Pino's trans-national comparison of cognitive deficits in schizophrenia and bipolar disorder will show good sensitivity and cross-cultural stability but poor specificity. Dr. Goddard will suggest that deficits of sustained attention on the Continuous Performance Test are robust in schizophrenia and co-segregate in high risk families, and she will offer original data for specificity and state-independence in a prospective comparison of schizophrenia and substance-induced psychosis. Dr. Woodward will relate the CPT to fronto-subcortical pathology, and offer evidence

of abnormal fMRI cerebral activation in schizophrenia patients and their unaffected siblings during a Serial Reaction Time (SRT) task that elicits procedural learning. Dr. Purdon will propose a genetic vulnerability to express high levels of glutamate triggered by pubertal endocrine changes resulting in subcortical structural damage manifest in frontal activation abnormalities that compromise sustained attention and global cognitive status. He will review proton magnetic resonance spectroscopy (1H-MRS) evidence of glutamate/glutamine elevations in the mesial frontal cortex of high risk adolescents, and offer original data showing 1H-MRS glutamate elevations associated with CPT impairment in a novel high risk sample. The discussion will emphasize theoretically driven co-registration of trans-discipline candidate markers to achieve a reliable endophenotype with implications to the cerebral and genetic basis for schizophrenia.

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K. GODDARD & S.E. PURDON. Early and Stable Continuous Performance Test (CPT) Deficits Consistent with an Endophenotype for Schizophrenia.

Objective: A lack of specificity has limited the diagnostic value of most cognitive deficits in schizophrenia, and few measures have exhibited the familial coherence required of an endophenotypic marker. One candidate for endophenotype status in schizophrenia is poor sustained attention quantified with the Continuous Performance Test (CPT). Although inconsistencies have been noted, there is evidence of family coherence, particularly within samples comparing patients with schizophrenia to their unaffected family members at high familial or genetic risk for developing the disorder.

Participants and Methods: The current presentation will briefly review prior studies relevant to consideration of CPT performance within an endophenotype for schizophrenia, and then report results suggesting both sensitivity and specificity of the deficit to schizophrenia. The study entailed comparison of CPT performance (CPT-AX, CPT-IP2, and CPT-IP4) between 51 patients suffering their first episode of schizophrenia (FES), and 31 patients suffering their first episode of substance induced psychosis (SIP). All subjects were unmedicated at the time of the baseline examination, and the clinical presentations within the two groups were very similar. Follow up assessments were undertaken at 9 and 27 weeks after random assignment to antipsychotic treatment.

Results: Both groups showed similar improvement in clinical symptoms over time. The CPT d-prime scores were lower on all CPT tasks for the FES relative to the SIP group across evaluations. The deficit remained stable over the course of treatment in the FES group, but the SIP group exhibited substantial improvement with treatment.

Conclusions: The CPT is sensitive to the sustained attention deficits in schizophrenia, and it has some specificity relative to patients with substance-induced psychosis. The CPT may thus have value to an endophenotype for schizophrenia, particularly if the deficits co-register with biological endophenotypic measures related to relevant cerebral pathology.

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N. WOODWARD & S.E. PURDON. Patients With Schizophrenia and their Unaffected Relatives Demonstrate fMRI Abnormalities in Fronto-subcortical Circuitry During Procedural Learning.

Objective: An impairment of sustained attention in schizophrenia may relate to cerebral pathology in fronto-subcortical circuitry, raising the possibility of a co-registration of sustained attention deficits and frontal physiological deficits in schizophrenia that could improve the sensitivity and specificity offered by either measure alone. Diminished metabo-

olism in the frontal and subcortical regions has been reported for many years from investigations with Positron Emission Tomography, but the pathology is not specific to schizophrenia, and familial coherence has not been confirmed. In a recent investigation we demonstrated a significant lack of basal ganglia activation in chronic medicated patients with schizophrenia while engaged in the serial reaction time (SRT) task commonly used for procedural learning, relative to normal controls, despite equivalent performance in the two groups on the activating task.

Participants and Methods: 10 patients with schizophrenia, 12 unaffected relatives, and 15 controls underwent fMRI while they performed the SRT.

Results: All three groups achieved a similar degree of procedural learning. However, both the schizophrenia patients and their unaffected relatives demonstrated less activity in the frontal lobes, angular gyrus of the parietal cortex, and striatum than control subjects.

Conclusions: These observations suggest that genetic vulnerability for schizophrenia may relate to alterations in fronto-parietal and fronto-subcortical circuitry. This could account for the poor sustained attention performance observed in prior studies with the CPT and suggests a possible co-registration of metabolic and psychological markers within a common endophenotype for schizophrenia.

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S.E. PURDON. Single Proton MRS Glutamate Levels Associated With Poor Continuous Performance Test (CPT) Scores and Genetic Risk for Schizophrenia.

Objective: The endophenotypic value of a relatively specific impairment of sustained attention in schizophrenia that may relate to fronto-subcortical physiological disturbance would be enhanced by further co-registration with a neuro-toxic mechanism. High levels of glutamate, possibly representing a genetic vulnerability triggered by pubertal endocrine changes, could account for the late adolescent onset of schizophrenia while also supplying an age-dependent biochemical marker for the illness.

Participants and Methods: In a prior investigation, we used proton magnetic resonance spectroscopy (1H-MRS) to demonstrate elevated glutamine/glutamate in the mesial frontal cortex of high risk children of patients with schizophrenia. The present investigation applied a 3 Tesla 1H-MRS to isolate and quantify glutamate and glutamine in the mesial frontal cortex of 15 adult siblings of patients with schizophrenia (HR) and 14 healthy volunteers (HV), all of whom also completed a Continuous Performance Test (CPT).

Results: All subjects were free of psychopathology, but the HR group showed greater variability in glutamate levels. After median stratification, the high glutamate group contained a larger proportion of HR than HV subjects and scored lower on the CPT.

Conclusions: Elevated glutamate may relate to poor sustained attention and elevated risk of schizophrenia, suggesting a potential role for glutamate in an endophenotype for schizophrenia. Although a single endophenotype marker alone may lack specificity, and fail to exhibit familial coherence, co-registration of neurochemical, neurophysiological, and neuropsychological markers theoretically linked along a common cerebral pathogenic pathway could address the problem posed by the clinical heterogeneity of schizophrenia to confident delineation of a cerebral basis for schizophrenia and isolation of a relevant genotype for the illness.

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O. PINO & S.E. PURDON. Sensitivity and Cross-Cultural Consistency, But Not Diagnostic Specificity, of the Screen for Cognitive Impairment in Psychiatry (SCIP).

Objective: The clinical presentation of schizophrenia is heterogeneous and non-specific. There are no characteristic positive or negative symp-

toms common to all patients suffering from schizophrenia, and the DSM-IV active symptoms for schizophrenia are often present in other psychiatric and neurological illnesses. In the absence of a sensitive or specific clinical phenotype for schizophrenia, clinical decision making is compromised and research on the cerebral and genetic basis for schizophrenia is undermined. Early neuropsychological investigations implicated the potential value of cognitive deficits to this delineation, but again the within-group heterogeneity and the lack of between-group specificity undermined the early optimism.

Participants and Methods: After a brief review of the general deficits associated with schizophrenia, a Screen for Cognitive Impairment in Psychiatry will be introduced along with normative evidence supporting the reliability of three alternate forms available in the English (SCIP) and Spanish (SCIP-S) languages collected over the past 8 years. Evidence supporting the validity and cross-cultural comparability of the SCIP for detection of cognitive deficits associated with schizophrenia and bipolar disorders will be provided by comparison of large clinical samples collected at multiple centers in Spain and Canada over the past three years.

Results: The results confirm the sensitivity of the SCIP to deficits in schizophrenia and bipolar disorder, and the consistency of the deficits in both a European and North American sample. The results also underscore the lack of specificity in the cognitive deficits apparent in schizophrenia.

Conclusions: Co-registration of a discrete cognitive impairment with a biological anomaly will be required to adequately define an endophenotype relevant to cerebral pathogenesis that could assist delineation of a schizophrenia genotype.

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Symposium 11

9:00–10:30 a.m.

Neuropsychological Contributions to Understanding the Cognitive and Neurobiological Mechanisms of Perceptual Category Learning

Chair: Vincent Filoteo

V. FILOTEO. Neuropsychological Contributions to Understanding the Cognitive and Neurobiological Mechanisms of Perceptual Category Learning.

Symposium Description: The ability to categorize is a fundamental and important cognitive process that is required in nearly all aspects of our daily living. Fittingly, the study of category learning has maintained a prominent position in our attempts to understand human behavior. Given this important role, it is not surprising that category learning has been studied using several different approaches, including cognitive experimentation, mathematical modeling, and functional neuroimaging. In addition to these levels of inquiry, neuropsychological studies are critical for understanding the neurocognitive mechanisms involved in category learning, and the insights gained from this work have provided important constraints for theories of both the cognitive and neurobiological underpinnings of category learning. In keeping with the “trans-disciplinary” theme of this conference, the symposium will present neu-

ropsychological studies of category learning in various patient populations and will highlight how such studies have informed our understanding of the neuropsychology of category learning. Importantly, the studies presented all use a similar methodology, thus allowing for a more direct comparison across studies. In addition, each study applies well-established mathematical models to patients’ performances to provide a better understanding of the nature of the observed deficits. Presentations will include studies in patients with focal frontal lesions, Parkinson’s disease, pre-Huntington’s disease, and focal basal ganglia lesions. The results indicate that a frontal-subcortical network is highly involved in the learning of various category structures, and provide strong evidence for a dissociation between category learning processes that rely on either a hypothesis testing system or a procedural-based system.

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G. ASHBY, S. QUELLER, S.A. JOHNSON, V.V. VALENTIN, J.C. STOUT, E. AYLWARD & J.S. PAULSEN. Category Learning in Prediagnosis Huntington’s Disease.

Objective: Huntington’s disease (HD) is associated with impairments in category learning, and research suggests that damage to the striatum may be a cause of these deficits (Filoteo, Maddox, & Davis, 2001; Knowlton, Squire, Paulsen, Swerdlow, Swenson, & Butters, 1996). Aylward et al. (1996) have shown a 50% reduction in the striatum’s putamen volume already by the time of HD diagnosis, suggesting that category learning deficits may also be present prior to diagnosed HD. We investigated explicit and implicit category learning in people with the HD gene who were not yet diagnosed (preHD), and examined whether categorization performance was related to striatal volumes, motor symptoms, and estimated proximity to clinical diagnosis.

Participants and Methods: 307 preHD participants and 26 controls completed a rule-based task that required learning an explicit rule that was easy to verbalize; 286 preHD and 30 controls completed an information integration category learning task that required integrating information from separate perceptual dimensions in a way that was difficult to verbalize (implicit task).

Results: The preHD participants were impaired in both tasks, with poorer performance correlating with greater motor impairment. For the rule-based task, smaller striatal volumes were associated with slower learning. For the information-integration task, mathematical modeling showed that participants with more severe motor impairments failed to integrate perceptual information more often than participants with less motor impairment. In addition, smaller putamen volumes were associated with a decreased ability to integrate perceptual information.

Conclusions: These findings strongly implicate the striatum in both the rule-based and the information integration tasks.

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S.W. ELL, A. WEINSTEIN & R.B. IVRY. The Effect of Focal Basal Ganglia Lesions on Rule-Based and Information-Integration Category Learning.

Objective: We report the results of two experiments investigating the effect of focal basal ganglia pathology on category learning.

Participants and Methods: In the first experiment, seven patients with basal ganglia lesions (6 left side) were tested on rule-based and information-integration categorization tasks. In rule-based tasks, it is assumed that participants can learn the category structures through an explicit reasoning process. In information-integration tasks, optimal performance requires the integration of information from two or more stimulus dimensions, and participants are typically unaware of the categorization strategy. The second experiment compared two types of

rule-based categorization tasks that varied in terms of their demands on selective attention. In the unidimensional task, participants must attend to a relevant stimulus dimension while ignoring an irrelevant dimension; thus, the task requires learning to attend selectively to one dimension. In contrast, in the conjunction task, participants must attend to both dimensions.

Results: Consistent with previous studies involving patients with degenerative disorders of the basal ganglia, the patients were impaired on the rule-based task. In contrast, the patients were unimpaired on the information-integration task. Opposite the pattern observed in patients with degenerative disorders of the basal ganglia (i.e., Parkinson's disease), the focal lesion patients were impaired on the conjunction task, but not the unidimensional task.

Conclusions: These results provide evidence that further specifies the role of the basal ganglia in category learning and raise the intriguing possibility that focal basal ganglia lesions and disorders that alter dopamine systems might have opposite effects on rule-based category learning.

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D.M. SCHNYER, W.T. MADDOX, S.W. ELL, S. DAVIS & M. VERFAELLIE. Dissociable Executive Functions Predict Performance Separately for Rule-Based and Information Integration Category Learning: Evidence from Patients with Lesions to Frontal Cortex.

Objective: Previous research has revealed that the basal ganglia play a critical role in rule-based category learning (Ell et al., 2006; Maddox & Filoteo, 2006). While a direct role is probable, the BG also provide drive state input and reward feedback to the frontal cortex suggesting a frontal role in category learning (CL).

Participants and Methods: The current study examined category learning in 13 patients with damage to prefrontal regions.

Results: After 600 learning trials with feedback, these patients were found to be significantly less accurate than matched controls. This impairment was found both when category learning was rule-based (RB) and when it depended on information integration (II). The level of RB learning was correlated with performance on the Wisconsin Card Sorting Test, a test of abstract rule formation and the ability to shift and maintain rule implementation. In contrast, performance on II learning was marginally correlated with performance on the Stroop test, which taps the ability to inhibit inappropriate responses and resist interference. Consistent with the latter finding, the II learning impairment in the frontal patients reflected the use of a suboptimal RB approach.

Conclusions: These results demonstrate that in addition to the BG, the prefrontal cortex also plays a critical role in the acquisition and implementation of new category learning. Additionally, executive functions attributable to frontal cortex can play dissociable roles in different types of category learning and lesion analysis of the 13 patients may indicate specific regions associated with these dissociable functions.

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V. FILOTEO & W.T. MADDOX. Category Learning Deficits in Patients with Parkinson's Disease: Neuropsychological Underpinnings and Clinical Utility.

Objective: Patients with Parkinson's disease (PD) are impaired on a variety of category learning tasks, and until recently, such deficits were thought to be due to a common mechanism. In a series of recent studies, we demonstrated that PD patients can be impaired on both implicit

(information-integration) and explicit (rule-based) category learning tasks. However, our work shows that the underlying cognitive deficits are distinct. This presentation provides an overview of these recent studies and demonstrates that the neurocognitive mechanisms underlying implicit and explicit category learning in PD are dissociable.

Participants and Methods: In our studies, PD patients were examined and compared to normal controls in various rule-based and information-integration category learning tasks. In each study, mathematical models were applied to participant's data so as to provide a more in-depth analysis of the nature of PD patient's deficits.

Results: Results indicate that the explicit category learning deficits observed in PD are due to impairments in selective attention and not working memory. In contrast, PD patients' implicit category learning deficits depend on the nature of the rule in that patients are primarily impaired when there is greater perceptual dissimilarity among the exemplars within the categories. Further, PD patients' deficits in implicit category learning predict future decline in global cognition above and beyond that predicted by more traditional neuropsychological measures.

Conclusions: Overall, this work indicates that PD can result in both implicit and explicit category learning deficits, but for very different reasons. Further, a detailed examination of such deficits can be helpful in predicting future changes in cognition in nondemented PD patients.

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Poster Session 10: Traumatic Brain Injury

9:00–10:30 a.m.

Other

G.L. IVERSON, M.W. COLLINS, M. ROBERGE & M.R. LOVELL. Pre-season Neurocognitive Testing in Athletes with Academic Problems.

Objective: Baseline preseason neurocognitive testing is recommended for amateur and professional athletes. Then, if an athlete sustains a concussion, it can be determined more precisely when he or she returns to normal neurocognitive functioning. Baseline testing is particularly important if an athlete has a developmental condition, such as ADHD or a learning disability, because these conditions might have an adverse effect on cognitive functioning. However, the effect of learning problems and disabilities on test batteries used in athletics is unknown. The purpose of this study was to examine the effect of academic problems on preseason testing in amateur athletes.

Participants and Methods: Forty-one student athletes with academic problems (e.g., those who receive special education services or have repeated a grade) were compared to 41 randomly selected controls on ImPACT, a 20-minute computerized neurocognitive test battery. The two groups were compared on the five composite scores using MANOVA followed by univariate ANOVAs.

Results: There was a significant multivariate effect [Wilks' Lambda =.80; F(6, 75)=3.1, p<.01, eta squared=.20]. The ANOVA results revealed significantly worse test scores for students with academic problems on the Verbal Memory (p<.014, Cohen's d=.55) and Processing Speed (p<.033, d=.48) composites. The groups did not differ on the Visual Memory, Reaction Time, or Impulse Control composites. The students with academic problems also reported significantly more subjective symptoms on the Post-Concussion Scale (p<.006, Cohen's d=.70).

Conclusions: Knowing the pre-injury symptom reporting and neurocognitive test performance of student athletes with academic problems will facilitate the interpretation of post-injury evaluations and return-to-play decision making.

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G.L. IVERSON, R.J. ECHEMENDIA & B.L. BROOKS. Are there lingering effects of a single concussion in young women athletes?

Objective: Researchers have reported that sport-related concussions might be experienced differently by women than men. The purpose of this study was to examine whether young women athletes with a history of one previous concussion differed on their preseason neuropsychological test performance or symptom reporting.

Participants and Methods: Participants were 240 young women who completed preseason testing with ImPACT Version 2.0. Participants were sorted into two groups: zero (n=207) and one previous concussion (n=33). Their most recent concussion occurred between 1-60 months prior to the baseline evaluation (M=21.2, SD=18.7).

Results: The groups were not significantly different in age or education. MANOVA was conducted using the Verbal Memory, Visual Memory, Reaction Time, Processing Speed, and Impulse Control composite scores as dependent variables and group membership as the independent variable. There was no significant multivariate effect or any significant main effects for individual scores based on exploratory follow-up analyses (parametric and nonparametric). A subsample of 25 women with one previous concussion (sustained 4-48 months prior) was selected for further analysis and matched precisely on age, education, sport, and school to 25 women athletes with no previous concussion. Again, MANOVA revealed no significant multivariate effect, nor were there any significant main effects for individual scores on exploratory follow-up analyses. There was a trend toward previously concussed women in the subsample reporting more symptoms on the Post-Concussion Scale.

Conclusions: Similar to the literature with men, in this study there was no obvious measurable effect of one previous concussion on women's preseason neuropsychological test performance or symptom reporting. Correspondence: *Brian L. Brooks, Ph.D., Research, BC Mental Health & Addiction Services, Administration Building, 2601 Lougheed Highway, Coquitlam, BC BC, Canada. E-mail: blbrooks@bcmhs.bc.ca*

G.L. IVERSON, R.J. ECHEMENDIA & B.L. BROOKS. No Obvious Cumulative Effects in Male Athletes with One or Two Previous Concussions.

Objective: Researchers have reported mixed findings regarding the possibility of lingering effects of one or two previous concussions in athletes. The purpose of this study was to examine whether athletes with a history of one or two previous concussions differed on their preseason neuropsychological test performance or symptom reporting.

Participants and Methods: Participants were 647 male athletes who completed preseason testing with ImPACT Version 2.0. Participants were sorted into three groups on the basis of concussion history. There were 518 athletes with no previous concussions, 100 with one, and 30 with two past concussions. Their most recent concussion occurred between 4 and 48 months prior to the baseline evaluation (M=21.7, SD=11.7, IQR=11-29 months).

Results: Multivariate analysis of variance was conducted using the Verbal Memory, Visual Memory, Reaction Time, Processing Speed, and Impulse Control composite scores as dependent variables and group

membership as the independent variable. There was no significant multivariate effect, nor were there any significant main effects for individual scores. There was a nonsignificant trend toward athletes with two prior concussions having slower reaction times. The groups did not differ in symptom reporting on the Post-Concussion Scale.

Conclusions: In this study, there was no obvious measurable effect of one or two previous concussions on athletes' preseason neuropsychological test performance or symptom reporting. If there is a cumulative effect of one or two previous concussions, it is very small. These findings replicate a previous study that found no obvious lingering effects of 1-2 previous concussions (Iverson, Brooks, Lovell, & Collins, 2006). Correspondence: *Brian L. Brooks, Ph.D., Research, BC Mental Health & Addiction Services, Administration Building, 2601 Lougheed Highway, Coquitlam, BC BC, Canada. E-mail: blbrooks@bcmhs.bc.ca*

C. LYSACK & S. NEUFELD. The Role of Cognition in Predicting Discharge Destination after Rehabilitation.

Objective: The purpose of this study was to evaluate the influence of cognition on the living arrangements of patients discharged from inpatient rehabilitation, and to examine the role of occupational therapy home evaluations as a mediating influence on discharge setting (home versus institution).

Participants and Methods: An archival review was conducted of eligible in-patients (n=7,286) in a large urban rehabilitation hospital over a 5-year period. The physical motor and cognitive subscales of the widely used Functional Independence Measure (FIM) provided key data.

Results: Living arrangements were strongly influenced by cognition. For each of our 5 diagnostic groups (spinal cord injury, cerebral vascular accident, traumatic brain injury, orthopedic conditions, and other), those discharged home alone had the highest cognition scores, followed by those discharged to live with family or friends, and finally those discharged to an institutional setting. Except for patients with spinal cord injury, the differences in the mean FIM cognition subscale scores between the 3 living arrangement categories were significant (p<0.005) in each case, after controlling for the FIM motor subscale, length of stay in rehabilitation, and a set of demographic variables (age, gender, ethnicity). More surprising was that for those discharged home (versus institution), there was a significant relationship (p<.01) between better cognition and having received an occupational therapy home evaluation.

Conclusions: This research highlights the importance of cognition, above and beyond physical function, as an independent predictor of discharge home after rehabilitation, but raises new questions about how therapists assess patient safety and independence.

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Traumatic Brain Injury

L. AGUERREVERE, K.W. GREVE, K.J. BIANCHINI & J.S. ORD. Visual Perception in TBI: Effects of Severity and Effort.

Objective: Previous studies have found that poor effort can significantly impact psychometric performance by Traumatic Brain Injury (TBI) patients. So far, this impact has been relatively well studied in attention, memory, and executive functions. However, this is not the case for visual perceptual testing. Thus, the goal of this study was to determine to what extent TBI severity affect visual perception measures after controlling for effort.

Participants and Methods: Data were obtained on 60 (20 per group) TBI patients divided into three demographically matched groups: mild TBI good effort group (mTBI good), mild TBI poor effort group (mTBI poor), moderate to severe TBI (M-S TBI). All TBI patients were seen in a compensation-seeking context.

Two comparison groups (20 patients per group) were included, right hemisphere cerebro-vascular accident (R-H CVA) group and a demographically matched control group.

To determine effort, cutoffs at the 2% false positive rate from the Portland Digit Recognition Test were used.

The Dependent variables were: the Wechsler Adult Intelligence Scale (WAIS-III) Perceptual Organization Index (POI) and constituent subtests: block design (BD), matrix reasoning (MR) and picture completion (PC); the Rey Osterrieth Complex Figure (ROCF); and the Benton Facial Recognition Test (BFRT).

Results: There was a significant group effect. The mTBI good group did not differ from controls. In contrast, the mTBI poor, M-S TBI and the R-H CVA groups performed significantly worse than the mTBI good group. In general, mild TBI has no effect on visual perception tasks, M-S TBI and R-H CVA had a small effect, and effort had a large effect.

Conclusions: The results suggest a dose-response relationship between injury severity and visual perception performance. After controlling for effort, results indicated that moderate-severe TBI, but not mild TBI, has long lasting effects on visual perception. Clinical implications are discussed.

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D.N. ALLEN, G. GOLDSTEIN & B. DONOHUE. The effects of alcoholism comorbidity on neurocognitive function following traumatic brain injury (TBI).

Objective: Substance use disorders increase the risk of sustaining traumatic brain injury (TBI). However, little information is available regarding the compounding effects of pre-existing alcoholism on neurocognitive functioning following TBI. These issues were investigated in the current study and it was hypothesized that alcoholism would have compounding deleterious effects on neurocognition in those with TBI.

Participants and Methods: Participants were divided into three groups including a patient comparison group composed of individuals who had no evidence of neurological disorder or brain damage (PC group), a TBI group who had suffered a traumatic injury and had evidence of structural brain damage (TBI group), and a TBI+Alcoholism group who in addition to having sustained a TBI also had a history of alcoholism (TBI+ALC group). All participants were administered the Halstead-Reitan Neuropsychological Test Battery (HRNB).

Results: Results comparing the groups on the individual tests of the HRNB indicated that both the TBI and TBI+ALC groups performed significantly worse than the PC group, although they did not significantly differ from each other.

Conclusions: The current results suggest that for patients with pre-existing alcoholism who then sustain TBI, the effects of the traumatic brain injury overshadow any preexisting deficits resulting from the alcoholism, so that following injury the groups do not meaningfully differ with regard to neurocognitive function.

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J.W. ANDERSON & M. SCHMITTER-EDGEcombe. Attentional Control and Variability following Moderate-to-Severe Traumatic Brain Injury.

Objective: The ability to mentally track and sustain attention is important for rehabilitation following traumatic brain injury (TBI). We examined attention and working memory abilities in 28 participants with moderate-to-severe TBI shortly following emergence from post-traumatic amnesia (PTA) and 28 controls.

Participants and Methods: To evaluate attention and working memory abilities, participants completed a Letter-Number Span task and the WAIS-III Letter-Number Sequencing task. Variability in attention was calculated as the intrasubtest scatter score divided by the number of correct responses.

Results: Compared to controls, the TBI group produced fewer total correct responses on the Span task, $t(54) = -3.27$, $p < .01$ and on the Sequencing task, $t(54) = -2.54$, $p < .05$. After controlling for total correct on the Span task, there was no longer a significant group difference on the Sequencing task, $F < 1$, suggesting that attention abilities greatly impact working memory performance. The TBI participants also demonstrated greater levels of variability in attention on the Sequencing task, $t(54) = 2.13$, $p < .05$. Results of a regression revealed that this variability accounted for a large proportion of variance for the TBI participants' total score on the Sequencing task, but not for the controls.

Conclusions: The finding of poorer performance on measures of attention, and that variability in attention partially accounted for the TBI groups poorer total score on the working memory task, supports the notion that attention difficulties following TBI may impact the efficiency of other cognitive domains.

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G.L. ANDREWS & C.J. ROBINS. Adult Short-Term Memory Loss: A 12-year case study in multidisciplinary rehabilitation.

Objective: In rural environments, it is critical to be innovative and persistent in rehabilitation with person with TBIs. On-going multidisciplinary programs are rarely available for persons in these underserved areas. Our purpose was to use available resources to assist a person with a TBI in improving his quality of life.

Participants and Methods: S.G. sustained a TBI at the age of 28 which left him with severely impaired short-term memory and an inability to develop long-term memories. He also lost 12 years of remote memory. Multiple professionals and students have provided S.G. with intense cognitive retraining, physical health programs, motor and social skills interventions, medication management, vocational exploration, and psychological evaluations. Verbal, non-verbal and visual methods were used. In addition several memory aids such as memory books, cellular devices, and visual reminders were utilized in daily living.

Results: Wechsler Intelligence Scale scores document an IQ increase of 2 SD with his current IQ in the average range. Documentation of effective implicit memory functions early in the rehabilitation guided the development of specific techniques used throughout the interventions. Evidence of new long-term memories were documented through content achievement tests and motor skills tests.

Conclusions: Techniques were developed and implemented for interacting with S.G. without relying on his memory in order to decrease his frustration with needing to make judgments based upon recent events. Training providers in the use of visual memory aids, appropriate use of technology and a cued conversational style have increased S.G.'s ability to be successful in moving toward increased independence. S.G. progressed from a presumed nursing home resident to semi-independent living complete with a structured full-time employment arrangement. Correspondence: *Glena L. Andrews, Ph.D, Psychology, Northwest Nazarene University, 623 Holly Street, Nampa, ID 83656. E-mail: glandrews@nnu.edu*

T. ASHMAN, J. CANTOR, A. GINSBERG & C. ENGMANN. Cognitive Fatigability, Participation, and Co-Morbid Conditions after TBI.

Objective: Fatigue is one of the most common symptoms of TBI and has been related to poor outcomes and co-morbid conditions. The present study examined the relationship between participation, symptoms of co-morbid conditions, and an objective measure of cognitive "fatigability" (deterioration in performance on serial neuropsychological batteries over time).

Participants and Methods: A group of 202 individuals with mild to severe TBI and a group of 73 persons with no disability underwent serial administrations of a computerized neuropsychological test battery (CANTAB) over several hours. Change in performance between Time 2 and Time 3 (fatigability) was correlated with scores on measures of participation (POPS), depression (BDI-II), pain (MPQ), and sleep disturbances (PSQI).

Results: In the TBI group, fatigability was related to participation in major life areas ($r = -.20$, $p = .047$), interpersonal functioning ($r = -.21$, $p = .044$), community participation ($r = -.29$, $p = .005$), and overall participation ($r = -.23$, $p = .024$). Fatigability was unrelated to participation in the non-disabled group and was unrelated to symptoms of depression, pain, or sleep disorders in either group.

Conclusions: The results suggest that there is a significant relationship between cognitive fatigability and participation in individuals with TBI that does not exist in individuals with no disability. Fatigability is not accounted for by the presence of co-morbid mood, pain, and sleep disturbances. The findings contrast with previous research on fatigue based on self-reports and suggest that objectively measured cognitive fatigability may be a better predictor of participation than self-reported fatigue.

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M.H. BEAUCHAMP, C. CATROPPA, J. MALLER, C. GODFREY & V.A. ANDERSON. The role of the corpus callosum in social function 10 years after pediatric traumatic brain injury.

Objective: Background: Studies have shown that the corpus callosum (CC) is vulnerable to lesion and atrophy following head injury and that volumes decrease over time in severely injured patients. Abnormalities of the CC have also been linked to social and behaviour problems in both children and adults. This study aimed to investigate the relationship between callosal area and social function in children with traumatic brain injury (TBI), ten years post-injury.

Participants and Methods: Method: As part of a longitudinal follow-up, 37 patients with TBI (mean age = 16.7 years, SD = 3.8) were assessed on measures of social function (Adaptive Behaviour Assessment System – ABAS; Behaviour Assessment System for Children – BASC) and their results were correlated with callosal area obtained from T1-weighted midsagittal segmentation of magnetic resonance images acquired on a 1.5T scanner.

Results: Results: Severe TBI patients had significantly smaller CC areas than mild/moderate patients ($t(35) = 2.1$, $p = 0.04$). For all patients, scores on the social composite of the ABAS and BASC correlated positively and very significantly with callosal area (ABAS: $r = 0.62$, $p = 0.004$; BASC: $r = 0.55$, $p = 0.01$).

Conclusions: Conclusion: These findings suggest a relationship between smaller callosal areas and poorer social skills in children with TBI. Furthermore, compared to mild/moderate injuries, severe brain injury leads to reductions in callosal area up to ten years post-injury. The role of the corpus callosum in social function and the implications of the results for long-term social outcome and intervention following pediatric TBI will be discussed.

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J. DOOLEY, V.A. ANDERSON, J. OHAN & S. HEMPHILL. Social Behaviours and Paediatric Traumatic Brain Injury: Long-Term Outcome in Adolescent Boys.

Objective: Objective

Paediatric traumatic brain injury (TBI) results in social skills impairments and disruptive behaviours like aggression. Although aggression rates of 25% have been reported most studies use atheoretical measures. This study examined aggression in adolescents with TBI using theoretical and atheoretical measures of aggression. In addition, we examined general social skills from both adolescent and parent perspective.

Participants and Methods: Method

Eleven boys (Mean age = 15.7 yrs, SD = 1.3yrs) with moderate to severe TBI were compared to a matched non-injured sample ($M = 14.7$ yrs, $SD = 1.4$ yrs). Participants were injured 2.2 to 13.2 years prior to assessment ($M = 8.3$ yrs, $SD = 4.2$ yrs). All participants completed aggression and social skills measures.

Results: Results

When the reason for and type of aggression was examined, participants with TBI reported significantly more emotional and frustration related aggression but not bullying or planned aggression. Participants with TBI reported being as socially skilled as their non-injured peers. Parents of participants with TBI rated them as significantly more assertive but not more aggressive than their non-injured peers.

Conclusions: Discussion

Aggression after TBI was related to emotional instability and frustration intolerance but only when both the reason for and type of aggression was examined. Participants with TBI rated themselves as socially skilled suggesting unawareness of disinhibited behaviours which was consistent with parent report who rated them as more assertive but not more aggressive. The results indicate that a thorough examination of both positive and negative social behaviours is necessary to identify specific areas of difficulty after paediatric TBI.

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E. HESSEN, V.A. ANDERSON & K. NESTVOLD. MMPI-2 profiles 23 years after pediatric mild TBI.

Objective: Primary objective: Research indicate that postconcussive syndrome after mild traumatic brain injury (mTBI) is more frequent than chronic cognitive impairment. The aim of the present study was to investigate very long-term outcome of subjective complaints after pediatric mTBI. Research design: The study was a follow up 23 years after a prospective head injury study at a large hospital in Norway.

Participants and Methods: Methods and procedures: Forty-one patients were assessed with the Minnesota Multiphasic Personality Inventory-2 (MMPI-2) 23 years after sustaining mTBI as children and adolescents.

Results: Main outcomes and results: A good overall outcome was found. The scores were close to the normative mean and the patients had average length of education and normal employment rate. However, the children and adolescents that sustained complicated mTBI showed somewhat more pathological scores, typical for mild postconcussive syndrome. The most important predictors of poor outcome were skull fracture and a combination of PTA>30 minutes and EEG pathology within 24 hours after TBI. No influence of pre- and post-injury risk factors on present MMPI-2 profiles was evident.

Conclusions: Conclusions: The results give support for the notion of potentially differential impact of uncomplicated versus complicated mTBI. The findings indicate that children and adolescents sustaining complicated mTBI may be at risk of developing subtle chronic symptoms typical of postconcussive syndrome.

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S. WARSCHAUSKY & J. DONDERS. Predicting Transition-age Social Functioning Following Traumatic Brain Injury.

Objective: Objective: Studies of patients with traumatic brain injury (TBI) frequently examine social functioning as a uni-dimensional construct. This study was conducted to examine the predictors of distinct aspects of social outcomes.

Participants and Methods: Participants and Methods: The sample included 45 youth, ages 17 to 21, 58% male, with a history of complicated-mild to severe TBI, assessed 1–3 years post injury. Hierarchical regression analyses were used to examine demographic, neurological, and neuropsychological predictors of three aspects of social outcomes: prosocial problem-solving as assessed by the Response Generation Task, size of peer networks identified in the Peer Social Network Diagram, and global social integration as rated on the Community Integration Questionnaire.

Results: Results: Correlations between the three outcome variables were not significant, confirming that they assessed different aspects of social functioning. None of the predictors was significantly associated with prosocial problem-solving. Size of peer social network was inversely related to length of coma. Global social integration was predicted by PPVT-R and DEX, with the former variable mediating the effect of original socioeconomic status.

Conclusions: Conclusions: Aspects of social functioning are differentially vulnerable to the effects of a TBI. Despite the fact that many patients have difficulties with prosocial problem-solving, this outcome is not clearly associated with either traditional severity indicators or neuropsychological status. However, size of social networks appears to be strongly associated with severity of TBI in this age group, whereas global social integration is associated with neuropsychological status. Theoretical and practical implications will be discussed.

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T. BLAKE, N. FICHTENBERG & C. ABEARE. Clinical Utility of Demographically Corrected WAIS-III Subtest Scores After Traumatic Brain Injury.

Objective: Although demographic factors have been found to influence intelligence test scores, only age-corrected norms have traditionally been used in neuropsychological assessment. The aim of the present study was to determine whether recently developed demographic corrections enhance the clinical utility of Wechsler Adult Intelligence Scale-Third Edition (WAIS-III) subtests in the evaluation of the cognitive sequelae of traumatic brain injury (TBI).

Participants and Methods: 57 adults with TBI and 61 pseudoneurologic controls matched for age, gender, and ethnicity, were drawn from a consecutive series of outpatient neuropsychological evaluations. Participants completed the WAIS-III as part of a comprehensive neuropsychological battery. The sensitivity and specificity of demographically corrected subtest scores was compared to traditional age-corrected norms.

Results: Digit Symbol-Coding and Symbol Search subtests were the most useful measures for classifying individuals with TBI, whereas the remaining subtests were relatively insensitive to the effects of TBI. Applying demographically corrected norms did not significantly improve the accuracy with which the WAIS-III subtests distinguish individuals with TBI from pseudoneurological controls. A 1 SD cut-off for impairment yielded the most balanced levels of sensitivity and specificity in this sample.

Conclusions: While demographic variables such as education, sex, and ethnicity may influence intelligence test performance, demographically corrected WAIS-III norms do not offer an obvious advantage relative to traditional age-corrected norms when evaluating patients with TBI. Current results are consistent with previous findings regarding the sensitivity of the Processing Speed Index to the cognitive sequelae of TBI. However, the results also indicate that the WAIS-III should be supplemented with other measures in the assessment of TBI.

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T. BLAKE, R. HANKS & C. MCKAY. Comparative Utility of Reading Measures For Estimating Premorbid Intelligence Among Persons With Brain Injury: A Preliminary Study.

Objective: To compare the Wechsler Test of Adult Reading (WTAR), Wide Range Achievement Test – 3 (WRAT-3) Reading subtest, and North American Adult Reading Test (NAART) methods for estimating premorbid intellectual functioning in persons with traumatic brain injury (TBI).

Participants and Methods: Participants were 29 TBI outpatients who completed the 3 oral reading measures during a follow-up neuropsychological evaluation conducted 1 month to 23 years post-injury. Results were compared to a group of 14 participants who sustained non-neurological injuries and were matched for age, gender, and race, who completed the reading measures during inpatient rehabilitation.

Results: Preliminary data collection revealed that the WTAR, WRAT-3 Reading subtest, and NAART premorbid intelligence estimates were highly correlated with one another and with WAIS-III Full Scale IQ scores of persons with TBI. However, the WTAR and NAART methods tended to overestimate general intellectual functioning in these individuals. A similar pattern of relationships among estimation methods was found for the control group.

Conclusions: The findings support the concurrent validity of oral reading measures for estimating premorbid intellectual functioning. The interrelationships between the measures appears to be similar in individuals with and without cognitive compromise, indicating that the convergent validity of these measures is stable and that the tests are relatively insensitive to cognitive changes secondary to traumatic brain injury.

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B.L. BROOKS, R.T. LANGE, G.L. IVERSON & M.D. FRANZEN. Influence of Age on the Acute Neuropsychological Outcome from Uncomplicated Mild Traumatic Brain Injury.

Objective: Most researchers have reported that older adults have worse outcome from traumatic brain injury, of all severities, than younger adults. However, the literature relating specifically to mild TBI is mixed. The purpose of this study is to examine the influence of age on acute neuropsychological outcome following an uncomplicated mild TBI.

Participants and Methods: Participants were selected from an archival database of trauma patients with MTBIs and normal day-of-injury CT scans. A sample of older adults (n=26; age=65.7, SD=4.8, range=60-90; GCS=14.8, SD=0.4; days post injury=3.4, SD=2.6) were matched in a case-control manner (sex, education, ethnicity, days post injury, and mechanism of injury) to a sample of adults (n=26; age=28.4, SD=9.0, range=18-45; GCS=14.9, SD=0.4; days post injury=3.1, SD=2.6). Patients were excluded if they had a known history of substance abuse, psychiatric illness, or were intoxicated at the time of injury. All were assessed within 14 days post injury on nine cognitive measures.

Results: Analyses were conducted on normative percentiles. Older adults had lower performance on Digit Span Backward (p=.01, Cohen's d=.71), Visual Reproduction II (p=.04, d=.58), and Trails B (p=.02, d=.65). When considering all scores from the brief cognitive battery simultaneously, 23% of older adults had six or more low scores (-1SD) compared to 4% of younger adults (p=.04).

Conclusions: Older adults with an uncomplicated MTBI had lower performance on neurocognitive testing in the first few days post injury compared to younger adults. These results are consistent with most of the literature suggesting that older adults might have worse outcome from TBI of all severities.

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M. BUI, J. POOLE, M. DAHDAH, L. TRETIN & J. WAGER. Facial Affect Recognition in Individuals with Traumatic Brain Injury.

Objective: The ability to recognize facial affect is essential in the day to day function of social interaction and judgment. Based on the Facial Affect Recognition (FAR) test developed by Ekman, Fiesen, & Poole, 1994; this study examines the accuracy of affect identification in individuals with traumatic brain injury.

Participants and Methods: The FAR is a paced computerized test displaying at the rate of one second a picture of faces with the following emotions expressed: happy, surprised, afraid, angry, disgusted, sad, and neutral. This study includes 52 individuals with Traumatic Brain Injury with a mean age of 31.27 (13.33) and mean education of 13.25 (1.78).

Results: Of the listed affects, the individuals in this study had the most difficulty with identifying afraid and more successful in identifying surprised. In addition, they tended to endorse an affect as neutral when it is not. As a group, their overall performance is moderately below the norm.

Conclusions: The results suggest individuals with Traumatic Brain Injury will have some difficulty with accuracy in recognizing specific facial affect. This difficulty may contribute to behavioral issues and interpersonal relationship in the process of recovery.

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P.W. ELY. You can fool all of the people some of the time.

Objective: Undetected malingering results in unnecessary engagement of healthcare providers across disciplines (PT, OT, SW, SPL, tutors, massage therapy, psychiatry and psychology). Typically, fraudulent litigants claiming TBI, chronic pain, or psychological disturbance derive few if any appreciable benefits from numerous and prolonged interventions, while legitimate TBI survivors are deprived of needed services because of limited resources. Yet, malingerers often persist in successfully eluding detection. This underscores the relevance of conducting thorough neuropsychological evaluations comprising multiple measures of malingering, and the need for transdisciplinary service delivery standards and best practices measures.

Participants and Methods: Ms. A. H., a 19 year old college student embroiled in civil litigation for more than five years, alleged functional limitations arising from cognitive symptoms, refractory pain, and affective disturbance putatively attributed to a TBI acquired in a serious MVC that resulted in no fractures, questionable LOC, and a GCS of 15/15 at the scene. She was provided with many treatments and five separate psychological assessments over four years.

Results: Neurobehavioral observations, a detailed file-review, and a comprehensive neuropsychological evaluation embedding several measures of effort, unequivocally revealed a systematic pattern of feigned neurocognitive impairment, selective symptom exaggeration, and defensiveness.

Conclusions: This case report highlights the relevance of incorporating multiple effort and symptom validity measures in neuropsychological

assessments. Transdisciplinary treatments of mildly concussed litigants also need to include evaluations of outcome and service delivery models. Collaborative studies involving mild TBI and postconcussion syndrome groups with refractory symptoms are required to further clarify and advance the methodology of malingering detection across disciplines. Correspondence: *Peter W. Ely, Ph.D., Ely & Associates, Psychologists, P.O. Box 8007, Station T, CSC, Ottawa, ON K1G 3H6, Canada. E-mail: elyneuro@sympatico.ca*

M. ENNOK, K. BURK & T. TOMBERG. Deficits in Generalization Ability in Traumatic Brain Injury.

Objective: The aim of this study was to assess the process of generalization and concept formation after traumatic brain injury (TBI).

Participants and Methods: Subjects were 43 patients with TBI who had sustained moderate to severe injury more than 6 years ago, and 43 age-, sex- and education-matched controls. Subjects were tested with an extended Similarities subtest of tryout version of the WAIS III Estonian adaptation. 0-point answers were re-coded to different error types according to error categories developed by Giovannetti et al (2001). Groups were compared based on their error proportion score.

Results: Preliminary analysis showed that TBI patients had a significantly lower full score than controls, they gave fewer 2-point responses and more 0-point responses. They also made more out-of-set errors than controls while controls made more in-set errors than TBI patients.

Within-group analysis showed significantly greater amount of in-set errors for controls than other error types. TBI patients made the same amount of out-of-set and in-set errors but made fewer "don't know" and "not alike" errors. Subjects with higher education made more in-set errors than other types of errors, subjects with lower education made fewer "not alike" errors but other error types were represented in roughly similar proportions.

Conclusions: TBI patients have difficulties in abstracting and forming mental set for verbal generalizations. The effects are mediated by the education level.

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G. EVANS, A.M. SANDER, A.N. CLARK, M.A. STRUCHEN, D. KURTZ & J. HANNAY. Title: Impact of Stressful Life Events and Post-Traumatic Stress on Emotional Distress and Quality of Life After Mild Traumatic Brain Injury.

Objective: To explore the contribution of pre-injury stressful life events and post-traumatic stress to emotional distress and quality of life after mild traumatic brain injury (TBI).

Participants and Methods: Participants were 299 persons with mild TBI consecutively admitted to a level one trauma center ER. Participants were primarily male Hispanics (58%) and African Americans (25%), with low education (Mean=10.33; SD=3.90). Participants completed an interview and assessment within two weeks of injury, including the Stressful Life Events Questionnaire (SLESQ) and Post-Traumatic Checklist (PCL). A follow-up assessment was conducted at three months after injury, including the Brief Symptom Inventory (BSI) and the SF-36.

Results: After accounting for age and injury severity, scores on the SLESQ accounted for a significant portion of variance in scores on the mental component score of the SF-36 (R2 change=.08, $p < .01$), as well as the BSI depression (R2 change=.03, $p < .05$) and anxiety scales (R2 change=.04, $p < .01$). Scores on the PCL contributed significantly to the SF-36 physical component score (R2 change=.06, $p < .01$), BSI depression scores (R2 change=.09, $p < .01$), and BSI anxiety scores (R2 change=.08, $p < .01$).

Conclusions: In this sample of consecutive ER admissions with mild TBI, history of stressful life events and the presence of pre-injury post-traumatic stress symptoms were predictive of emotional distress and health-related quality of life at 3 months post-injury. The results suggest that outcome after mild TBI may be partially due to past stressors. History of pre-injury stress should be included when assessing persons with mild TBI.

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C.C. EVANS, T. MANI, R. NAKASE-RICHARDSON, M. SHERER & J. STOUTER. Impact of Depressive Symptoms, Impaired Self-Awareness, and Therapeutic Alliance on Outcome from Post-acute Brain Injury Rehabilitation.

Objective: This study examined the contributions of depressive symptoms, impaired self-awareness (ISA), and therapeutic alliance to prediction of productivity status at discharge from post-acute brain injury rehabilitation (PABIR).

Participants and Methods: Participants were 48 patients with TBI who completed a PABIR program during the study period. All measures were collected at program discharge. ISA was measured by discrepancy scores between patient and clinician ratings on the Awareness Questionnaire. Depressive symptoms were measured by the CES-D, while therapeutic alliance between patient and treatment team was measured by the modified California Psychotherapy Alliance Scale. Participants were 56% male and 67% Caucasian with a mean age of 30 and mean education of 12 years. The median time between injury and program admission was 88 days and 60% of the sample had severe brain injuries (GCS= 3-8).

Results: Results of multivariable logistic regression analyses found that depressive symptoms ($p < .01$) and ISA ($p < .05$) made independent contributions to the prediction of productivity status at discharge after adjustment for other predictors (severity of injury, age, and therapeutic alliance). The model accounted for 53% (R-squared) of the variability in productivity outcome. Higher levels of depressive symptoms and ISA were associated with poor productivity. At discharge, 15% of patients reported depressive symptoms above the standard cutoff and 25% still showed significantly impaired self-awareness. The majority of participants (65%) were rated as productive at program discharge.

Conclusions: Findings indicate that impaired self-awareness and depressive symptoms should be addressed by therapists working in PABIR programs as they are associated with poor productivity outcome for patients with TBI.

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L. EWING-COBBS, M.R. PRASAD, D. RACHES, P.R. SWANK, M.A. BARNES, L. KRAMER, J.M. FLETCHER, H. HANNAY & K.M. HASAN. Relation of Diffusion Tensor Imaging Metrics from the Corpus Callosum with Neuropsychological Outcomes after Pediatric TBI.

Objective: Recent studies using diffusion tensor imaging (DTI) revealed alterations in the microstructure of all regions of the corpus callosum (CC) after traumatic brain injury (TBI). In the present study, DTI was used to examine the relation of post-traumatic changes in regional callosal macro- and microstructure to neuropsychological outcomes after pediatric TBI.

Participants and Methods: DTI was conducted in 41 children and adolescents with moderate to severe TBI and in 31 comparison children. DTI-derived metrics included regional callosal midsagittal area, fractional anisotropy (FA), radial, and axial diffusivities. FA is believed to index the integrity and degree of fiber organization. Radial diffusion

may assess change associated with myelination status; axial diffusivity appears to be more strongly related to intrinsic characteristics of axons and extracellular water. These DTI-derived metrics from the entire midsagittal CC, as well as from 6 callosal subregions, were correlated with neuropsychological outcomes.

Results: The mid-sagittal area of the entire CC was not significantly related to outcomes. FA and the radial diffusivity were significantly correlated with coding, rapid letter naming, reading accuracy, and reading comprehension scores. The relation of DTI metrics and outcomes was stronger in the TBI than in the comparison group. Across callosal regions, DTI metrics from the midbody were correlated with fine motor speed and coordination; metrics from the splenium were correlated with reading outcomes.

Conclusions: Microstructural changes after TBI may reflect decreased organization and disrupted myelination of white matter. Both FA and the radial diffusivity correlated significantly with multiple neuropsychological outcomes; the axial diffusivity was generally unrelated to outcomes (NIH ROI NS-046308).

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C. FAULHABER, R. PERNA & B. ABLITZ. Neurorehabilitation Outcomes After Brain Injury: Gender Differences.

Objective: The impact of gender on neurorehabilitation outcomes is mixed. A metaanalysis conducted by Farace and Alves (2000) found overall outcome was worse for women following brain injury. However, other researchers found male gender to be predictive of poorer outcomes post brain injury (Devitt et al., 2006). This study examines the impact of gender on functional improvement as measured by the Mayo-Portland Adaptability Inventory-4 (MPAI-4; Malec & Lezak, 2003).

Participants and Methods: Change (admission-discharge) in the total MPAI-4 and its three Index scores (Cognitive/Physical Ability, Community Participation, Psychosocial Adjustment) were compared between genders [male=216, female=142; mean age = 39.8 years; mean education = 11.7 years; mean time since injury (TSI) = 7.5 years; mean length of stay (LOS) = 214.6 days] in a transdisciplinary neurorehabilitation program. Age, education, TSI, LOS, and admission MPAI-4 total scores were similar between genders. Sample injury type included tumor (5.6%), TBI (54.7%), anoxia (4.2%), seizure (2.8%), CVA (17.6%), and other (15.1%).

Results: Both genders had significantly improved total MPAI-4 scores. However, mean change between males (5.47) and females (5.46) was not significantly different. Change in Index scores revealed significant improvements for both genders, although no significant differences were found between genders. Age, gender, injury type, TSI, and LOS did not significantly correlate with overall change in MPAI-4 scores.

Conclusions: Men and women benefit significantly, but equally from neurorehabilitation programs as measured by change in total MPAI-4 and its three Index scores. Given the long time post-injury of this sample, these findings may not be generalizable to more acutely injured individuals.

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C. FILANOSKY, A.A. GINSBERG & T. TSAOUSIDES. The Relationship Between Sleep Efficiency and Depression after Traumatic Brain Injury (TBI).

Objective: Depression is common in individuals who have sustained a traumatic brain injury (Ashman et al., 2004). Sleep disturbances following TBI have also been frequently reported (Fichtenberg et al., 2002; Parcell et al., 2006). Sleep efficiency (the ratio of number of hours sleep-

ing to number of hours spent in bed) appears to be poorer for individuals with TBI compared to controls (Ginsberg et al., 2007). Given the relationship between sleep problems and depression in the general population (Taylor et al., 2005), the objective of this study was to explore the relationship between sleep efficiency and depression following TBI. **Participants and Methods:** Participants included 223 community dwelling adults with TBI (all severities) and 85 controls. Measures included the Pittsburgh Sleep Quality Index (PSQI), and the BDI-II. Quality of sleep, sleep efficiency, and depression rates were analyzed.

Results: As expected, significant relationships were found between quality of sleep and depression (TBI group: $r = .43$, $p < .001$; controls: $r = .52$, $p < .001$), and between sleep efficiency and depression (TBI group: $r = .24$, $p < .001$; controls: $r = .25$, $p < .05$). Analyses also revealed that there was a significant relationship between sleep duration and depression in individuals with TBI ($r = -.15$, $p < .05$) but not in controls.

Conclusions: For all participants, higher sleep efficiency was related to lower rates of depression. For the TBI group specifically, actual duration of sleep was negatively related to depression. This finding has multiple implications for the function of sleep and understanding the nature of depression in individuals with TBI.

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N. FITZPATRICK, J. WANG, K.S. CHIOU, J. VESEK & F.G. HILLARY. Cross-Validation of Diffusion Tensor Imaging in Acute TBI using Proton Magnetic Resonance Spectroscopy.

Objective: Diffusion Tensor Imaging (DTI) provides a novel method for evaluating white matter integrity by measuring fractional anisotropy (FA), or directed water diffusion. In the study of traumatic brain injury (TBI), DTI has been largely used to examine chronic injury in large white matter tracts where injuries have been presumed to exist. Little work has used DTI to examine specific sites of axonal disruption in acute TBI. Because of this, the potential confounding influence of edema and local hemorrhage on measures of FA has not been fully characterized. The purpose of this study is to evaluate DTI as a measure of local white matter functioning in perilesioned areas after acute brain injury by comparing FA values to the ratio of N-acetylaspartate to Choline (NAA/Cho) obtained using proton magnetic resonance spectroscopy (pMRS).

Participants and Methods: Participants included TBI patients ages 20-63 with 24-hour Glasgow Coma Scales from 5-13. All participants signed an IRB-approved consent form and underwent scanning using a Phillips 3.0T scanner, acquiring a whole-brain DTI image and either single-voxel or multi-voxel pMRS. FA values were compared to pMRS values by setting the location of the pMRS voxel as the region of interest for the FA map.

Results: Initial results reveal moderately high correlation between NAA/Cho and FA values in areas of axonal disruption.

Conclusions: DTI is sensitive to white matter injuries even in potentially edematous tissue surrounding microhemorrhages. These data provide support for using DTI to identify local areas of axonal disruption in acute TBI.

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S.D. GALE, L.C. BAXTER, J.A. GRAY & G.P. PRIGATANO. Decreases in Fractional Anisotropy of the Fornix in Children with Chronic TBI.

Objective: Compare microstructural integrity of white matter (WM), via diffusion tensor imaging (DTI), between controls and pediatric TBI patients now in the chronic stage to determine if changes persist beyond the post-acute period.

Participants and Methods: Eight children (3 males) with moderate/severe TBI greater than 1 year post-injury ($x=2.7$ yrs, $sd=1.5$), av-

erage age 11.3 ($sd=1.8$), were compared to seven age-matched controls (3 males) average age 12.6 ($sd=1.3$). Whole brain fractional anisotropy (FA) images were obtained on a 3T GE scanner (1.05x1.05x2.60) measuring DTI in 25 directions. Images were normalized to the MNI EPI template. FA maps were spatially transformed according to the b0 images, reformatted to 2x2x2, and then smoothed to 4x4x4. Group differences were assessed using SPM5.

Results: In SPM, the TBI group demonstrated decreased anisotropy compared to controls in several regions, mainly subcortical, most prominently in the fornix. A region of interest in the fornix revealed FA values of .47 ($sd=.05$) in controls and .39 ($sd=.06$) in the TBI group ($p < 0.05$).

Conclusions: Microstructural integrity of WM measured with DTI was clearly compromised in children with TBI. The fornix was particularly vulnerable to the effects of TBI and these changes were present after the acute injury period. The anatomical location of abnormalities was consistent with diffuse axonal injury. Decreased FA was mainly subcortical, though changes in frontal and temporal regions were observed. This research supports previous studies suggesting long coursing WM structures are vulnerable to the effects of TBI and that the fornix should be a focus of further research.

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A. GHEYTANCHI, I. WEBER-ORNSTEIN, G. SMITH, M. SWANSON & J.H. POOLE. Determinants of Self-Reported Post-Concussive Symptoms in Combat Veterans with Mild to Moderate Traumatic Brain Injury.

Objective: There has been an increasing interest in determining best practices in screening for TBI in combat veterans who have also may have PTSD. Patients with TBI and PTSD often report symptoms that overlap both diagnostic criteria of both disorders. The current study investigates if there are specific self-report neuropsychological symptoms that differentiate PTSD from TBI and if patients with self-reported Post-Concussive Symptoms (PCS) will also report significantly higher emotional symptoms.

Participants and Methods: A group of 65 veterans were screened for possible TBI in an outpatient polytrauma clinic and assessed using Neuropsychological Assessment Battery (NAB), a Neuropsychological Symptom Inventory (NSI), Beck's Depression Inventory (BDI), Beck's Anxiety Inventory (BAI), Post Traumatic Stress Disorder Checklist (PCL-M) and the Neuropsychological Assessment Battery (NAB).

Results: The association between of PCS with other measures and demographics were analyzed using spearman correlation with one-tailed significance. We found significant positive correlation ($\phi = .765$, $p = .000$) between severity of self-reported PCS symptoms and PTSD symptoms revealed through the PCL-M. Reported anxiety levels measured by the BAI had the strongest correlation with cognitive test performance ($\phi = .365$; $p = .009$). We also found an effect of education on cognitive test performance, where people with higher education level had lower deficits shown on cognitive tests ($\phi = .350$, $p = .009$). The effect of education was mediated by lower anxiety in higher educated individuals.

Conclusions: Results suggest that self-reported PCS are significantly correlated with self-reported PTSD symptoms, but not with the neuropsychological assessment battery. Further diagnostic implications using self-report measures will be discussed.

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A. GINSBERG, T. TSAOUSIDES & C. FILANOSKY. The Role of Sleep Efficiency in Post-TBI Fatigue: A Comparison between Individuals with TBI and Non-TBI Controls.

Objective: Fatigue and sleep disturbance are commonly reported symptoms after traumatic brain injury (TBI) (Borgaro et al., 2005; Fichten-

berg et al., 2002). One of the components of sleep quality is sleep efficiency, defined as the ratio of sleep duration (in number of hours) over time spent in bed (in number of hours). The objective of this study was to understand the role of sleep efficiency in post-TBI fatigue, by comparing self-reported levels of fatigue and sleep efficiency between individuals with TBI and non-TBI controls.

Participants and Methods: The Barroso Fatigue Scale and the Pittsburgh Sleep Quality Index, were administered to 223 individuals with TBI and 85 non-TBI controls. Gender and income were controlled for, based on preliminary analyses.

Results: Significant differences between the TBI and non-TBI groups were found in terms of global fatigue ($F = 24.71, p < .001$), and sleep efficiency ($F = 4.38, p < .05$). There were no significant differences in average sleep duration and time spent in bed. The two groups differed in range of sleep duration (11.5 hours vs. 6 hours). Regression analyses showed a significant contribution of sleep efficiency to global fatigue in the non-TBI group ($F = 4.1, p < .05$), but not in the TBI group ($F = .71, ns$).

Conclusions: Sleep efficiency was lower for the TBI group, even though the two groups reported equivalent sleep duration and time spent in bed. Sleep efficiency accounted for a higher amount of variance in global fatigue in the non-TBI group. This finding suggests that factors other than sleep efficiency account for the higher fatigue experienced by the TBI group, and provides preliminary support for theories addressing differences in sleep architecture post-TBI.

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G. GOLDSTEIN & D.N. ALLEN. Neurocognitive heterogeneity in traumatic brain injury.

Objective: Neurocognitive deficits resulting from traumatic brain injury (TBI) are heterogeneous in nature owing to a number of factors such as mechanism of injury, type of injury, severity of injury, etc. The few studies that have focused on investigating this heterogeneity using neuropsychological measures have typically examined a single measure that assesses one aspect of cognition such as memory. The current study investigates heterogeneity in TBI using a comprehensive neuropsychological battery to determine if meaningful subgroups of patients can be identified.

Participants and Methods: Participants included male veterans who had sustained a traumatic brain injury that had resulted in structural brain damage as determined by appropriate examinational methods. All participants were administered the Halstead-Reitan Neuropsychological Test Battery (HRNB). Cluster analysis was used to examine four and five cluster solutions, which were hypothesized as the most likely number of clusters based on prior investigations.

Results: Results indicated that whether four- or five-cluster solutions were examined, the resulting subgroups were primarily distinguished by differences in level of performance across the HRNB tests, with one group performing in the average range and a second performing in the severely impaired range. For the intermediate groups, some evidence was present that would suggest differences in pattern of performance in addition to overall level of performance differences.

Conclusions: The current results suggest that TBI does indeed result in heterogeneity of neurocognitive deficits, although differences in the patterns of performance among the various clusters are not as prominent as might be expected. Rather, level of performance differences are the primary distinguishing factor between groups.

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S.T. GONTKOVSKY, J.E. LEE, R. NAKASE-RICHARDSON & C.D. SPIELBERGER. Multidimensionality of the State-Trait Personality Inventory with Traumatic Brain Injury Patients: A Rasch Analysis.

Objective: Detrimental changes in psychological functioning are commonly manifested following traumatic brain injury (TBI). Assessment of such changes among individuals with TBI remains challenging because of limitations in existing instruments commonly utilized for this purpose. This investigation examined the dimensionality of the State-Trait Personality Inventory (STPI, Spielberger, 1995), a relatively new measure of acute emotional states and dispositional personality traits.

Participants and Methods: Participants were comprised of 100 patients with documented TBI. Data were analyzed using a generalized multidimensional Rasch model in which the eight predefined constructs assessed by the STPI were tested. Two multidimensional models were used to examine the fit of the STPI scales to the data: a 2-dimensional model that combined the STPI state and trait domains, and an 8-dimensional model that included the STPI state and trait anxiety (Ax), anger (Ag), depression (D), and curiosity (C) domains.

Results: Both analyses yielded a better fit to the data than a one-dimensional model. Compared to the 2-dimensional model, the 8-dimensional model demonstrated a significantly better goodness of fit ($\chi^2 = 890, df = 33, p < 0.001$), with all 80 STPI test items displaying good fit. The Ax, Ag, and D scales all were significantly associated (r 's = 0.37 - 0.96). The C scales, were highly associated with each other ($r = 0.77$), but not significantly correlated with the other scales.

Conclusions: These results strongly indicate that all 8 STPI dimensions can be effectively measured in TBI patients, and support the validity of using the STPI with this population.

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S. HAN, D.C. DELIS, A.I. DRAKE, L.M. CESSANTE, A.J. JAK, W.S. HOUSTON, J. WINGO, J. FILOTEO & M.W. BONDI. Cognitive Discrepancy Patterns Following Traumatic Brain Injury Among Active Military Personnel.

Objective: To determine if active military personnel who have sustained a mild or moderate head injury display patterns of cognitive discrepancy between two opposing tasks or functions and whether such discrepancies, if present, differ by APOE genotype.

Participants and Methods: Fifty-one active military personnel who sustained a mild or moderate closed head injury were recruited for the present study from Balboa Naval Hospital or Camp Pendleton. Participants were administered a comprehensive battery of neuropsychological measures and consented to buccal swabbing for APOE genotype analysis approximately one month following injury treatment. Cognitive discrepancy was defined as a difference of at least one standard deviation or more between standardized scores of two opposing tasks.

Results: APOE genotype analysis yielded 15 $\epsilon 4$ carriers and 36 non- $\epsilon 4$ carriers in the present study. Using Fisher's exact test, a significantly greater number of cognitive discrepancies were observed in $\epsilon 4$ carriers as compared to non-carriers on a verbal processing measure vs. a visuospatial processing measure (Boston Naming Test vs. WASI Matrix Reasoning; $p < 0.05$) and between executive function measures of verbal vs. visuospatial ability (DKEFS Verbal Fluency Switching vs. Design Fluency Switching; $p < 0.05$).

Conclusions: Results support the utility of examining cognitive discrepancies in the assessment of neuropsychological sequelae following TBI and suggest that such patterns are modified by genetic factors. Findings also highlight the heterogeneity of cognitive changes following TBI and suggest that cognitive discrepancies are a sensitive method for capturing the subtle changes in cognition in this population.

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R.A. HANKS, S.R. MILLIS, J.H. RICKER, J. GIACINO, R. NAKESER-RICHARDSON, A. FROL, T. NOVACK, K. KALMAR, M. SHERER & W. GORDON. The Predictive Validity of a Brief Inpatient Neuropsychological Battery for Persons with Traumatic Brain Injury.

Objective: To examine the predictive validity of a brief neuropsychological test battery consisting of the Galveston Orientation and Amnesia Test, the California Verbal Learning Test – 2nd Edition, Trail Making Test, Symbol Digit Modalities Test, Grooved Pegboard, phonemic and categorical word generation tasks, the Wechsler Test of Adult Reading, and the Wisconsin Card Sorting Test-64 relative to functional outcome at one year in persons with traumatic brain injury (TBI).

Participants and Methods: 174 adults who met criteria for admission to an inpatient brain injury rehabilitation service at seven TBI Model Systems were enrolled in the study. Neuropsychological testing was conducted during the acute inpatient rehabilitation stay and functional outcome measures were obtained at 1 year outpatient follow-up.

Results: Multiple regression analyses revealed that the neuropsychological test battery was predictive of outcome at one year post-injury for the Disability Rating Scale, Supervisory Rating Scale (SRS), Functional Independence Measure total score, and the Extended Glasgow Outcome Scale. This battery was found to predict 1 year outcomes above and beyond functional variables and injury severity variables collected during inpatient rehabilitation, thereby indicating incremental validity for this test battery. Individual tests that were found to be significant predictors of 1 year outcomes included the WTAR and Trails B.

Conclusions: These findings support the clinical utility and ecological validity of this battery with respect to level of disability, functional independence, and supervision required

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M. HEINLY, K. GREVE & K. BIANCHINI. Language Dysfunction in Traumatic Brain Injury While Controlling for Effort and Severity.

Objective: The purpose of the present study is to examine the effect of traumatic brain injury on language impairment while controlling for effort and severity level. The instruments used to assess language functioning include: the WAIS-III Verbal Comprehension Index, Vocabulary, Similarities, Information, and Comprehension subtests; Auditory Comprehension subtest of the Cognistat; Boston Naming Test; Phonemic and Semantic cue conditions of the COWAT; WRAT-3 Reading subtest; and the Peabody Picture Vocabulary Test.

Participants and Methods: Data were collected from mild and moderate/severe TBI patients, stroke patients with unilateral left hemisphere lesions, and dementia patients seen for neuropsychological examination. The mild TBI patients were separated into Good effort and Poor effort groups based on their performance on the Portland Digit Recognition Test and the Test of Memory and Malingered. The performance of the different patient groups were compared on the language measures.

Results: Unilateral ANOVAs determined that the Poor effort mild TBI group consistently performed worse on language measures than the Good effort mild TBI group, and at the same level or worse than the moderate/severe TBI group, the stroke group, and the dementia group. To define impairment the 11 language measures above were condensed into seven measures, and it was determined that by chance no one should have three or more impaired scores (lower than 1.5 standard deviation below the normative mean) (Ingraham & Aiken, 1996). The Poor effort mTBI group had more patients with this defined impairment than all of the other groups, and the seven Good effort mTBI patients that could be defined as having an impairment were able to be diagnosed as malingering using Slick, Sherman, and Iverson's (1999) criteria, had psychometric evidence of exaggeration, or had scores consistent with premorbid levels.

Conclusions: These results support the use of effort measures in mild TBI to assist in explaining impaired scores on language measures.

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S.M. HOWARD. Individuals with Traumatic Brain Injury: Visual Impairments and Quality of Life.

Objective: While it is well documented that sensory impairment is a common consequence of traumatic brain injury (TBI), there is little research examining the relationship between sensory disruption and quality of life (QOL) (Dijkers, 2004; Davies, 2000).

Participants and Methods: A structured clinical interview that included questions about various sensory impairments experienced since TBI (Living Life After Traumatic Brain Injury), and a measure of overall quality of life (Life-3) were administered to 40 individuals (52% male, 48% female) with TBI of varying severity, up to six years post injury. This observational study investigated the relationships between self-reported visual, auditory, olfactory and gustatory impairments, and quality of life in adults living in the community with TBI.

Results: While participants endorsed other sensory impairments, only visual impairment was significantly related to QOL, $t(-2.69)$, $p=.01$. Study findings suggest that vision impairments (present in 41% of subjects) may be more closely related to quality of life after TBI than other types of sensory impairments (auditory 26%, olfactory 29%, and gustatory 17%) that were endorsed.

Conclusions: This study suggests a relationship between visual impairments and QOL in individuals with TBI. Future studies with a larger sample are necessary; to repeat these current findings, to further clarify the relationship between visual impairments and QOL, and to specify the types of visual impairments. Future findings may have implications for refinement of rehabilitation tools that would lead to better visual processing. This study also supports the need for neuro-ophthalmologic examinations and treatments for individuals who have experienced all levels of TBI trauma.

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A.L. JANOS, J. MIELKE, K.M. HEILMAN, M. PAGGI, P. WEI & J.W. TSAO. Comparison of Cognitive Testing Methods for the Detection of Blast-Related Traumatic Brain Injury.

Objective: The challenge of identifying an effective means of diagnosing mild traumatic brain injury (TBI) is receiving considerable attention, as blast injury is currently the signature mechanism of head injury in forces serving in Iraq and Afghanistan. Development of a more reliable screening method for subjects with mild TBI will contribute to improved diagnostic tools, for the increasing number of troops who present with subtle symptoms, and help to determine the effects of combat-related blast exposure on neurocognitive function. It is hypothesized that blast exposure will result in cognitive deficits, with severity of the blast force directly correlated with the degree of cognitive impairment. The purpose of this study is to compare the sensitivity and specificity of the most commonly used neurocognitive tests to the Military Acute Concussion Evaluation (MACE) in the diagnosis of blast injury to determine the best neurocognitive indicator of mild TBI.

Participants and Methods: Our cohort is comprised of Marines deployed to Iraq who will be tested for cognitive changes immediately following blast exposure/concussion and in the subsequent days during a recovery period if they have an abnormal screening score. The neuropsychological screening tests to be compared, including the Controlled Oral Word Association test (COWA), portions of the Automated Neuropsychological Assessment Metrics (ANAM), and Trail Making Tests A & B, mimic executive function batteries used in standard neuropsychological assessment that measure cognitive abilities such as processing speed, verbal fluency, sustained attention, learning and memory, and simple and complex attention.

Results: We will present interim data from these neurocognitive tests.

Conclusions: These results will support or disprove our hypothesis that adding additional screening tests to the MACE will improve sensitivity and specificity for detecting cognitive impairment in blast TBI.

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K. KALMAR, T.A. NOVACK, R. NAKASE-RICHARDSON, M. SHERER, A.B. FROL, W.A. GORDON, R.A. HANKS, J.T. GIACINO & J.H. RICKER. Feasibility of a Brief Neuropsychological Test Battery for Use During Acute Inpatient Rehabilitation After TBI.

Objective: To determine 1) if greater than 50% of patients in an acute rehabilitation setting can complete a battery of neuropsychological tests in less than 75 minutes one month after TBI regardless of post traumatic amnesia (PTA) status; 2) which tests are most likely to be completed; 3) the range of scores obtained.

Participants and Methods: Multi-center prospective observational design. 543 TBI Model Systems patients with moderate-to-severe injury were screened; 354 of these patients met criteria and were tested 14-42 days post injury. The percentage of patients able to complete the neuropsychological tests in less than 75 minutes was the main outcome measure.

Results: 218 (62%) patients completed the battery in 66 minutes on average. The mean interval from injury to testing was 28.3 days (SD=7.1). Tests completed with the highest frequency were California Verbal Learning Test-II, Controlled Oral Word Association (FAS) and Animal Naming. Performance was better ($p < .001$) on all measures for patients who had emerged from PTA.

Conclusions: Approximately two-thirds of screened patients were able to complete a brief neuropsychological test battery at one month post injury, regardless of PTA status. Although patients out of PTA performed better on all tests measured, confusion did not preclude participation in the test battery or mitigate assignment of test scores. Early neuropsychological assessment after injury may contribute to determination of severity of cognitive dysfunction which may facilitate prediction of later outcome, treatment planning and patient and family education.

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S. KASHLUBA, R.A. HANKS, J.E. CASEY & S.R. MILLIS. Neuropsychological and Functional Outcome after Complicated Mild Traumatic Brain Injury.

Objective: To investigate the extent to which neuropsychological and functional outcome after complicated mild traumatic brain injury (MTBI) parallels that of moderate traumatic brain injury (TBI) recovery.

Participants and Methods: A longitudinal study comparing neuropsychological performance and functional status after complicated MTBI versus moderate TBI at discharge from inpatient rehabilitation and at 1-year post-injury. Participants included 102 persons with complicated MTBI, each with an intracranial brain lesion documented via neuroimaging and a highest Glasgow Coma Scale (GCS) score in the Emergency Department between 13 and 15, and 127 persons with moderate TBI.

Results: Few differences in neuropsychological performance existed between the TBI groups. Less severely impaired information processing speed and verbal learning was demonstrated by the complicated MTBI group at rehabilitation discharge and 1-year post-injury. Despite overall improvement across cognitive domains within the complicated MTBI group, some degree of impairment remained at 1-year post-injury on those measures identified as impaired soon after injury. No differences on functional ability measures were found between the TBI groups at either time period post-injury, with both groups exhibiting incomplete recovery of functional status at the 1-year follow-up.

Conclusions: When classifying severity of TBI based on GCS scores, consideration of a moderate injury designation should be given to persons with an intracranial bleed and a GCS score between 13 and 15.

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M.A. KEISKI, D.L. SHORE & J.M. HAMILTON. Neurological Content Relevant to Traumatic Brain Injury (TBI) on the Personality Assessment Inventory (PAI).

Objective: The purpose of this study was to identify items on the PAI that potentially reflected plausible sequelae of TBI and to elucidate underlying constructs influencing endorsement of these items.

Participants and Methods: Subjects with invalid PAI profiles or suspect effort on neurocognitive measures were excluded from a consecutive series of referrals to a private practice, yielding 99 participants, of whom 61 had sustained mild TBI (mTBI) and 38 had sustained moderate to severe TBI (sTBI). Neurologically relevant items were selected via a rational-empirical method. The sum of scores on these items (i.e., Neuro-Item Sum) was computed to identify relevant correlates.

Results: Of 24 items selected by expert raters as plausibly representing sequelae of TBI, scores on 13 were found to discriminate between the sTBI group and the PAI normative sample. The Neuro-Item Sum was higher in mTBI than sTBI, but time since injury was unrelated to the sum. Computed correlations suggested a strong relationship between the Neuro-Item Sum and depression regardless of injury severity. However, the association between the Neuro-Item Sum and response bias was attenuated in the sTBI group relative to the mTBI group. In hierarchical regression analyses, DEP emerged as the only independent predictor of the Neuro-Item Sum for the sTBI group. In contrast, both NIM and DEP contributed significantly to the prediction of the Neuro-Item Sum for the mTBI group.

Conclusions: Although the employed rational-empirical items identified several PAI items with neurological content germane to TBI, item endorsement appeared multi-factorial in nature, with a potent contribution from depression.

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A.V. KING & I. KRYSPIN-EXNER. The Impact of Specific Attention Retraining after Traumatic Brain Injury.

Objective: A large-scale impact of a computerized cognitive training addressing four aspects of attention was studied in patients with traumatic brain injury. The research questions were as follows:

- 1) Is there an effect of specific attention training on aspects of attention which have been subject to training, and 2) on aspects of attention which have not been subject to training?
- 3) Does specific attention retraining lead to effects on daily functioning and emotional state?
- 4) Do effects remain stable for 12 weeks?

Participants and Methods: To eliminate confounding variables' influence performance changes of two experimental groups, which differed solely by the type of cognitive retraining, were compared: 30 patients were specifically trained in impaired attention domains and 20 patients received a non-specific training of various cognitive functions, both in form of 25 minutes lasting single sessions over a period of two weeks.

Results: One-Way-ANOVAs with subsequent Dunnett-t-Tests and reliable change indices were calculated to analyze performance changes. Results indicate that specific training led to a better performance in three attention domains, with training of alertness additionally enhancing quantitative performance in more complex attention aspects, whereas a difference in the change of daily functioning and emotional state was not found between the groups. Improvements were observed in single case analyses as well and mostly remained stable for 12 weeks.

Conclusions: The results corroborate the assumption of a hierarchic organization of attention functions, with intensity aspects of attention providing separable cognitive skills to performance in selectivity tasks, as well as the necessity of each component being trained specifically.

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R.T. LANGE, G.L. IVERSON, L.C. HOSHINO & M.D. FRANZEN. Influence of Sex on the Acute Neuropsychological Outcome from Traumatic Brain Injury.

Objective: Some researchers have reported that men tend to have worse outcome from traumatic brain injury (TBI) than women, although recent research on sport-related concussion suggests the opposite. The purpose of this study is to examine the effects of sex on the acute neuropsychological outcome from TBI.

Participants and Methods: Participants were selected from an archival database of 2,160 patients from the Allegheny General Hospital. Patients were excluded if they had a history of drug or alcohol abuse, psychiatric illness, or day-of-injury alcohol intoxication. Four groups were formed based on a careful matching procedure based on injury severity and sex [i.e., those with uncomplicated MTBIs (55 men and 55 women) and those with definite TBI (22 men and 22 women)]. Definite TBI was defined as those patients with complicated MTBI, moderate TBI, or severe TBI. Patients were carefully matched on mechanism of injury, demographic variables (e.g., age, education, and ethnicity), and injury severity characteristics (e.g., GCS, CT scans). All patients were assessed within 10 days post-injury on 11 cognitive measures.

Results: In the definite TBI group, men performed more poorly than women on three of the 11 cognitive measures ($p=.009$ to $p=.021$; Cohen's $d=.53$ to $.84$). When all measures were considered simultaneously, there was a higher percentage of men with multiple low scores compared to women (e.g., 5 or more low scores: men=27.3%, women=4.5%, $p=.039$). There were no obvious sex differences in the uncomplicated MTBI groups.

Conclusions: Sex differences were present in those with definite TBIs but not in those with uncomplicated MTBIs.

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J. LEON-CARRION, A. LEAL-CERRO, F. MURILLO-CABEZAS, A. MADRAZO-ATUTXA, S. GARCÍA-GÓMEZ, J. FLORES-CORDERO, A. SOTO-MORENO, M. RINCÓN-FERRARI & M. DOMÍNGUEZ-MORALES. Contribution of Growth Hormone Deficiency to Cognitive Deterioration in Patients with Traumatic Brain Injury: A Transdisciplinary Study.

Objective: Recent clinical studies have documented the occurrence of Growth Hormone (GH) dysfunction after Traumatic Brain Injury (TBI) in approximately 20% of patients. Signs and symptoms associated with GH deficits often mimic the cognitive and emotional sequelae of TBI, although it is not clear whether the cognitive deficits found in these patients are due to the consequences of the brain injury itself or are related to hypopituitary deficits. The primary objective of this study is to determine whether cognitive and behavioural disorders observed in patients with TBI are due to hormonal deficits or to the brain injury itself.

Participants and Methods: We studied 22 patients with severe TBI (GCS<8): 11 had isolated GH deficiency and 11 did not. We prepared detailed clinical reports and performed physical examinations, standard biochemical and full blood count analysis. Patients underwent a neuropsychological assessment and hormonal evaluation six months post-TBI.

Results: Using a transversal, between-group design, we found that TBI patients with GH deficiency show greater deficits in attention, executive functioning, memory and emotion than those without GH deficiency ($p < 0.001$).

Conclusions: Results show GH-related cognitive impairment in patients who develop GH deficiency after TBI and suggest that treatment of GH deficiency would improve cognition. These findings are important to better understand the nature, magnitude and meaning of GH-related cognitive impairment in patients who develop GH deficiency after TBI. These results also highlight the clinical importance of transdisciplinary work between neuropsychologists and endocrinologist, which provide patients with more effective treatment.

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C. LIOSSI, P. MOORJANI & P. WHITE. The effects of organic alexithymia after acquired brain injury on marital satisfaction.

Objective: To investigate factors that affect marital satisfaction after one spouse sustains a brain injury. Factors studied included levels of alexithymia, depression, and anxiety, dysexecutive problems, personality characteristics and coping strategies of the injured individual and their spouse.

Participants and Methods: Forty individuals who had sustained a brain injury and were currently in a relationship were matched to forty healthy coupled controls by gender, age, length of relationship and number of children. Both members of the marital dyad had to agree to participate in the study.

Results: Individuals with brain injury exhibited significantly more alexithymic characteristics and dysexecutive problems compared to controls. Spouses of brain injured individuals had significantly lower overall marital satisfaction compared to all other study participants. Extraversion, neuroticism and alexithymia explained most variance in overall marital satisfaction for brain injured couples. Extraversion, alexithymia and neuroticism also emerged as predictors of marital satisfaction in the healthy couples.

Conclusions: This study supports the existence of a link between organic alexithymia and brain injury and adds to evidence that emotional sequelae of brain injury persists in the long-term. Alexithymic characteristics either in the injured partner or in any of the healthy partners could be a potential barrier to the maintenance of a satisfactory relationship. Conversely, being extroverted could be a protective factor against relationship dissatisfaction. This study offers empirical evidence to the widely held belief that the processing and expression of emotions of partners is crucial for satisfying personal relationships.

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C.D. MARQUEZ DE LA PLATA, S. ASLAN, K. BAKHADIROV, J.Y. WANG, M.D. DEVOUS, C. MOORE, R. MCCOLL & R. DIAZ-ARRASTIA. Acute and Chronic Global White Matter Integrity as Biomarkers for Neurocognitive Outcome after DAI.

Objective: CT and structural MRI have shown limited utility in assisting with the prognosis of patients with diffuse axonal injury (DAI), as they are relatively insensitive to white matter lesions, and are only modestly correlated with outcome. Diffusion tensor imaging (DTI) has shown greater sensitivity to white matter lesions suggesting it may be a useful imaging tool for detecting DAI, and may be a useful biomarker for outcome.

Participants and Methods: Ten patients with DAI were age- and gender matched with twelve control subjects. Patients were scanned during the acute stage (≤ 9 days) followed by a rescan approximately six months later. Whole brain fractional anisotropy (WBFA) from both acute and chronic scans were evaluated to determine their correlation with neurocognitive outcomes six months post-TBI.

Results: The mean WBFA from patients' acute scans was not significantly different from controls; however, the WBFA for patients decreased significantly over time ($p = 0.001$) and their chronic WBFA was lower than the WBFA for controls ($p=0.002$). Measures of processing speed, learning and memory, and executive functioning were positively correlated with acute and chronic WBFA. Working memory and language fluency tasks were not significantly correlated with acute WBFA, but were correlated with chronic WBFA.

Conclusions: The results suggest WBFA decreases over the first few months post-TBI, and that acute and chronic measures of white matter integrity are correlated with neurocognitive outcome six months post-TBI. These findings confirm our hypothesis that chronic WBFA is more highly correlated with outcome than acute WBFA, but the latter can be a useful early biomarker for outcome.

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C.D. MARQUEZ DE LA PLATA, J.Y. WANG, K. BAKHADIROV, M.D. DEVOUS, C. MOORE, R. MCCOLL, C.M. CULLUM & R. DIAZ-ARRASTIA. Tractography as a Biomarker for Outcome after Traumatic Diffuse Axonal Injury.

Objective: Diffuse axonal injury (DAI) occurs when brain tissue of relatively lighter consistency is torn from more rigid tissue when exposed to linear or rotational deceleration forces. DAI often occurs in centroaxial white matter and subcortical connections to the hippocampus, and often have negative effects on neurocognitive functioning. This study examined the utility of diffusion tensor imaging (DTI) and associated fiber tractography as biomarkers for neurocognitive outcome six months post-injury.

Participants and Methods: Ten patients with DAI were scanned acutely (< 9 days post-injury) and compared with 12 age- and gender-matched controls. Tract-derived fiber parameters for three regions (corpus callosum (CC), fornix, and perforant pathway) were analyzed by conventional statistical techniques to explore their correlation with neurocognitive functions often affected by DAI. The primary neuroimaging parameters were fractional anisotropy (FA) and fiber count for the three tracts. Composite scores from a battery of neurocognitive tests measuring learning & memory (LM), processing speed, and executive functions six-months post-injury were used as primary outcome measures.

Results: Significant FA and fiber count differences were found between groups for the three structures of interest ($p<.05$). Additionally, all three neurocognitive composites were significantly correlated with FA in the perforant pathway and fornix; and the LM factor was correlated with FA and fiber count in the CC.

Conclusions: Fractional anisotropy of white matter structures derived from DTI fiber tractography in acute DAI can be used as a biomarker for outcome. Correspondence: *Carlos D. Marquez de la Plata, PhD, Neurology, University of Texas Southwestern Medical Center at Dallas, 5323 Harry Hines Blvd., Dallas, TX 75390-9036. E-mail: carlos.marquezdelaplata@utsouthwestern.edu*

M. MCKERRAL, J. LACHAPPELLE, J. BOLDDUC-TEASDALE & A. PITTIO. Deficits in Complex Visual Information Processing After Mild TBI: Electrophysiological Markers and Vocational Outcome Prognosis.

Objective: There is increasing evidence that milder forms of traumatic brain injury (MTBI) can result in persisting difficulties related to infor-

mation processing. However, the exact mechanisms involved and their relationship with global outcome remain unclear. The purpose of this study was to evaluate low-level to complex information processing using visual electrophysiology, and to examine the latter's prognostic value in regards to vocational outcome.

Participants and Methods: We recorded event-related potentials (ERPs) to pattern-reversal, simple motion, texture segregation, and cognitive oddball paradigms from 22 symptomatic mild ($n=17$) to moderate ($n=5$) subjects with TBI at onset of specialized clinical interventions, and from 15 normal controls. The outcome measure was return to work status (not known at time of testing/analysis): ability to return (all patients employed full time pre-injury) to active vocational life at end of treatment (searching for, studying for, or working 21 hours+ in gainful employment).

Results: Subjects with MTBI presented significantly ($p<0.05$ - $p<0.0005$) reduced amplitudes for cognitive ERPs, delayed latencies for texture and cognitive paradigms, and slower reaction times compared to controls. Furthermore, MTBI subjects who presented texture or cognitive ERP latency delays upon admission were at significantly greater risk of negative vocational outcome than patients with normal electrophysiology (OR=11.66; Likelihood ratio chi-square=6.74, $p=0.009$).

Conclusions: Our results indicate that individuals with symptomatic MTBI present selective deficits in complex visual information processing. The addition of complex ERPs - targeting not only the cognitive domain, but also visual integration processes - to clinical indices such as symptomatology is warranted in order to identify deficits that remain silent with other methods. Such ERP paradigms show promising potential for assessing global outcome prognosis, following cerebral recovery, and orienting treatment. Study supported by REPAR, FRSQ, NSERC. Correspondence: *Michelle McKerral, Ph.D., Department of Psychology, Université de Montreal, C.P. 6128, Succursale Centre-Ville, Montreal, QC H3C3J7, Canada. E-mail: michelle.mckerral@umontreal.ca*

J. MCWILLIAMS & M. SCHMITTER-EDGECOMBE. Access to Semantic Knowledge during Early Stage Recovery from Traumatic Brain Injury.

Objective: We used an object definitions test (ODT; Hodges et al, 1996) to examine semantic memory and the organization of semantic knowledge during the early stage of recovery from traumatic brain injury (TBI). **Participants and Methods:** Thirty-four moderate-to-severe TBI participants and 34 controls described six objects (three living, three non-living) as if they were describing them to someone who had never heard of or seen such things before. The verbal definitions were examined at a feature level and for whether they communicated the core concept (i.e., could a blind rater identify the object).

Results: Compared to the TBI group, the control group more frequently provided object definitions that communicated the core concept, $t(66) = -4.35$, $p < 0.001$, included superordinate category information, $t(66) = -3.07$, $p < 0.005$, and contained a smaller proportion of nonpurposeful information (e.g., judgments, intrusions), $t(66) = 3.13$, $p < .005$. Both groups produced more specific feature information about the objects than general feature information; and more physical specific feature information about living objects and associative specific feature information about nonliving objects. Overall, the TBI group produced a smaller proportion of physical specific features than controls, $t(66) = -2.09$, $p < .05$, and the production of less physical specific features was associated with lower production of the core concept ($r = .45$, $p = .007$).

Conclusions: The pattern of findings suggests decreased efficiency in accessing physical specific features following severe TBI, which influenced core concept production, despite intact organization of semantic knowledge.

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J.S. ORD, K.W. GREVE, K.J. BIANCHINI & L. AGUERREVER. Executive Dysfunction in Traumatic Brain Injury: The Effects of Injury Severity and Effort on the Wisconsin Card Sorting Test.

Objective: Executive dysfunction is often reported following traumatic brain injury (TBI); however, incentives to perform poorly can complicate the assessment of functional ability. This study examined the persistent effects of TBI on Wisconsin Card Sorting Test (WCST) performance while controlling for the effects of effort given during testing. In patient's providing good effort, deficits in executive function are expected to correlate with injury severity.

Participants and Methods: Participants were 54 good effort mild TBI cases, 35 poor effort mild TBI cases, and 39 good effort moderate-severe TBI cases seen for neuropsychological evaluation at least one year post injury. Effort given during testing was established using cutoffs from the Portland Digit Recognition Test. Dementia patients ($n = 68$) and healthy controls subjects ($n = 20$) were also included for comparison.

Results: A dose-response relationship was observed between TBI severity and deficits on the WCST in good effort patients. Mild TBI did not significantly impact WCST performance (Cohen's $d = .05$) and no significant increases in rates of impairment were observed relative to controls or Heaton et al. (1993) normative data. Moderate-to-severe TBI had a larger impact on WCST performance ($d = .28$) and caused significant increases in rates of impairment. Poor effort during testing showed the largest effect on WCST performance ($d = .66$) and produced the highest rates of measured impairment.

Conclusions: Deficits in executive function following TBI directly correlate with injury severity when the effects of effort are considered. Results from this study continue to demonstrate the need to consider effort during testing to accurately measure cognitive impairments following compensable injuries.

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K.F. PAGULAYAN, N. TEMKIN, J. MACHAMER & S. DIKMEN. The Relationship between Alcohol Use and Neuropsychological Functioning Following Traumatic Brain Injury.

Objective: To examine the relationship between alcohol consumption and neuropsychological functioning at one year post traumatic brain injury (TBI).

Participants and Methods: 68 individuals with complicated mild to severe TBI completed alcohol use questionnaires and neuropsychological measures (Trail Making Test, Performance IQ, Visual Reproduction, Selective Reminding Test) at 1 month and 1 year post-injury. All participants included in this study reported moderate to heavy alcohol consumption pre-injury; alcohol consumption at 1 year post injury was categorized as abstinent/light or moderate/heavy based on the Quantity-Frequency Index.

Results: Neuropsychological test scores improved significantly more between 1 month and 1 year post-injury for those who abstained from alcohol or consumed light amounts of alcohol compared to those who consumed moderate to heavy amounts of alcohol. However, comparison within time points revealed worse neuropsychological scores at both one month and one year in the abstinent/light group compared to the moderate/heavy alcohol consumption group. Further, there was a trend toward more severe injuries (longer time to follow commands) in the abstinent/light group.

Conclusions: Examination of change scores suggests that individuals who abstain or consume light amounts of alcohol following their injury have greater cognitive improvement over time, but closer examination reveals that this result is due to greater room to improve due to greater severity of injury and associated neuropsychological impairments. Examination of the impact of alcohol use on cognitive recovery is complex, and should not be limited to single time-point comparisons or difference scores, but needs to take into account pre-injury characteristics, injury severity, and post-injury experiences.

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J. POOLE, D. THOMANDER, T. SIM & H. LEW. Assessing Veterans with Mild Brain Trauma and Post Traumatic Stress: Can Neuropsychological Tests Distinguish Cognitive and Emotional Impairments?

Objective: We previously reported overlapping diagnoses of Cognitive Disorder and Post Traumatic Stress Disorder in combat veterans screening positive for mild traumatic brain injury (mTBI). We now examine whether neuropsychological tests can distinguish cognitive and emotional impairments in this population.

Participants and Methods: Subjects: 45 Iraq & Afghanistan veterans screened positive for mTBI, mostly after repeated blast exposure. Median age 26, educ 12, premorbid IQ est 98.

– Tests: Neuropsychological Assessment Battery - Screen (NAB-S), WAIS-III Processing Speed, Trails, Wisconsin Card Sort, Grooved Pegboard, Wechsler Adult Reading.

– Self-reports: Neurobehavioral Symptom Inventory-22, PTSD Check List, Beck Depression & Anxiety Inventories, Clinical Interview.

Results: Subjects showed mild to moderate deficits on measures of attention, memory, executive, speed and dexterity skills (group means = -0.5 to -1.5 SD). Most deficits were correlated with anxiety, post traumatic stress, depression ($r = -0.4$ to -0.5), and to a lesser extent, headaches and other somatic complaints ($r = -0.3$). However, deficits in executive working memory were largely uncorrelated with emotional and somatic distress, including the NAB-S Executive Index ($r = -0.1$), word generation, multitasking, digit reversal, and alternation tasks ($r = 0.0$ to -0.2).

Conclusions: These analyses suggest: (1) Mild cognitive deficits are common in veterans with mTBI and repeated blast exposure. (2) Most of these deficits are related to clinically significant emotional and somatic distress. (3) Some executive working memory measures may be sensitive to cognitive impairment, relatively independent of distress. If confirmed, such measures could prove valuable in diagnosing primary cognitive and/or emotional problems in this population. (4) A neurocognitive treatment approach is suggested for patients who have post-concussive plus post-traumatic symptoms, focusing on psychoeducation, reduction of hyper-arousal, and reorganization of executive skills. Correspondence: *John Poole, PhD, Defense & Veterans Brain Injury Center (117), VA Palo Alto Health Care System, 3801 Miranda Ave., Palo Alto, CA 94304. E-mail: john.poole@va.gov*

S. RASKIN. Cognitive Rehabilitation of Prospective Memory Using Structured Mental Rehearsal.

Objective: To determine whether a structured mental rehearsal paradigm can improve the length of successful prospective remembering in individuals with traumatic brain injury.

Participants and Methods: Ten individuals with traumatic brain injury were enrolled in this study. All participants were at least 18 years of age, had been in a motor vehicle accident and had no other neurologic or psychiatric history. All subjects demonstrated significantly impaired baseline functioning on the Memory for Intentions Screening Test (MIST). All participants were trained to use a mental rehearsal technique similar to verbal mediation. First subjects were asked to actually move as if completing the task, then subjects were asked to imagine completing the task in real time, finally subjects were asked to merely form a visual image of completing the task. Tasks to be completed were required within one hour of training. All tasks were time-based. Subjects were given two tasks to rehearse and/or complete in any one session.

Results: All subjects served as their own controls in a cross-over design. Five of the subjects were first given ten tasks to complete with no instruction and were then given the training in mental rehearsal before being asked to complete ten more tasks. The other five were first given

mental rehearsal training and then not given any instruction. All sessions were part of a longer treatment session and took place over six months. McNemars test for change indicated improvement in all tasks that followed the training as compared to baseline but no improvement in tasks that preceded training. In addition, significant improvement was seen in all subjects on the Memory for Intentions Screening Test at the completion of training compared to the baseline testing.

Conclusions: Mental rehearsal seems to improve prospective memory performance and may relate to focusing attention on the task or to making the task more automatic.

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L.M. RITTER, J. HANNAY & C. PEDROZA. Neuroanatomical Models of Impaired Awareness Following Traumatic Brain Injury: Do They Predict Neuropsychological Test Performance?

Objective: Determination of the neuroanatomic basis of impaired self-awareness (ISA) following traumatic brain injury (TBI) has proven challenging. Historically, ISA has been thought to originate in the frontal lobes, but more recent findings have suggested that ISA is a function of the number of cerebral brain lesions sustained. Evaluation of the ability of ISA, along with demographic and injury severity covariates, to predict performance on measures of executive function, prospective memory, focused and divided attention, and on a global cognitive functioning score might provide inferential data on the possible neuroanatomic location of this phenomenon.

Participants and Methods: At three months post-injury, 111 complicated mild, moderate, and severe TBI patients completed a neuropsychological evaluation and the Problem Checklist (PCL) Version 2.0 of the NYU Head Injury Family Interview. Measurement of ISA was obtained by assessing the agreement of ratings between the patient and significant other on the presence and severity of the neurobehavioral symptoms listed in the PCL. A series of linear regressions were conducted to determine the contribution of ISA in predicting performance on eight neuropsychological test variables and a global cognitive functioning score.

Results: The PCL global unawareness score was a significant predictor of WCST perseverative responses and Trails B performance. Results changed when the discrepancy score for Physical/Dependency subscale, the only measure of the PCL for which participants and SO ratings were significantly different, was used as the measure of ISA. The Physical/Dependency subscale was a predictor of WCST perseverative responses, Trails B performance, COWA total score, Rey-Osterrieth delayed recall, Digit Span Forward, and Trails A performance.

Conclusions: The collective findings of this study did not overwhelmingly support a regional or diffuse neuroanatomic basis of ISA but instead highlighted weaknesses in the measurement of ISA.

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A.M. SANDER, A.N. CLARK, R. NAKASE-RICHARDSON, M. SHERER, J.F. MALEC, L.C. DAVIS, M. MILLS & M.A. STRUCHEN. Family Functioning and Community Integration Following Traumatic Brain Injury.

Objective: To determine the contribution of family functioning to community integration outcomes after traumatic brain injury (TBI).

Participants and Methods: 144 persons with complicated mild/moderate or severe TBI and their caregivers at 1 of 3 participating centers were enrolled at the time of inpatient rehabilitation admission and followed up at 1 year after injury. The majority of subjects were male and White. One third had less than a high school education and 29% had annual household incomes of less than \$20,000. At 1 year after injury,

caregivers completed questionnaires, including the Family Assessment Device General Functioning Scale. The Community Integration Questionnaire (CIQ) and Craig Handicap Assessment and Reporting Technique (CHART) were completed regarding functioning of the person with injury.

Results: After accounting for age, injury severity, and income, family functioning accounted for a significant proportion of the variance in CIQ total score (R^2 change=.07, $F=5.39$, $p<.01$) and Home Integration scale score (R^2 change=.12, $F=14.97$, $p<.01$), with a trend for the Social Integration scale score (R^2 change=.03, $F=3.14$, $p=.08$). Lower income was related to poorer outcomes on the CIQ total score, CIQ Home Integration and Productivity scale scores, and CHART Social and Occupation scale scores. The interaction of income with family functioning was not significant for any outcome measure.

Conclusions: After accounting for age, injury severity, and income, unhealthy family functioning is associated with poorer community integration outcomes after TBI, specifically with regard to independence in the home and social activity. Family intervention may not only benefit caregivers, but may also result in improved functioning for the person with injury.

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K. SAWADA, Y. HASHIMOTO, M. MARUISHI, K. KONDO & S. SUZUKI. Cognitive factors related to compensatory behavior in patients with traumatic brain injury.

Objective: The purpose of this study is to examine the effects of cognitive factors related to compensatory behavior in patients with memory impairment following traumatic brain injury (TBI)

Participants and Methods: Participants comprised 45 Japanese patients with TBI. Cognitive factors (the belief of memory impairment, the belief of compensatory behavior, and self-efficacy); a number of compensatory behaviors; and quality of life (QOL) of the participants were measured. Participants were also subjected to neuropsychological tests (WAIS-R, WMS-R, and RBMT).

Results: No differences were detected between the scores of neuropsychological tests and the number of compensatory behaviors. To investigate the effects of cognitive factors, we divided the participants into low-score groups and high-score groups, based on their mean scores for the belief of compensatory behavior and for self-efficacy. Based on the results of two-factor factorial ANOVA, the intervention effects (the belief of compensatory behaviors \times self-efficacy) were significant for the number of compensatory behaviors ($p < .05$). In the high-score group for the belief of compensatory behaviors, the number of compensatory behaviors increased as compared to that in the high-score group for self-efficacy.

Conclusions: The results suggest that it may be possible to increase compensatory behavior by modifying cognitive factors and self-efficacy. Correspondence: *Kozue Sawada, Master, Hiroshima Higher Brain Function Center, Hiroshima Prefectural Rehabilitation Center, 295-3, Taguchi Saijo, Higashihiroshima 7390036, Japan. E-mail: sawadakoze@yahoo.co.jp*

J.J. SCHNEIDER, J. ROITZSCH, A. SELASSIE & W.D. GOUVIER. Etiology of Traumatic Brain Injury: Impact on Psychological Functioning.

Objective: Traumatic brain injury (TBI) due to violence has received more research focus in recent years, with numerous studies examining the impact of violent TBI on cognitive and psychosocial outcomes. However, few studies have examined psychological outcomes following violent TBI. The present study examined the prevalence of depressive and

anxious symptoms in individuals with TBI due to violence and other causes such as accidents and falls, hypothesizing the violence group would endorse more symptoms than the comparison group and etiology of injury would be a significant predictor of level of depressive and anxious symptoms.

Participants and Methods: Participants were obtained through the South Carolina Traumatic Brain Injury Follow-up Registry (SCTBIFR; Selassie et al., 2006). From this database, 180 individuals were identified as having TBI due to violence. A comparison sample, matched by income before injury, of individuals with TBI due to other causes ($n = 360$) was also collected. Symptoms of depression and anxiety were assessed using selected questions from telephone interviews completed approximately one year after hospital discharge.

Results: Exploratory factor analysis was used to extract dependent variables from the interview questions assessing depression and anxiety, yielding three factors: (1) Depression/Anxiety Symptoms, (2) Cognitive Symptoms, and (3) Fatigue/Loss of Energy. Results of multiple regression analyses indicated that etiology was not a significant predictor of psychological status, with no significant differences in endorsement of the dependent variables between individuals with TBI due to violence and other causes.

Conclusions: Based on the present findings, violent etiology does not appear to significantly influence level of depressive and anxious symptoms following TBI compared with other causes such as motor vehicle accidents and falls.

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C. SCHUTTE & R. HANKS. The impact of alcohol intoxication at time of injury on functional and cognitive variables one year post TBI.

Objective: The purpose of the present study was to examine the impact of alcohol intoxication on cognitive and functional variables at one year post injury in a sample of individuals who sustained TBI. It was expected that alcohol intoxication would have significant negative impacts on functional and cognitive variables sensitive to brain injury.

Participants and Methods: 452 individuals with a history of TBI and who were tested for blood alcohol level (BAL) in the ER were assessed as part of a comprehensive outpatient neuropsychological evaluation. BAL was categorized into no alcohol present or intoxicated (above .08 mg/dl). A logistic regression was completed based on an a-priori model with age, gender, history of TBI, time to follow commands in the ER, Functional Independence Measure (FIM) total score at one year, WAIS-III Digit Span forward, Symbol Digit Modalities Test written (SDMT), Rey Auditory Verbal Learning Test (ReyAVLT) delayed recall and Controlled Oral Word Association Test (COWAT) entered as covariates and BAL as the dependant variable.

Results: The overall regression model failed to reach statistical significance ($p > .05$). Additionally, none of the individual covariates were able to account for a statistically significant portion of the variance in the model. Counter to hypotheses, alcohol intoxication did not have a statistically significant impact on any variable measured in this research.

Conclusions: There is significant research in both human and animal models to suggest that alcohol intoxication has significant impacts on cognitive and functional outcomes after TBI, maybe even protective effects. This research suggests that intoxication does not have a significant effect on cognitive or functional variables at one year post injury. The unexpected null effects of alcohol intoxication at time of injury on outcome may have significant implications for both clinical work and research.

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A. SEPEHRI, R. NAKASE-RICHARDSON, C. EVANS & S.A. YABLON. Empirical Determination of Post-Traumatic Amnesia Duration Severity Classification Relative to One Year Outcome.

Objective: Duration of post-traumatic amnesia (PTA) has been widely investigated as a predictor of late outcome. Lezak reports mild, moderate, and severe injuries associated with time intervals less than 7 days. However, PTA durations of greater than 7 days are quite common in neurorehabilitation populations. To date, no study has derived a PTA severity schema anchored to late outcome. The purpose of this study is to empirically develop a PTA severity classification for individuals with greater TBI severity.

Participants and Methods: Sample included 346 TBI Model System participants with known durations of PTA during acute hospitalization and one-year outcome data (Disability Rating Scale, DRS; employment status). Sample was primarily male (69%), median age of 34, and motor vehicle collision as mechanism of injury (67%). For study purposes, PTA duration was divided into quartile ranges (G1= 0-17 days; G2=18-31; G3= 32-52; G4 =>53).

Results: Individuals with the shortest durations of PTA were less disabled ($F = 61$, $df = 3$; $p < .001$) and more likely to be productive at one-year post injury ($\chi^2 = 42$, $df = 3$; $p < .001$). No differences were found between G2 & G3 on both outcomes and G3 and G4 for DRS. A majority of individuals with PTA less than 17 days had favorable one-year outcome (58% return to work); whereas worse outcomes were associated with PTA greater than 53 days. Individuals with 18-52 days had similar DRS and employment outcomes.

Conclusions: An alternative classification schema (<17 days; 18-52 days; and >53 days) is proposed for individuals with greater TBI severity.

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R.L. SHERR, J.F. RATH, D.M. LANGENBAHN, D.R. LITKE, A. HRADIL, D.P. CASCIO, A.S. YI & L. DILLER. Treatment for Emotional Self-Regulation and Problem-Solving Deficits in Adults with Moderately to Severe Cognitive Deficits.

Objective: To present a research-based method for improving emotional self-regulation and problem-solving skills in neurorehabilitation outpatients with moderate to severe cognitive deficits. More impaired individuals present a greater challenge in regard to difficulties with emotional control and do not have the skills necessary for participation in problem-solving groups; as such, individualized training and one to one practice are necessary. This study demonstrates the efficacy of group treatment methods for individualized treatment of outpatients with mild to moderate cognitive deficits and is based on an earlier randomized clinical trial.

Participants and Methods: A series of case examples will be provided to illustrate the adaptation of previous group treatment protocol to an individualized program for more severely impaired participants. Rehabilitation of problem-solving deficits in persons with ABI must target both emotional self-regulation and clear thinking. Treatment methods include prompting participants to observe somatic, behavioral, cognitive, and emotional reactions; to report and analyze precursors to the problematic situation; to evaluate their overall outcome satisfaction; and to develop a revised plan of action via structured reframing process. Roleplay and verbal mediation are key elements in treatment with the use of repetition, structure, and breaking down tasks into smaller parts.

Results: Empirically-validated problem solving group treatment methods have been adapted to meet the needs of individuals with more severe cognitive impairments. Case examples illustrate improvements in the practice of problem-solving and related executive functioning ability.

Conclusions: This study introduces an empirically-driven neurorehabilitation approach in adapting group treatment for problem-solving deficits to meet the needs of individuals with more severe cognitive impairments.

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D. SHUM, M. BANKS, J. FLEMING & H. GILL. Performance of individuals with TBI on executive function tests and its relationship with psychosocial outcome.

Objective: Problems in executive function are commonly reported and observed after traumatic brain injury (TBI). This has been linked to damage to the prefrontal area resulting from TBI. In this study, we aimed to clarify the process(es) of executive function impaired in these individuals by using a number of tests. In addition, we aimed to ascertain if performance on these tests in these individuals is related to their everyday functioning or outcome.

Participants and Methods: The Wisconsin Card Sorting Test, Cognitive Estimate Test, and Tower of London (+-disk) were administered to 18 individuals with long-term moderate to severe TBI and 18 matched controls. Individuals with TBI were also asked to fill in the Sydney Psychosocial Reintegration Scale.

Results: Compared to the controls, individuals with TBI were found to perform significantly more poorly on measures of executive function. More interestingly, accuracy measure of a test of planning (viz., Tower of London) was found to correlate significantly with the outcome measure.

Conclusions: These results have implications for understanding the nature of executive function impairment after TBI. In addition, the results provide evidence to support the significance of executive function and its relationship with everyday living.

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T. SIM & J. POOLE. The Effects of Blast Exposure and Loss of Consciousness on the Cognitive Functioning of War Veterans.

Objective: There has been a growing interest in understanding the effects of traumatic exposure on the cognitive functioning of war veterans. To date, little is known about the association between the nature of cognitive deficits after mild head injury and the extent of cognitive deficits as a function of duration of loss of consciousness (LOC) and frequency of blast-related exposures. The purpose of this study is to identify neuropsychological correlates of war veterans with traumatic exposure who were referred to an outpatient polytrauma clinic for an initial evaluation.

Participants and Methods: Thirty-one outpatients were given the Neuropsychological Assessment Battery screening tests of attention, memory, language, spatial abilities, and executive function, Wechsler Adult Intelligence Scale-III measures of processing speed, and Wisconsin Card Sort Test.

Results: Preliminary results indicate that having a history of blast exposure is significantly associated with poorer performance on language, $b=21.64$, $p=.028$, and significance was trending on impairment of general cognitive functioning, $b=13.24$, $p=.089$. Having greater exposure to blasts is significantly correlated with memory problems, $b=4.47$, $p=.027$. Moreover, loss of consciousness during traumatic exposure is associated with poorer performance on tests of memory, $b=-9.26$, $p=.043$, and trending significance on problem-solving abilities, $b=-6.82$, $p=.053$. Longer duration of loss of consciousness was also related to poorer overall cognitive performance, $b=-5.68$, $p=.047$, with primary deficits in attention, $b=-7.58$, $p=.018$, memory, $b=-5.56$, $p=.043$, and problem solving skills, $b=-5.04$, $p=.033$.

Conclusions: These findings support previous literature that cognitive deficits are more pronounced among individuals who are exposed to more head injuries and who experienced a longer period of LOC.

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M.A. STRUCHEN, A.N. CLARK, A.M. SANDER, M.R. MILLS, G. EVANS & D. KURTZ. Executive Functioning, Social Communication, and Functional Outcome After Traumatic Brain Injury.

Objective: To investigate the relationship between executive functioning, social communication, and occupational and social integration for persons with traumatic brain injury (TBI).

Participants and Methods: 121 persons with TBI enrolled in a longitudinal study of outcomes during inpatient rehabilitation admission were followed up an average of 6 years post-injury (range 1 to 17 years). Mild, moderate, and severe TBI were all represented, with most having severe injury (Mean ER-GCS=6.7, SD=3.8). Executive functioning was assessed by the DKEFS Color-Word Interference Test and Sorting Test, Trail Making Test, COWA, and Script Analysis Measure. Social communication abilities were assessed by the La Trobe Communication Questionnaire and the Facial Affect and Conflicting Emotional Prosody subscales from the Florida Affect Battery. Outcomes were measured by the Craig Handicap Assessment and Reporting Technique- Short Form (CHART-SF) occupational and social integration subscales.

Results: After accounting for age, education, and executive functioning, measures of social communication accounted for a significant proportion of the variance in CHART-SF occupational scores (R^2 change=.06, $F(10,102)=4.56$, $p<.01$). Executive functioning performance accounted for 13.3% of the variance. Performance on social communication measures also added significantly to the variance in CHART-SF social integration scores (R^2 change=.08, $F(10,102)=3.47$, $p<.01$). Executive functioning performance accounted for 16% of the variance.

Conclusions: Executive functioning is known to be related to occupational outcomes; the current study showed that it is also related to social integration. This study is unique in demonstrating that social communication adds significantly to the variance in outcomes that is already accounted for by executive functioning. Social communication measures should be included as part of the neuropsychological evaluation.

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C. SULLIVAN, M. SWANSON, M. DAHDAH, R. SALERNO, K. SCHWAB, E. DATE & J. POOLE. DETERMINANTS OF POST-TRAUMATIC STRESS SYMPTOMS 5 OR MORE YEARS AFTER TRAUMATIC BRAIN INJURY.

Objective: Determine factors associated with long-term post-traumatic stress (PTS) symptoms, following traumatic brain injury (TBI).

Participants and Methods: Subjects were 76 veterans, 22 - 70 years old (median 41), who sustained moderate to severe TBI and received rehabilitation in our VA medical center. We conducted a telephone interview from the Centers for Disease Control plus assessments of post-traumatic stress 5 or more years post injury (median 10).

Results: 40% of patients reported intrusive thoughts or memories of a past traumatic event, with 17% describing these symptoms as disrupting their daily lives. Intrusive thoughts were associated with self-reported neurologic symptoms ($r=0.4$, $p<.001$), especially problems with equilibrium, hearing, mobility, pain, and fatigue. 75% reported a lifetime incidence of two or more head injuries with altered awareness or loss of consciousness (LOC). PTS symptoms increased with the number of head injuries without LOC ($r=0.2$, $p<.04$), but were unrelated to the number of injuries with LOC. Patients with PTSD symptoms reported lower quality of life ($r=-0.4$, $p<.001$) and were more likely to experience other emotional problems ($r=0.4$, $p<.001$).

Conclusions: A subset of patients with TBI struggle with symptoms of post-traumatic stress, including intrusive thoughts and memories many years post injury. The likelihood of PTS symptoms increases with re-

peated head injuries without LOC, consistent with prior research. Continuing neurologic symptoms may also trigger intrusive memories. The relationship of these symptoms to distress and decreased life satisfaction emphasizes the importance of understanding and treating PTS symptoms in this subset of TBI patients.

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L.S. TERRYBERRY-SPOHR & J.M. BURNFIELD. Interdisciplinary Management of Concussive Events in High School Athletes: The Importance of the Neuropsychologist in Detection and Monitoring of Concussive Injuries.

Objective: Repetitive sports-related concussions over short periods of time can lead to increased long-term cognitive and motor impairments. Highlighting this issue's importance, some high schools have implemented use of standardized neuropsychological assessments (e.g., ANAM) to help staff (athletic trainers, coaches, nurses) recognize and manage concussive events. This study examined whether interdisciplinary use of ANAM and involvement of a Neuropsychologist altered detection rate of concussive events in high school athletes. We hypothesized that ability to detect concussive events would improve with utilization of ANAM and would also improve in proportion to the involvement of a consulting Neuropsychologist.

Participants and Methods: Data from three previous football seasons were extracted from Madonna Rehabilitation Hospital's Nebraska Concussion Study database and analyzed for number of incidents/season. All schools used ANAM during at least one year. Frequency data regarding contact with the Neuropsychologist (e-mail, telephone, referrals) were compiled.

Results: The school that utilized the Neuropsychologist with greatest frequency while also using ANAM had a concussion detection rate of 16-19% across two seasons compared to the prior season when neither were utilized (3%). This sharply contrasts with schools that didn't seek professional consultation but did utilize ANAM (0-6%).

Conclusions: These data suggest that standardized assessment tools utilized in combination with neuropsychological consultation can assist with detection and subsequent monitoring of these injuries. Directions for future research and clinical work include understanding the level of expertise and training required to effectively utilize tools, comparisons of other measures of cognitive-motor efficiency in aiding detection, and methods to promote access to neuropsychological consultation.

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T. TSAOUSIDES, C.A. FILANOSKY & A. GINSBERG. Reliability and Validity of the Pittsburgh Sleep Quality Index in Individuals with Traumatic Brain Injury.

Objective: Sleep disturbance following TBI is an area of limited but growing research. Using psychometrically sound measures in this domain is fundamental. The objective of this study was to examine the reliability of the Pittsburgh Sleep Quality Index (PSQI) and its concurrent validity with other self-report sleep measures in individuals with TBI. The PSQI is the most widely used measure of sleep quality and has been validated on several populations, including individuals with TBI and insomnia (Carpenter & Andrykowski, 1998; Fichtenberg, Zafonte, Putnam, Mann, & Millard, 2001).

Participants and Methods: The PSQI, the BDI-II, and the Brain Injury Screening Questionnaire (BISQ) were administered to 223 individuals with TBI living in the community. Participants were included if they were 12-months post-injury and excluded if they had a history of non-traumatic BI.

Results: Good internal consistency was obtained for the Global PSQI Score ($\alpha=.75$), and for the PSQI Sleep Disturbance Score ($\alpha=.76$). PSQI Total and subscale scores correlated significantly with sleep-related items on the BDI-II ($r = .19$ to $r = .45$, $p < .01$) and the BISQ ($r = .34$ to $r = .64$, $p < .01$).

Conclusions: Reliability and validity of the PSQI in a TBI sample appear adequate. As a measure of self-reported sleep quality, the PSQI appears to be reliable for individuals with TBI. In addition, the measure corresponds well with other subjective reports of sleep disturbance, despite the limitations of self-report in this population.

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T.D. VANNORSALL, V. RAO, J.M. WINICKI, B. GORDON & D.J. SCHRETLEN. A Voxel-Based Morphometry Study of Neuroanatomic Abnormalities in Traumatic Brain Injury.

Objective: Moderate to severe traumatic brain injury (TBI) can result in focal changes in white matter and reduced total brain volumes. We previously presented data comparing 14 adults who sustained moderate to severe TBI to 28 healthy controls who were matched on age, sex, race, education, and premorbid intelligence. TBI survivors showed significantly reduced white matter (WM) volumes, total brain volumes, and ratios of WM to total intracranial volumes as well as WM atrophy-related declines in cognitive functioning.

Participants and Methods: In this study we compared these same subjects using voxel based morphometry (VBM), a whole-brain analysis that allows for the detection of specific areas of reduced of regional WM and grey matter (GM) volumes. Each subject underwent brain magnetic resonance imaging (MRI). We acquired contiguous 1.5mm T1-weighted 3D coronal images that were registered to a standard template, spatially normalized, and smoothed. Group differences in WM and GM volumes and associations between cognitive functioning and brain volumes were examined after adjusting for the ratio of GM-to-intracranial volumes.

Results: Using a false-discovery-rate correction of $p < 0.05$, TBI survivors displayed reduced WM volumes along WM tracts throughout the cerebrum ($t = 2.59$). GM volumes showed few differences between groups. Reduced WM volumes were associated with poorer cognitive functioning, particularly on tests of divided attention and psychomotor speed.

Conclusions: Taken together, data indicate that WM reductions following TBI are diffuse, occur in WM fiber tracts throughout the cerebrum, and are associated with poorer cognitive functioning on measures sensitive to TBI-related injury.

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I. WEBER-ORNSTEIN, C. SULLIVAN, M. DAHDAH, K. SCHWAB, E. DATE & J. POOLE. Long-Term Life Satisfaction after Traumatic Brain Injury: Relationship to Continuing Problems & Community Integration.

Objective: Prior studies of traumatic brain injury (TBI) outcomes have focused mainly on the initial 2 to 5 years of recovery. This study examined subjects' long-term satisfaction with life 5-15 years after TBI (median 10 yrs), and its relation to patients' ongoing problems and successes.

Participants and Methods: 75 mainly male veterans with moderate to severe TBI, previously treated on our inpatient rehabilitation unit, now age 22-70, completed a comprehensive telephone interview assessing functional impairments, life satisfaction, support systems, and community integration.

Results: Two-thirds of subjects viewed themselves as having a disability, with significant continuing problems in multiple areas: cognitive,

emotional, physical, interpersonal, vocational, and activities of daily living. Nonetheless, 70% of subjects reported favorable outcomes in overall quality of life: 40% viewed their life as better than before TBI, 30% felt no change, and 30% felt life was worse than before TBI. Similar percentages were obtained when subjects rated whether their current life is meaningful & satisfying. Patients' life satisfaction was related most strongly to employment, frequency of social interactions, and positive mood ($r = 0.6$ to 0.4) and, to a lesser extent, whether they complained of problems with cognitive or physical functioning ($r = 0.2$ to 0.3). Life satisfaction was unrelated to subjects' perception of their social supports (help available from others). However, life satisfaction was significantly related to the frequency of social interactions with friends, relatives and neighbors, both inside and outside the home and by telephone or email.

Conclusions: These findings highlight the possibility of experiencing positive quality of life in the long-term recovery from moderate to severe TBI. Although patients' life satisfaction is related to multiple factors, community integration (work and social relationships) may play a relatively larger role in life satisfaction than the presence or absence of specific deficits.

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E.S. WEISS & M.R. LOVELL. Recovery from Concussion in the Competitive Skier.

Objective: Downhill skiing is potentially a very dangerous sport which frequently results in mild traumatic brain injury. As in other high-risk sports, such as football, skiers often sustain differing degrees of head injuries. ImPACT, a computerized neurocognitive test battery that also contains a Post Concussion Symptom Scale evaluation (PCSS), has proven to be both a valid and reliable method of evaluating neurocognitive dysfunction of concussed athletes and has become a valuable tool in aiding neuropsychologists in making return-to-play advisements. The purpose of the present study is to investigate the post injury performance of skiers on ImPACT following sport-related concussion.

Participants and Methods: ImPACT was administered to 10 competitive U.S. skiers who had sustained concussions during competition or training, 5 of whom had baseline, pre-injury ImPACT data, and 6 of whom took ImPACT at time 2 (50% were male, and 50% were female). The mean age of the athletes was 20.7. Mean follow up 1 time was 4.5 days, and mean follow up time 2 was 13.7 days.

Results: ImPACT performance on neurocognitive subsections including visual memory, verbal memory, and reaction time showed a trend of decrease from baseline to time 1, and then of increase at time 2 after partial recovery. These results correlated with the subjects' report of symptoms on PCSS.

Conclusions: This data demonstrates the value of administering ImPACT to injured skiers. Immediately after sustaining a concussion, these athletes clearly experienced deficits in neurocognitive functioning, which correlated with the physical effects they were suffering from the injury. It is our belief that ImPACT is a vital aid to ski trainers in managing head injuries.

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N.J. WILDE & S.L. BARKER-COLLO. Compensatory Strategy Use and the Ecological Validity of Memory Tests Following TBI.

Objective: A fundamental question inherent in neuropsychological assessment is whether neuropsychological tests can reliably reflect day-to-day behaviour. One potential confound to this relationship is the use of strategies to compensate for cognitive difficulties, which may weaken the relationship between test performance and everyday skills. That is, an individual who has successfully implemented compensatory strate-

gies in daily life may still perform poorly on tests that do not allow the use of such strategies. The goal of the current study was to evaluate the ecological validity of a number of memory tests in relation to everyday memory performance and compensatory strategy use, in a sample of adults following traumatic brain injury (TBI).

Participants and Methods: Participants were 44 adults (37M, 7F) with moderate/severe TBI recruited from a rehabilitation facility. Neuropsychological memory tests included the CVLT, Logical Memory (LM) and Visual Paired Associates (VPA). Everyday memory performance and compensatory strategy use was assessed using the Memory in Everyday Life and Use of Aids and Strategies Questionnaire, as completed by both the patient and a clinician.

Results: As expected, performance on memory tests was significantly below normative means. Clinician-rated everyday memory was significantly related to test performance on all measures, while this was not the case for self-ratings. In contrast, self-rated strategy use (but not clinician ratings) was related to CVLT performance. Strategy use contributed significantly to the prediction of everyday memory, over and above the variance accounted for by memory test performance.

Conclusions: The data support the ecological validity of memory test performance in the prediction of memory in everyday life. Furthermore, the use of compensatory aids and strategies should be considered as another factor in the prediction of everyday memory difficulties.

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Paper Session 10

10:45 a.m.–12:15 p.m.

HIV/AIDS

M.L. ETTENHOFER, S. CASTELLON, M. WRIGHT, M. LAM, A. GOODING, J. JANG, R. DURVASULA & C. HINKIN. Aging, Neurocognition, and Medication Adherence in HIV Infection: A Latent Model Analysis.

Objective: Although a number of factors have been found to predict medication adherence in HIV, little is currently known about ways in which the utility of these predictors may vary by age. In this study, the possible moderating effects of age on relationships between neurocognitive functioning, health beliefs, and medication adherence were examined in HIV-positive individuals.

Participants and Methods: Data on neurocognitive functioning and health beliefs were collected from 431 HIV-infected participants. Adherence to antiretroviral medication was tracked prospectively for approximately 30 days using the MEMS caps electronic monitoring system and self-report. Structural Equation Modeling (SEM) was used to evaluate models of the variable relationships, with estimates obtained separately for younger individuals (age < 50; n=352) and older individuals (age ≥ 50; n=79).

Results: Neurocognitive functioning was significantly related to adherence for older participants ($r=.38$, $p<.05$), but not for younger participants ($r=.09$, $p>.05$). Executive functioning, the cognitive domain which had the strongest loading for both younger ($\beta=.84$, $p<.05$) and older participants ($\beta=.97$, $p<.05$), appears to account for much of this relationship. Cognition was also significantly related to health beliefs, albeit more strongly for older ($r=.41$, $p<.05$) than for younger participants ($r=.15$, $p<.05$). Health beliefs were strongly related to adherence in both younger ($r=.55$, $p<.05$) and older ($r=.57$, $p<.05$) participants.

Conclusions: These findings suggest that neurocognitive functioning is a potent predictor of medication adherence for HIV-infected individuals age 50 and over, but not for individuals under age 50. Therefore, individuals' ages should be considered carefully in research and clinical interventions related to medication adherence in HIV.

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T.L. JERNIGAN, S.L. ARCHIBALD, M.J. TAYLOR, S.P. WOODS, I. ABRAMSON, D. CLIFFORD, A. COLLIER, R.J. ELLIS, A.C. GAMST, B.B. GELMAN, R. HEATON, S. LETENDRE, T. MARCOTTE, C. MARRA, J.C. MCARTHUR, J.A. MCCUTCHEN, S. MORCELLO, D. SIMPSON & I. GRANT. White Matter Damage and Cortical Volume Loss Affect Different Cognitive and Motor Functions in HIV-infected Individuals.

Objective: Some HIV-seropositive (HIV+) individuals develop clinically significant cognitive impairment that in some cases progresses to dementia. The pattern of deficits observed is variable, but among the most prominent are motor and psychomotor slowing, attention and executive deficits, and inefficient learning. The neural basis for this heterogeneity is poorly understood.

Participants and Methods: Here we report findings in 267 HIV+ participants in a multi-site study. All participants were studied with neuropsychological and neuromedical assessments, and multi-spectral, structural MRI. Morphometric analyses yielded cranium size adjusted measures of extent of signal abnormality within cerebral white matter (AbWM) and of volume of the cerebral cortex.

Results: These 2 indices were only weakly correlated with each other ($R^2 = .02$); however both higher AbWM ($R^2 = .06$, $p < .0001$) and lower cortical volume ($R^2 = .08$, $p < .0001$) were significantly correlated with lower global neuropsychological performance (as indexed by a demographically-corrected T-score). Both measures of tissue damage remained significant in a model regressing the global T-score on both simultaneously (AbWM: $p < .0006$; cerebral cortex: $p < .0001$). Secondary regression analyses were then conducted to examine the relative contributions of these 2 measures in separate models predicting performance in different functional domains. Results suggest 3 patterns: 1) AbWM appears to contribute more strongly than cortical damage to working memory and executive function; 2) cortical damage contributes more strongly than AbWM to learning and memory performance; and 3) both measures make relatively equal contributions to motor and psychomotor speed.

Conclusions: These results suggest that severity of AbWM and low cortical volume are often dissociated in this population, and that some of the neuropsychological heterogeneity may be related to differences in the relative severity of these two forms of tissue abnormality.

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K.A. BOLDEN, J.J. CONLEY, R.H. PAUL, K. COOP, K. TASHIMA, T. FLANIGAN, C. GUTTMANN & D.F. TATE. Cognitive Performance and Medial Temporal Lobe Volumes in HIV+ Patients.

Objective: The relationship between cognitive performance and medial temporal lobe (MTL) structures has not been thoroughly examined in HIV+ patients. The objective of this study was to examine the volume of MTL structures (hippocampus, amygdala) in patients with worsening global cognitive function.

Participants and Methods: 39 HIV+ patients were recruited from a University Hospital HIV Clinic and cognitively examined using a battery of 19 tests sensitive to HIV+ associated cognitive deficits. MRI was obtained for each patient and automated quantitative measurements of the hippocampus and amygdala were accomplished using Freesurfer. Patients were divided into three groups based on impairment ratings de-

rived from cognitive data of 19 demographically matched controls. We used a one standard deviation below the mean cut off as our criterion for impairment. These groups included the following: patients impaired on at least one test (mild), impaired for two/three tests (moderate), impaired for > three tests (severe). The volumes were then examined for size differences using multivariate statistical tests.

Results: There were no significant differences between the three groups in volume for either of the two structures. Importantly, there were average reductions in the moderate and severe cognitive groups when compared to the mild cognitive group. This reduction was approximately 5% for the hippocampus and an 8% for the amygdala.

Conclusions: Our results demonstrate a reduction in hippocampal and amygdala volumes in patients experiencing the most cognitive difficulty. Though these differences did not reach the level of statistical significance, it will be important for future studies to examine the clinical significance associated with atrophy of MTL structures.

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E.M. MULLER-OEHRING, T. SCHULTE, A. PFEFFERBAUM & E.V. SULLIVAN. Effects of Alcohol and HIV-infection Comorbidity on Visual Feature and Conjunction Search: Relation to Corpus Callosum Integrity.

Objective: HIV infection and alcoholism are each associated with deficits in components of selective attention; those requiring visual search may be further compromised with disease comorbidity. We asked whether alcohol- and HIV-related microstructural alterations of the corpus callosum affect parallel or serial attentional processing mechanisms in visual feature and conjunction search.

Participants and Methods: Control ($n=26$), alcoholic (ALC, $n=29$), HIV-infected (HIV, $n=23$), and comorbid (H+A, $n=20$) participants performed a reaction time (RT) task, involving two visual loads (4 and 8 stimuli) in single feature color search (target=red tomato; foils=yellow tomatoes) and color-form conjunction search (target=red tomato; foils=yellow tomatoes and red or yellow strawberries); and two display types (ordered or dispersed) for conjunction stimuli.

Results: All groups had longer RTs to high than low visual loads in conjunction but not feature search. H+A had disproportionately longer RTs to high than low load in ordered conjunction search, indicating impairment in employing normal parallel processing mechanisms for target identification among perceptually ordered distractors. Callosal integrity, indexed as fractional anisotropy (FA) with diffusion tensor imaging, indicated that the patient groups had $-.44$ to -1.14 SD deficits in FA, with H+A showing the greatest abnormalities. Although overall RTs were longer in H+A than HIV and ALC, and the latter two had longer RTs than in controls, only in H+A did prolonged RTs in feature search correlate significantly with lower FA.

Conclusions: Thus, slowed visual search performance in HIV and alcoholism was exacerbated by disease comorbidity. Relationships with callosal compromise suggest involvement of cortical networks subserving parallel processing mechanisms of feature search.

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B.C. SCHWEINSBURG, J.J. JACOBUS, M.J. TAYLOR, T.B. HARRISON, R.J. THEILMANN, S.P. WOODS, S. LETENDRE, R.J. ELLIS, L.R. FRANK, D.R. FRANKLIN, R. HEATON, I. GRANT & T.L. JERNIGAN. Neurochemical Markers of Cellular Integrity Predict White Matter Anisotropy in HIV Infection.

Objective: Inflammation and excitotoxicity may represent distinct pathways to HIV-related brain injury; however, these pathways interact at

the molecular level. Inflammatory changes may be tightly coupled to altered axonal metabolism, leading to changes in white matter microstructure. In this study, we explored the relationship between in vivo neurochemical markers of phospholipid metabolism (CHO: choline compounds, increased during inflammation) and axonal metabolism (NAA: N-acetylaspartate, neuronal marker) to determine how they relate to white matter change across major fiber pathways.

Participants and Methods: Sixty-three HIV-infected individuals (age 41.5 ± 7.9 , education 13.4 ± 2.3 , 90% male, median CD4 nadir = 249, IQR [136, 350]) received spiral diffusion tensor imaging (DTI) with whole brain coverage (TE = 120 ms, TR = 6000 ms, 3.9 cubic mm voxels, b-value = 2416, 42 directions) and single voxel spectroscopy from frontal white matter (TE = 35 ms, TR = 3000 ms). DTI data were the main outcome measure and were subjected to tract based spatial analysis that identified shared fiber structure across the individuals in this study for voxelwise comparisons of FA.

Results: Multiple regression analysis revealed that the interaction between levels of NAA and CHO explained significant variance in fractional anisotropy above and beyond age, NAA, and CHO (all clusters Cohen's $D > .53$). The significant clusters ($p < .05$, $> 38 \mu\text{L}$) occupied fiber pathways that included anterior internal capsule, corpus callosum (genu, truncus, and splenium), anterior corona radiata, and fornix. The directionality of the results suggested a multiplicative decline in FA as CHO increased and NAA decreased.

Conclusions: The results showed a considerable decline in the microstructural integrity of white matter as levels of an inflammatory marker increased and an indicator of axonal integrity/metabolism decreased. Reduced FA could be due to membrane breakdown or axonal atrophy/loss that we believe is secondary to activated phospholipid metabolism.

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Symposium 12

10:45 a.m.–12:15 p.m.

The Clinical Application of Functional Neuroimaging

Chair: Robert Doss

R. DOSS, L. BAXTER, G. RISSE, S. SWANSON & S. BOOKHEIMER. The Clinical Application of Functional Neuroimaging.

Symposium Description: The last decade has seen a rapid increase in the development of high resolution functional neuroimaging techniques to address a wide range of cognitive/behavioral studies of the normal brain. The application of this technology to clinical decision making has been slow to follow. Functional neuroimaging is now being utilized by neuropsychologists in the clinical care of epilepsy and brain tumor patients who are undergoing presurgical evaluation. At present, functional MRI (fMRI) and Magnetic Source Imaging (MSI) are the primary procedures used for this purpose. Both fMRI and MSI now have CPT codes to facilitate reimbursement for these services. This symposium will review the current clinical uses of fMRI and MSI in epilepsy and brain tumor patients who are candidates for surgical intervention. Presentations will also address task development and implementation as well as the status of functional neuroimaging in other clinical populations. Finally, coding and reimbursement issues will be discussed.

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L. BAXTER. Mapping of “Eloquent” Cortex Using fMRI in Brain Tumor Patients.

Objective: Surgical resection is often the best treatment option for brain tumors. Functional MRI (fMRI) provides a noninvasive tool to assist with surgical planning for tumors in “eloquent” cortex, such as motor and language regions. Functional MRI can help determine surgical trajectory, the extent of resection, or other treatment options as well as provide the patient and the neurosurgeon additional information regarding potential risks/benefits of surgery. The purpose of this talk is to illustrate how fMRI procedures can be adapted for clinical use in patients with brain tumors and other lesions. Broad issues specific to clinical populations will be addressed including consideration of analysis approaches and integration of fMRI with other data sets (e.g., Diffusion Tensor Imaging). Emphasis will be made on the practical aspects of performing presurgical fMRI procedures (inclusion/exclusion issues, typical procedural flow, feedback) as well as technical information (scanner and stimulus presentation issues, neuronavigation and PACS integration). Case examples of brain tumor, AVM, and other lesions will be used to illustrate methodology and provide clinical examples.

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S. BOOKHEIMER. Developing Applications and New Populations for Clinical fMRI.

Objective: Functional MRI (fMRI) is currently approved for a single clinical use: preoperative planning of sensory, motor or language functions. However, there are emerging data on other clinical applications of fMRI and related imaging methodologies that may soon become accepted as clinical tools. This talk will review several of the most promising applications as well as clinical populations for fMRI. The technological advance of using Diffusion Tensor Imaging (DTI) in combination with fMRI for surgical planning is becoming more widespread. The most common approach is to identify functional brain regions with fMRI and use DTI tractography to identify the specific fiber tracts entering and exiting these functional regions. Such work can prevent the surgeon from creating disconnection syndromes that effectively isolate functional tissue. Optical Intrinsic Signal imaging (OIS) is another relatively new intraoperative approach based on cerebral hemodynamics that can measure both O₂ utilization and deoxyhemoglobin, and provides an alternative to intraoperative corticography. Functional imaging is increasingly becoming important in treating neuropsychiatric disorders. Transcranial Magnetic Stimulation (TMS), developed as a research tool to create temporary lesions, has become increasingly important as a treatment tool to arouse brain regions thought to be hypoactive. Recent applications include treatment of depression; movement disorders, and auditory hallucinations in schizophrenia. Functional MRI may contribute by identifying areas to focus on and evaluate treatment efficacy. Finally, the use of fMRI in Alzheimer's disease/MCI will be reviewed. These few examples demonstrate the breadth of clinical areas in which functional imaging will play a role in the next few years.

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G. RISSE. Clinical Application of MEG/MSI in the Presurgical Evaluation of Epilepsy Patients.

Objective: Magnetoencephalography (MEG)/magnetic source imaging (MSI) data is being used increasingly at epilepsy surgery centers to as-

sist with spike localization and functional mapping in patients undergoing preoperative diagnostic evaluations. This presentation will provide a brief introduction to the technique of MEG/MSI as well as a summary of validation studies demonstrating its effectiveness in clinical populations. These may include recent studies demonstrating the accuracy of localizing epileptogenic cortex, data on the concordance between language lateralization using the intracarotid sodium amytal procedure vs. MSI, and discussion of the specific language tasks that elicit both receptive and expressive language activation responses. Recent data on language outcome in epilepsy surgery patients who were evaluated with these techniques will also be included. Finally, actual cases will be briefly reviewed to demonstrate how the different aspects of MSI can contribute to an integrated diagnostic profile and ultimately a successful surgical outcome both in terms of seizure control as well as neuropsychological status.

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S. SWANSON. Clinical fMRI Task Development: Methodological Considerations.

Objective: Understanding the methodological issues involved in fMRI task development is critical for using fMRI responsibly as a clinical tool. To be clinically useful, fMRI activation protocols need to be reliable, sensitive to the function of interest, and specific with regard to the clinical predictions being made. The most common methodological limitation of previous language functional imaging studies has been the failure to incorporate a control or contrast task in the activation protocol that serves to minimize the effects of unwanted mental activity. Rest is known to be an active state during which self-initiated linguistic and semantic processes occur. This presentation will focus on a discussion of 1) limitations of using rest or fixation as a task contrast, 2) designing probe and control tasks that are theoretically selected to image the substrate of interest and include measures of behavioral performance, 3) varieties of language imaging tasks including event-related single trial designs, clustered acquisition techniques that allow patients to speak in the scanner, and task “panels” that include multiple language tasks, and 4) difficulties with developing memory tasks given that episodic encoding is ubiquitous even during control tasks and tasks designed to image recall and recognition. Rigorous task design will result in improved sensitivity, specificity and predictive value of the functional maps.

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Symposium 13

10:45 a.m.–12:15 p.m.

The Neuropsychological Basis of Written Language in Children

Chair: Stephen Hooper

S.R. HOOPER, J.M. FLETCHER, R.K. WAGNER, S.R. HOOPER & V.W. BERNINGER. The Neuropsychological Basis of Written Language in Children.

Symposium Description: Despite the complexities inherent in written language, research investigating this academic skill has lagged behind

work in reading. While the study of written language has begun to receive the attention of researchers over the past decade, there are still a plethora of questions that remain, particularly with respect to the neuropsychological basis of written language in children. In this regard, three federally funded transdisciplinary studies will be presented accompanied by an integrated discussion of the findings. First, Dr. Wagner and colleagues will present evidence showing what domain-specific writing variables separate older versus younger elementary school students. Dr. Wagner’s presentation will highlight not only key group differences, but discuss innovative evaluation strategies for writing components. Second, Dr. Hooper and colleagues will present neuropsychological data on a large sample of first grade students who are at-risk for problems in written expression when compared to their typically developing peers. Using the Simple View of Writing model, Dr. Hooper will show key differences on language, short-term memory, and attention/executive functions. Third, Dr. Berninger will report unique brain activation for three neuropsychological tasks shown previously to contribute to writing development, and how good and poor writers differ on these. Taken together, these three papers will provide new and innovative neuropsychological data in the study of written expression in children. Finally, an integrative discussion of all three studies will be provided by Dr. Jack Fletcher, with a particular focus on their implications for advancing the neuropsychological study of written language in children.

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R.K. WAGNER, C. PURANIK, B. FOORMAN, E. FOSTER & E. TSCHINKEL. Comparing Alternative Models of Underlying Dimensions of Written Language.

Objective: Writing is an enormously complex task that requires the coordinated execution of practically all of the major cognitive processes that have been studied to date. Progress in understanding the neuropsychology of childhood written language is likely to accelerate when the key underlying dimensions of individual and developmental differences in written composition have been identified.

Participants and Methods: Writing samples to both expository and narrative prompts were obtained from 187 first- and fourth-grade participants. Variables were generated from the writing samples using two approaches. The first was to code the writing samples using the Systematic Analysis of Language Transcripts (SALT). The second approach was to submit the writing samples to COH-METRIX, an analysis package that generates a wide variety of variables related to characteristics of individual words (e.g., frequency, concreteness) as well as the aspects of larger units of text (e.g., cohesion, readability).

Results: With SALT, most variables differentiated the first- and fourth-grade samples, with largest differences obtained for number of different words, total number of words, number of clauses and number of supporting arguments. With COH-METRIX, group differences were found for causal cohesion, number of sentences and words, words per sentence, sentences per paragraph, and Flesch-Kincaid readability. The variables obtained were used as indicators of latent variables in multi-level confirmatory factor analyses of underlying dimensions of writing, with levels representing t-units or sentences nested within writing samples.

Conclusions: Similarities and differences between best-fitting models at first and fourth grade will be discussed, and implications for neuropsychological investigations of children’s written language will be summarized.

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S.R. HOOPER, K.L. ANDERSON, D.C. YERBY & S.B. KNUTH. Neurocognitive Functioning of First Graders At-Risk for Problems in Written Expression.

Objective: This study describes initial findings from a longitudinal project examining the neurocognitive underpinnings of written expression in young elementary school children.

Participants and Methods: The sample included 102 first grade students from a single school district in North Carolina. The sample was divided into those deemed At-Risk ($n = 51$) for problems in written expression (WIAT-2 Written Expression Standard Score < 90) and a Typical Group ($n = 51$). The groups were similar with respect to gender, race, socioeconomic status, and educational experience, but the At-Risk Group was slightly older and had a lower IQ than the Typical Group. A battery of tasks was constructed to align with the Simple View of Writing theoretical model of writing development: fine-motor (PAL Sequential Finger Movements), linguistic (CTOPP Elision, PPVT-4, PAL Word Choice and Rapid Naming), short-term memory (WRAML-2 Picture Memory and Story Memory), working memory (WISC-IV Spatial Span, CTOPP Nonword Repetition), and attention/executive functions (WJ-III Planning and Verbal Retrieval, Vigil Auditory Attention). A brief measure of IQ (WASI) also was administered.

Results: Controlling for age and IQ, a series of MANCOVAs revealed significant differences between the groups on linguistic, short-term memory, working memory, and attention/executive functions. Effect sizes ranged from moderate for PAL Orthographic Word Choice ($d = .47$) to large for CTOPP Elision ($d = .94$). No group differences were evidenced in the fine-motor functions.

Conclusions: These findings provide support for components of the Simple View of Writing and underscore the importance of employing neurocognitive tasks in the assessment of children at-risk for problems in writing.

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V.W. BERNINGER, T.L. RICHARDS, P. STOCK, L. ALTEMEIER & P. TRIVED. Brain Differences of 5th Graders with and without Writing Disabilities on fMRI Handwriting, Orthographic Coding, and Finger Succession Tasks.

Objective: fMRI brain imaging tasks that are analogues of behavioral measures previously shown to explain unique variance in writing skills were studied.

Participants and Methods: Participants were 12 good writers and 8 poor writers (all were right handed and metal-free). The Handwriting Contrast identified unique brain activation for familiar a (circle with vertical line on right) versus novel (circle with line under it) letter forms with component strokes held constant. The Orthographic Coding Contrast identified unique brain activation for analyzing letters in written word in working memory. The Finger Succession Contrast identified unique brain activation unique for planning sequential finger movements.

Results: Novel letter form activated all the same regions as familiar letter form (left superior frontal, precentral, postcentral, inferior parietal, and bilateral cerebellar) plus additional ones. On Handwriting Contrast, good and poor writers differed in left motor and right parietal cortex on group map but in left fusiform in individual analyses, showing that handwriting is both a motor and orthographic task. Good and poor writers differed significantly in left posterior cingulate on the Orthographic Contrast, showing that executive functions may impair orthographic coding. On the Finger Succession Contrast, good and poor writers differed robustly in BOLD activation in nine frontal regions plus cingulate, five parietal, six temporal, four occipital, five cerebellar and other regions, showing that the hand activates widely dispersed neural networks for language, executive functions, timing, and working memory.

Conclusions: Good and poor writers differed in brain activation that was specific to the task contrast studied.

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Poster Session 11: Dementia

11:00 a.m.–12:30 p.m.

Dementia Alzheimer's Disease

C. BACK-MADRUGA, K.B. BOONE, S. MCPHERSON, K. KIM & J. CUMMINGS. Executive Variant Alzheimer's Disease: Further Evidence of a Subtype.

Objective: The present study evaluated whether an executive subtype of Alzheimer's disease (AD) could be identified statistically from a large neuropsychological data base of mild AD patients using a clustering approach.

Participants and Methods: Neuropsychological test data and demographic information from 217 patients meeting the NINCDS-ADRDA diagnostic criteria for probable or possible AD were utilized in the current investigation. In order to examine patients in the mild stage of the illness, all patients had MMSE scores of 20 or greater.

Results: A two-step cluster analysis was performed using Schwarz's BIC on log-likelihood distance measures on the neuropsychological test variables. Two clusters were observed. Cluster 1 (54%) evidenced severe executive dysfunction with nearly as severe memory impairment and generally moderate deficits in mental speed, language, and visual-spatial-constructional skills. Cluster 2 (46%) had marked to severe memory dysfunction with accompanying moderate executive deficits, mild impairment in select language skills, and normal performance in visual-spatial-constructional skills and processing speed. The two clusters were fairly similar in age (± 2 years), educational level (± 1 year), and MMSE scores (± 2 points).

Conclusions: The results of the present study provide support for the presence of an executive variant of AD with disproportionate executive dysfunction in the early stage of the illness. Findings further suggest that this subgroup is not uncommon, occurring in fully half of our large archival sample. Even in those remaining subjects with a primary memory disturbance, executive dysfunction was more prominent than deficits observed in language, visual-spatial-constructional skills, and mental speed. Historically, investigations of AD have focused on memory impairment; current findings suggest that the prominence of executive dysfunction in this disorder has been underappreciated.

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S. BAYAN, G. DANCEL, A. SCOTT & J. RAZANI. The Relationship between the CVLT-II Short Form and Functional Ability in Patients with Dementia.

Objective: The California Verbal Learning Test (CVLT) is a widely used assessment tool for predicting the extent of verbal memory. The purpose of this study was to examine the relationship between the CVLT-II Short Form (CVLT-II SF) and daily functional ability in patients with dementia.

Participants and Methods: Daily functioning was assessed using the Direct Assessment of Functional Status (DAFS). The DAFS measures seven areas of functioning, including orientation, communication skills, financial management, shopping ability, and ability to identify driving signs and rules. The CVLT-II SF requires participants to learn and recall a list of 9 words belonging to 3 distinct categories. Sixty-five patients with Alzheimer's disease and vascular dementia were administered the CVLT-II SF and DAFS.

Results: Correlation analyses revealed that the CVLT-II SF total learning trials and the cued recall measure correlated with all of the DAFS domains. Free delay scores correlated with all DAFS subscales, with the exception of the transportation domain. Interestingly, semantic and serial clustering were not related to any of the assessed functional abilities. Stepwise regression analyses revealed that total learning was the best predictor for all of the DAFS measures, with the exception of the shopping task. The DAFS shopping task was best predicted by the free delay recall CVLT outcome measure.

Conclusions: The results of the present study suggest strong relationships between CVLT-II SF and functional abilities. Moreover, CVLT-II SF predicts specific aspects of daily functioning, such as poor cued recall leading to the inability to carry out shopping tasks effectively.

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B.M. BETTCHER, T. GIOVANNETTI, L. MACMULLEN & D.J. LIBON. Correction of Everyday Action Errors in Dementia: Time Frames and Neuropsychological Correlates.

Objective: Efficient error correction remains an important concern for people with dementia, as it may impact one's ability to safely live alone. Various forms of error correction have been described in the literature, including microsips and overt corrections. This study purports to isolate the relative frequency of microsips versus overt error corrections in dementia patients and determine the neuropsychological correlates of correction time frames.

Participants and Methods: Fifty-three participants were administered a neuropsychological protocol and the Naturalistic Action Test. The number of corrected errors were summed and further classified according to their time frames of completion. Microsips were coded if an error was terminated before completion. Immediate corrections were coded when an overt error was corrected directly after the error. Delayed corrections were coded when an overt error was corrected after an intermediary action. Correlations between error correction variables and neuropsychological tests of general cognitive capacity, executive functioning, and episodic memory were performed.

Results: Dementia participants corrected only 25% of errors on everyday tasks ($SD = 19$). Patients showed a higher proportion of Microsips than Delayed Corrections ($z = 2.20, p = .03$). Microsips were significantly related to naming ($r_s = .31, p = .03$) and a measure of executive/visuoconstructional abilities ($r_s = .29, p = .04$). By contrast, Delayed Corrections were significantly related to an executive measure of generative abilities ($r_s = .32, p = .03$). Immediate Corrections were not significantly related to neuropsychological measures.

Conclusions: When dementia participants corrected their errors, they were more likely to engage in rapid than delayed corrections. Correlation analyses further suggest that everyday error correction may be a multidimensional process, with rapid and delayed corrections dependent upon distinct cognitive operations.

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V. BHARADIA & H. TUOKKO. Predicting Alzheimer's Disease (AD) from Mild Cognitive Impairment (MCI): Are Our Biological and Neuropsychological Tools Up to the Task?

Objective: A critical review of the current state of biomarker and cogmarker research in MCI with respect to the diagnosis and prediction of AD.

Participants and Methods: Search criteria were used to retrieve longitudinal studies of biomarkers and cogmarkers of MCI published from 1996-2006. Data was summarised and critiqued on the basis of MCI definition, biological and cognitive markers measured, and main findings.

Results: Markers in structural, functional imaging, genetic, cerebrospinal fluid, blood and cognitive domains were reviewed. The most promising markers appear to be the cerebrospinal fluid and structural markers, with cognitive data remaining the gold standard for assessment of MCI or AD.

Conclusions: The available longitudinal data do not currently support the use of any biological marker in isolation or combination to classify MCI, or predict and diagnose AD. Authors have recently published opinions to the contrary and have recommended a redefinition of AD diagnostic criteria to include biological markers. In this view, AD would be diagnosed before clinical symptoms occur based on these biomarkers; this perspective may also advocate the use of dementia medications at this non-symptomatic stage. This review does not support this conclusion, and maintains that clinical impression based on cognitive data and informant information remain the gold standard for MCI and AD classification and risk assessment at this time. Biological markers may one day play a vital role in this area of clinical practice, however at this point are useful only as supporting evidence of cognitive decline in MCI and AD.

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L. BRENNAN, T. GIOVANNETTI, D.J. LIBON, B. MAGOUIRK BETTCHER, K. DUEY & D. WAMBACH. To Cue or Not to Cue: The Influence of Cues on Everyday Action Performance in Dementia.

Objective: Written notes are often suggested as a cueing strategy for improving everyday functioning in dementia patients. This study directly examined the effect a written goal cue, designed to serve as a reminder of task objectives, on everyday action performance in people with dementia.

Participants and Methods: Fifty-three participants were administered the Naturalistic Action Test (NAT), which requires performance of 3 everyday tasks. Twenty-six participants were administered the NAT without cues (NO-CUE GROUP), and 27 were administered the NAT with written cues present on the tabletop throughout the duration of the tasks (CUE GROUP). The groups were matched on MMSE ($M=22.04$ for both groups). Overall level of impairment and total errors were collected, and distributions of errors types (omissions & commission subtypes - sequence, perseveration, etc.) were calculated.

Results: The groups did not differ in overall level of impairment or total errors; all participants were mild to moderately impaired relative to normative data. However, the groups demonstrated significantly different distributions of omission versus commission errors ($\chi^2 = 10.46, p < .01$). The CUE GROUP made significantly fewer omissions versus commissions (32% vs. 68%), whereas the NO-CUE GROUP showed a more even distribution of omissions and commissions (44% vs. 56%). The groups also differed in their distribution of commission subtypes ($\chi^2 = 18.2, p < .01$), with the CUE GROUP showing more perseverations and fewer spatial and quality errors than the NO-CUE GROUP (perseverations - 20% vs. 11%; spatial/quality - 5% vs. 15%).

Conclusions: Cues did not influence overall level of performance across groups; however, cues did influence the pattern of errors observed in everyday action performance in dementia. Thus, caregivers and clinicians should consider the task, task context, and potential consequences of various performance patterns when determining whether or not to implement written reminder cues for everyday tasks.

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O. BRUNA, S. GALLEGO, N. CULLELL, R. GÓMEZ, A. DERGHAM, R. CUEVAS & J. SUBIRANA. Clinical and Social Factors Related to Burden on Relatives of Patients with Dementia.

Objective: This study pretended to detect the needs that relatives of patients with dementia have and also to know how they conciliate their work with their familiar everyday life in order to articulate interventions and measures to improve the health and the wellbeing of this population.

Participants and Methods: The sample was composed by 44 caregivers of patients with dementia older than 65 years. We administrated a sociodemographic questionnaire, and scales that measured burden on caregivers (Zarit Scale), depression (BDI), anxiety (BAI), wellbeing (WHOQOL-BREF) and social adaptation (SASS). The sample of patients with dementia was composed by 44 subjects and we administrated tests to evaluate basic and instrumental daily life activities and degree of neuropsychological impairment (MMSE).

Results: Patients with dementia showed a profile with a moderate (28%) and a low (52%) level of dependence and a certain degree of neuropsychological impairment (MEC=19.6). Caregivers presented a high level of burden and anxiety, moderate levels of depression and social adaptation as well as they felt their wellbeing being affected. There were a significant correlation between levels of burden and anxiety ($r=.331$, $p=.042$) as well as between anxiety and their health global perception ($r=.492$, $p=.002$). Burden levels are higher in the group of relatives who are still work-related ($p=.032$) and in relatives who take care of their own parents ($p=.007$).

Conclusions: The results of the study showed the importance of considering the burden on relatives who do take care of patients with dementia as well as the problems that they have in the relation of work and family in order to design specific programs of attention according their needs that allow them to improve their health and wellbeing.

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S.P. CERCY. Heterogeneity of Olfactory Processing in Early-Onset Familial Alzheimer Disease Due to Presenilin-1 Mutation.

Objective: To describe olfactory processing variability in patients with early-onset familial Alzheimer disease (AD) associated with identical presenilin-1 (PS-1) mutations.

Participants and Methods: Two AD patients with the Gly206Ala PS-1 mutation and one non-AD control were administered the University of Pennsylvania Smell Identification Test (UPSIT). Participants were of Caribbean-Hispanic ethnicity. On the MMSE, AD patient 1 (age 61) scored 22/30, and AD patient 2 (age 58) scored 17/30; the control (age 57) scored 28/30. Age- and gender-specific standard errors of measurement (SEM) and corresponding 90% and 95% confidence intervals (CI) were determined using UPSIT normative data.

Results: On the UPSIT, AD patient 1 scored 24/40, AD patient 2 scored 31/40, and the control scored 32/40. Within the 55–59 and 60–64 age ranges, SEM for men in the UPSIT normative sample was 2.023 and 2.218, respectively. Relative to the normative sample, AD patient 1 showed dysnosmia (95% CI = 30.39–38.33); olfaction in AD patient 2 and the control was normal (95% CI = 28.10–36.80). Across participants, performance overlapped slightly at the 95% confidence level. However, at the 90% confidence level, olfaction in AD patient 1 (90% CI = 20.35–27.65) was worse than AD patient 2 (90% CI = 27.67–34.33) and the control (90% CI = 28.67–35.33).

Conclusions: Olfaction varies considerably across confirmed AD patients, including individuals affected by the same PS-1 mutation, and may be preserved in some patients at least through the middle stages of progression. These data provide further evidence for substantial heterogeneity in the clinical presentation of AD.

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D. CLARK & R. GRIFFITH. Brain Glucose Metabolism is Associated with Everyday Functional Activities in Patients with Mild Cognitive Impairment and Patients with Alzheimer's Disease.

Objective: Glucose metabolic abnormalities involving the temporal and parietal lobes occur in patients with Alzheimer's disease (AD) and patients with mild cognitive impairment (MCI). Metabolic abnormalities are associated with cognitive impairments in these patients; however it is unclear if metabolic disturbances are also associated with changes in activities of daily living (ADLs). We examined the association of resting PET scans with a rating scale of ADLs in both AD and MCI patients.

Participants and Methods: Fifty-four AD patients, 125 MCI patients, and 81 healthy older adults underwent resting brain PET scans. Participants completed the MMSE and the Functional Activities Questionnaire (FAQ), an informant-based rating of IADLs. Multiple regressions were computed for controls + MCI and MCI + AD using the MMSE and FAQ to predict PET signal intensity. Voxel clusters for which F exceeded 6.64 ($p<0.005$) were identified.

Results: Regression in controls and MCI patients showed that FAQ scores predicted voxel intensity in the midline parietal region, accounting for 8.3% of the variance. Regression in MCI and AD patients showed that FAQ scores predicted voxel intensity in the midline parietal, orbitofrontal, medial thalamic and temporo-parietal regions, accounting for 10.5% of the variance.

Conclusions: Ratings of everyday activities predicted brain PET metabolism in AD and MCI, after accounting for cognition using the MMSE. This suggests that abnormalities of medial parietal regions result in a decline in ADLs in MCI and that abnormalities of other brain regions (especially orbitofrontal cortex) contribute to worsening ADL function in AD. Longitudinal study of the correlation between daily functioning and brain metabolic changes would likely be informative.

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S.A. CREAMER, J. RILEY & M. SCHMITTER-EDGECOMBE. Narrative Comprehension in Alzheimer's Disease: Assessing Inferences and Memory Operations with a Think-aloud Procedure.

Objective: To gain a better understanding of text comprehension abilities in Alzheimer's disease (AD), a think-aloud method was used to examine what information (from the prior text and world knowledge) is consciously available in working memory during narrative comprehension.

Participants and Methods: Twelve participants with AD and 20 healthy older adults talked aloud after they read each sentence of story narratives. Factual and inferential questions about each narrative were also answered. Participant's utterances were coded for the production of inferential and non-inferential clauses and the memory operations that supported inferential clause production (Trabasso & Magliano, 1996).

Results: Analyses revealed that the AD and control groups produced a comparable number of clauses, that inferences dominated narrative comprehension, and that both groups produced more explanatory inferences than predictive or associative inferences. Despite these qualitative similarities, the AD group generated proportionately fewer explanatory in-

ferences, $t = 2.10$, $p > .05$, relied less on prior text, t 's > 3.23 , p 's $< .005$, and more on world knowledge, t 's > -2.33 , p 's $< .05$, as a memory source for the production of both explanatory and predictive inferences, and answered fewer inferential and factual questions about the text correctly, t 's > 5.14 , p 's $> .001$.

Conclusions: The pattern of findings suggests that when comprehending text the AD participants have poorer access to prior text information and focus more on the focal sentence rather than on integrating the focal sentence with the larger discourse context. This is consistent with the notion that AD patients impaired episodic memory abilities contribute to their impaired comprehension.

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E. DA PENA, T.H. GOLLAN, R.I. MONTOYA & D.P. SALMON. The Limited Role of Inhibitory Control in Bilingual Language Production: Evidence from Alzheimer's Disease (AD).

Objective: Patients with AD have executive control dysfunction (Perry & Hodges, 1999) which could impair their ability to control activation of the nontarget language during verbal fluency (Green, 1998), and to switch languages when naming pictures. If so, bilinguals with AD might produce more cross-language intrusions, and might not benefit from the option to use either language to name pictures (Gollan et al., 2007).

Participants and Methods: We compared 14 bilinguals with AD and 14 proficiency-matched controls on production of within and between language errors in letter and category fluency (taken from 1 to 16 years of annual testing at the UCSD Alzheimer's Disease Research Center). Participants also completed the Boston Naming Test (BNT) in English and Spanish.

Results: Bilinguals with AD produced significantly more within language intrusions (8%) and perseverations (19%) than matched controls (5% and 9% respectively). However, bilinguals with and without AD produced the same rate of cross language intrusions (1%), and both patients and controls named 5% more pictures when given credit for producing a name in either language thereby demonstrating a significant benefit of use of both languages during testing.

Conclusions: Bilinguals with AD can prevent cross-language intrusions and benefit from dual-language testing. These results suggest that dominant-language fluency production, and the use of two languages in the same testing session, place limited demands on bilingual control. Patients' reduced ability to prevent within language errors may reflect the relatively greater demands on control mechanisms, or reduced memory function (for perseverations) and degraded semantic representations (for intrusions; Salmon et al., 1999).

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G.M. DANCEL, N. DAFEEBOINI, T. HANEY & J. RAZANI. Performance of Alzheimer's Disease Patients on Individual Subscales of the Direct Assessment of Functional Status.

Objective: The purpose of this study was to examine specific domains of daily functioning using an observation-based measure, the Direct Assessment of Functional Status (DAFS) test, in patients with Alzheimer's disease (AD).

Participants and Methods: The study consisted of 48 mild to moderate AD patients. The Direct Assessment of Functional Status was administered to all participants. The DAFS measures various areas of functioning, including patient's orientation, communication skills, financial management, shopping ability, and the ability to identify driving signs and rules (referred to as the Transportation subscale).

Results: Percentage correct response was calculated for each of the DAFS functional domains. A repeated measures ANOVA revealed an overall significant difference between the performance of Alzheimer patients on

the DAFS subscales, Wilk's Lambda $F(4,44) = 46.38$, $p < .001$. Fisher LSD pairwise comparisons further indicate patients performed best on the DAFS Transportation subscale relative to all other DAFS functional domains and worst on the Shopping task compared to all other DAFS subscales. There were no statistical differences between the Orientation, Financial, and Communication subscales of the DAFS for these patients.

Conclusions: The results of this study are consistent with the deficits observed in AD patients on cognitive tasks. That is, AD patients generally perform best on tasks that draw upon long-term memory such as those needed for driving and worse on tests of short-term memory, such as learning and recalling a shopping list.

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S. DAVID, L.M. ERCOLI, P. SIDDARTH, S.T. CHEN, K. MILLER, S.C. HUANG, M.E. PHELPS & G.W. SMALL. Prediction of cerebral metabolic decline in persons with a family history of Alzheimer's disease.

Objective: A preliminary study to determine if additional risk factors (e.g., density of affected relatives with Alzheimer's disease (AD), apolipoprotein epsilon-4 [APOE- ϵ 4], female sex, and age) increase the risk of brain metabolic decline over two years in nondemented older persons with a family history of AD.

Participants and Methods: We recruited 20 right-handed, healthy older adults. Eleven persons had < 2 relatives with AD (Low Density; LD) and nine persons had > 2 relatives with AD (High Density; HD). Cerebral glucose metabolism was determined using positron emission tomography and [F-18] fluorodeoxyglucose at baseline and after two years. Regions of interest included dorsolateral prefrontal cortex (DLPFC), posterior cingulate, inferior parietal, medial, superior and inferior temporal cortices, and global metabolism was also assessed.

Results: Repeated measures analyses revealed that decline in DLPFC metabolism was significantly associated with HD family history ($p < .05$); decline in temporal regions was associated with male gender ($p < .05$); and having at least one APOE- ϵ 4 allele was associated with global metabolic decline ($p < .001$).

Conclusions: These preliminary findings support previous reports that a family history of AD is a risk factor for metabolic decline in nondemented older adults. Having HD family history predicted DLPFC metabolic decline. Men showed metabolic decline in the inferior temporal region. APOE- ϵ 4 is a significant risk factor for metabolic change globally in the brain. Limitations include a small sample size that prevented examination of interaction effects.

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K.A. DUEY, A.C. LYON, T. GIOVANNETTI, D.J. LIBON, B. MACOUIRK BETTCHER, L. BRENNAN & A. CHOPRA. Aricept (donepezil) Reduces Everyday Action Errors in Alzheimer's Disease but Does Not Improve Error Monitoring.

Objective: Aricept is the most frequently prescribed medication for the treatment of mild/moderate Alzheimer's disease (AD). In an earlier study we demonstrated that Aricept improved everyday action performance in AD. This study evaluated whether this improvement could be explained by changes in everyday action error detection and correction.

Participants and Methods: Twelve participants (MMSE = 22.0, SD = 1.9) were videotaped while they completed the Naturalistic Action Test (NAT). Total errors and the proportion of errors that were detected or corrected were coded. The NAT was administered at baseline (Time 1; no medication), after 4-6 weeks on 5mg of Aricept (Time 2), and after an additional 4-6 weeks on 10 mg of Aricept (Time 3).

Results: Consistent with prior studies, there was a trend for participants to make fewer errors at Time 2 compared to Time 1 (15.67 vs. 12.03; $z = 1.73$, $p = .08$), but error rates did not differ between Time 2 and Time 3. The proportion of errors that were detected was consistently low/impaired and did not change across the 3 time points (Time 1 = 24%, Time 2 = 29%, Time 3 = 26%). The same pattern of findings was observed for the proportion of error corrected (Time 1 = 26%, Time 2 = 21%, Time 3 = 24%).

Conclusions: Consistent with prior reports, Aricept modestly reduced everyday action errors after 4 weeks of 5mg; however, further improvement from a higher dose (10 mg) was not observed. Aricept showed no influence on error detection and correction abilities. Thus, the impact of Aricept on everyday functioning cannot be attributed to improved error monitoring. Future studies should evaluate whether patients taking Aricept show further improvement in functional abilities when trained on behavioral strategies that target error-monitoring deficits.

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D.L. FLORES, L. MEDINA, Y. RODRIGUEZ, D. GESCHWIND, B. SCHAFFER, J. FITTEN, F. ORTIZ, J. CUMMINGS & J. RINGMAN. Premorbid Psychiatric Abnormalities Are Not Common in Presymptomatic Familial Alzheimer's Disease Gene Carriers.

Objective: Psychiatric symptoms may precede overt cognitive impairment in Alzheimer's disease (AD). Persons carrying mutations causing familial AD (FAD) provide the opportunity to study these changes during the presymptomatic phase. The goal of this study is to measure pre-morbid psychiatric state using various instruments in this population.

Participants and Methods: Subjects were 26 non-demented persons (21 female) at-risk for familial AD due to PS1 ($n = 22$) or APP ($n = 4$) mutations. Subjects underwent evaluation with self-rated scales (BDI, BAI, CESD), interview-based assessments (CDR, HAM-A, STAR-D, SCID), and the informant-based Neuropsychiatric Inventory (NPI). Scores were compared between mutation carriers (MCs) and non-carriers (NCs) by t-tests. Frequency of Axis-I diagnoses were compared between MCs and NCs by chi-square.

Results: Sixteen subjects were MCs and 10 NCs. Five MCs had CDR scores of 0.5 and the remainder had CDR scores of 0. There were no differences between groups in age, gender, or MMSE scores. MCs had higher total NPI scores (5.7 vs. 1.5, $p = 0.046$). When MCs with CDR scores of 0.5 were excluded, total NPI scores did not differ between the groups. Scores on self-rated scales and frequency of Axis-I diagnoses on the SCID did not differ between MCs and NCs.

Conclusions: Though the power of our study was limited, we did not find major psychiatric changes in presymptomatic FAD mutation carriers. Informant-based tools like the NPI may be more sensitive in this population though changes in the NPI were not evident until a mild degree of cognitive impairment was present.

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A.I. FORD, M. LAI, K. SIMMONS, C. PERSAD, J. MILLER, J. HEIDBRINK, L. NYQUIST, R. ALBIN, K. FEGAN & B. GIORDANI. Usefulness of a Telephone Screening for Identifying Cognitive Decline: Retrospective Analysis of Autopsy-Confirmed Cases of Alzheimer's Disease.

Objective: Identify longitudinal score trends of a telephone-based neuropsychological assessment that could be used as an early screen for Alzheimer's disease (AD).

Participants and Methods: Participants were 35 non-demented volunteers from a larger longitudinal study of aging and cognition (mean

age was 73.85 at entry). Annually (up to 8 years), they completed the AHEAD, a 42-point screen of cognitive functioning, and self-report memory questions. Seventeen participants died and donated their brains for scientific study. Autopsy found 9 with AD pathology and 8 with no dementia pathology. AD participants were compared with 3 control groups: (a) autopsy-confirmed no dementia; (b) living, never scored below AHEAD clinical cutoff; (c) living, scored at or above average on an in-clinic neuropsychological test battery.

Results: MANCOVA, controlling for years in study, found that by year four, AHEAD total scores were significantly different between AD and control groups ($p = 0.002$). The AD group also differed from control groups in: last AHEAD score ($p = 0.001$), change in AHEAD score ($p = 0.029$), last immediate memory score ($p = 0.049$), last delayed memory score (DMS; $p = 0.001$), change in DMS ($p = 0.000$), and mean present memory self-rating ($p = 0.023$). Orientation, simple attention and word definitions inconsistently discriminated between groups. Personal information, naming, and working memory scores were not significantly different.

Conclusions: After four years of screening, the AD group could be differentiated. Delayed memory testing appears to be the most important domain for early screening but participants' memory self-rating may also be an important component.

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D.D. GARRETT, H. TUOKKO & S.W. MACDONALD. Proximity to Death and Cause of Death Relate Differentially to Dementia Status.

Objective: Although demented older adults are typically at increased risk of mortality relative to those with no cognitive impairment (NCI), it remains unclear whether differences in time to death exist across dementia subtypes, and whether specific causes of death resulting from chronic conditions relate to dementia status over and above time to death.

Participants and Methods: Employing population-based data spanning three five-year waves from the Canadian Study of Health and Aging ($N = 327$; mean age at death = 87.40 years), we examined the impact of age at death, sex, education, time to death, and cause of death (cardiovascular, cerebrovascular, or non-CVD-related causes) on dementia diagnosis (NCI, Alzheimer's disease (AD), vascular dementia (VaD), or other dementia (OD)). All data were analyzed using hierarchical generalized linear modeling.

Results: Results revealed that: 1) all dementia subtypes were in closer proximity to death than was the NCI group; 2) all dementia subtypes were in equal proximity to death, and; 3) cause of death distinguished reliably between dementia status groups in all models tested. Those who died of cerebrovascular causes were most often VaD, and those who died of non-CVD were most often OD. Notably, despite substantial extant evidence for pathological similarities between AD and VaD, we found that those who died of cerebrovascular causes were two to three times as likely VaD as AD.

Conclusions: Overall, our findings suggest that regardless of subtype, demented older adults are in closer proximity to death, and that cause of death resulting from chronic conditions represents an important source of variance when differentiating dementia status groups.

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R. GRIFFITH, O. OKONKWO, J. DEN HOLLANDER, K. BELUE, S. LANZA, L. HARRELL, J. BROCKINGTON, D. CLARK & D. MARSON. Brain Metabolic Correlates of Decisional Abilities in Patients with Amnesic Mild Cognitive Impairment.

Objective: Persons with amnesic mild cognitive impairment (MCI) are thought to have normal instrumental activities of daily life (IADLs),

although recent investigations have challenged this assumption by demonstrating subtle impairments in IADLs. We previously reported that patients with MCI show mild impairments in medical decision-making capacity (MDC). The purpose of this investigation was to examine the relationship between brain metabolism as measured by proton magnetic resonance spectroscopy (MRS) and impaired MDC in MCI.

Participants and Methods: 33 MCI patients and 51 older controls underwent MRS of the posterior cingulate gyrus and completed the Capacity to Consent to Treatment Instrument (CCTI), a vignette-based instrument measuring MDC using decisional standards of expressing choice, appreciating consequences of choice, providing rational reasons for choice, and understanding treatment choices. Controls were compared with MCI patients on MRS ratios of N-acetylaspartate (NAA)/Creatine (Cr), Choline (Cho)/Cr, and myo-Inositol (mI)/Cr, as well as performance on the CCTI standards.

Results: MCI patients showed a trend towards higher mI/Cr compared to controls ($p = 0.057$). MCI patients showed lower performance on CCTI standards of providing rational reasons and understanding (p 's < 0.01) and a trend towards lower scores on appreciating consequences ($p = 0.066$). Performance on the rational reasons standard was positively correlated with NAA/Cr ($r = 0.45$, $p = 0.009$).

Conclusions: The correlation of posterior cingulate NAA/Cr with the CCTI reasoning standard in MCI suggests a role for posterior cortical pathology in early declines in decisional abilities involving reasoning about treatment choices. Further study into the brain metabolic correlates of IADLs in MCI and early AD appears warranted.

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A. HAYASHI, K. SUZUKI & E. MORI. The Relationship Between Writing Disorders and Linguistic Deficits in Japanese Alzheimer's Disease.

Objective: This study was conducted to examine the relationships between patterns of writing disorders and linguistic impairments in patients with probable Alzheimer's disease (AD).

Participants and Methods: Twenty-four patients performed writing and other linguistic tasks which were consisted of (1) writing 55 Kanji words, (2) meaning of Kanji words, (3) proverb comprehension, (4) lexical knowledge (on/kun reading in Kanji), (5) verbal fluency (categorical/phonological), (6) recall of Kanji character (a part of Kanji/phonology of Kanji were presented), and 7) form decision of Kanji and Kana characters.

We classified five patterns of writing errors in writing Kanji words task as follows: a) phonologically plausible error, b) lexical error, c) cued error (when the parts of a Kanji character were given, they could write the whole kanji character), d) incomplete writing error, and e) impossible writing error. The partial correlations between these patterns and the scores of the tasks were analyzed after controlling for age, sex, education and score of MMSE as confounding variables.

Results: There were significant correlations between all patterns of writing impairments and lexical knowledge. However all the classified writing errors were not correlated with verbal fluency. Significant correlations between phonologically plausible/lexical error and proverb comprehension and between lexical error and recall of Kanji character were noted. There were also significant partial correlation between incomplete writing error and form decision, between incomplete/impossible writing error and recall of Kanji character, and between impossible writing error and meaning of Kanji words.

Conclusions: It is suggested that writing disorders in AD patients relate to deficits in lexical knowledge (on/kun reading in Kanji). Each writing error may be correlated with the specified deficits in linguistic function. Correspondence: *Atsuko Hayashi, Doctor, Graduate School of Medicine, Tohoku University, 2-1 Seiryu-machi, Aoba-ku, Sendai 980-8575, Japan. E-mail: ahayashi@mail.tains.tohoku.ac.jp*

L. HEMMY, M.A. KUSKOWSKI, J.R. MCCARTEN, S.J. ROTTUNDA & S.E. MCPHERSON. Educational Attainment and Rate of Decline in Alzheimer's Disease.

Objective: Alzheimer's disease (AD) progression and hypotheses of the cognitive reserve theory were investigated by testing for a relation between education and rate of decline in patients with Mild Cognitive Impairment, possible AD, probable AD, and other progressive neurodegenerative dementias. The cognitive reserve theory proposes that individuals with more formal education (likely representing a variety of individual difference variables) have an increased capacity to cope with AD pathology before showing clinical symptoms. Once diagnosed, they have expended this reserve capacity and decline at a steeper rate due to a higher pathology burden in the brain. Thus, more formal education should be associated with a steeper rate of decline in patients with AD. This process also implies an accelerating decline, because the slope for these patients captures both a period of delay in clinical symptoms, and relatively steeper decline once diagnosed.

Participants and Methods: Patient data ($n = 726$) were acquired from a clinical database at the Minneapolis VAMC GRECC Memory Loss Clinic. Clinical disease progression was assessed with a measure of global cognition (Mini-Mental State Exam) and functional ability (Cognitive Performance Test).

Results: Analyses using mixed effect regression models found education was significantly related to an accelerated (curvilinear) rate of decline in global cognition (MMSE: $p = .003$) and a steeper linear rate of decline in functional ability (CPT: $p = .005$) for patients with probable AD.

Conclusions: These results suggest a curvilinear cognitive decline and a linear functional decline in AD. They are also consistent with previously reported findings and support predictions of the cognitive reserve theory.

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J.D. HUMPHREYS, J. RIGGINS, G. SCHRIMSHER, P.B. SUTKER & S.E. O'BRYANT. Cognitive Predictors of Impairment in Specific Functional Domains Among Individuals with Dementia.

Objective: The Clinical Dementia Rating scale (CDR) is a clinician-rated instrument used for staging dementia severity based on impairment in functional domains. The purpose of the current study was to determine whether impairment in specific cognitive domains could predict CDR domain scores.

Participants and Methods: Data from 101 individuals (42 males and 59 females) evaluated in a memory disorders clinic and given a diagnosis of dementia were examined. The sample's mean age and education were 75.6 (SD = 6.0) and 13.3 (SD = 3.5) years, respectively. Data examined included CDR domain scores and scores on the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS).

Results: Six regression equations were analyzed with the five index scores of the RBANS (e.g. Immediate Memory, Visuospatial/Constructional, Language, Attention, and Delayed Memory) entered as predictors of individual CDR domain scores. Immediate Memory and Language scores significantly predicted scores on the CDR memory ($R = .65$, $p < .01$) and judgment and problem solving ($R = .59$, $p < .01$) domains. No RBANS index scores were significantly predictive of scores on the CDR orientation domain. Language scores significantly predicted CDR community affairs ($R = .50$, $p < .01$), home and hobbies ($R = .49$, $p < .01$), and personal care ($R = .44$, $p < .01$) domain scores.

Conclusions: Immediate memory impairment was strongly predictive of functioning in memory and problem solving domains, while language impairment was significantly related to functional impairment in all CDR domains except orientation. Clinical implications of these results are explored.

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T. HYDE, K. PATTERSON & K. NIELSON. Dementia Detection Using a Brief Computer Administered Visual Memory Task.

Objective: Research has demonstrated that visual memory testing is extraordinarily sensitive to early dementia. To date no prospective studies have demonstrated adequate differential diagnostic validity within a naturalistic population. This study examined the diagnostic utility of a brief computer administered visual memory procedure designed specifically for use within geriatric settings, the Visuospatial Learning and Retention Test (VLRT).

Participants and Methods: Participants were a continuous sample of new referrals for dementia diagnosis to the neuropsychology, neurology, and geriatric medicine clinics at the Milwaukee VA Medical Center. Participants underwent standard diagnostic examination and were classified into three diagnostic categories: neurologically intact clinical controls ($n = 23$), Vascular Dementia ($n = 19$), and Dementia of the Alzheimer Type ($n = 20$). Depression and anxiety were examined as independent variables across diagnostic conditions. Nondecisional patients and patients not fitting into one of the three categories listed above were excluded. In addition, 29 neurologically intact non-psychiatric non-substance abusing geriatric controls were recruited from a geriatric primary care outpatient clinic.

Results: Discriminant analyses were made between performance on the VLRT and on the Brief Visuospatial Memory Test Revised (BVMTR; Benedict, 1997), an established test of visuoconstructive learning and recall.

Conclusions: Results indicated that the VLRT has excellent construct and predictive validity, and is less sensitive to the effects of demographic and psychiatric variables than the BVMTR. Both dementia detection and differential diagnostic utility were found to be comparable to the BVMTR. Using the two instruments synergistically produced a dramatic increase in diagnostic classification over the use of either individually. Correspondence: *Trevor Hyde, Ph.D., Regional Parkinson Center at ASMC, 2921 S Logan Ave, Milwaukee, WI 53207. E-mail: thyde01@tds.net*

E. JOHNS, N.A. PHILLIPS, S. BELLEVILLE, D. GOUPIL, L. BABBINS, N. KELNER, B. SKA, B. GILBERT, G. INGLIS, F. MASSOUD, M. PANISSET, C. DE BOYSSON & H. CHERTKOW. Disproportionate Deficits in Inhibitory Control: Profile of Executive Functioning in Mild Cognitive Impairment.

Objective: Mild cognitive impairment (MCI) is often a transitional stage between normal aging and Alzheimer's disease (AD), and recent studies have reported deficits in non-memory cognitive domains in MCI. A thorough categorization of cognitive functioning in MCI may lead to improved early diagnosis and treatment of AD. The goal of the present study was to examine executive functioning in MCI across multiple domains.

Participants and Methods: Together with the Quebec Consortium on Cognition and Aging, we recruited 40 MCI patients and 35 normal elderly controls (NECs) to be tested on 6 measures of executive functioning across the following domains: working memory (Brown-Peterson Task and Letter-Number Sequencing), inhibitory control (Stroop and Hayling test), verbal fluency (phonemic and semantic), and planning (Tower of London).

Results: Preliminary analyses (NEC, $N = 21$) using separate ANOVAs and correcting for multiple comparisons revealed that MCI patients performed significantly worse than NECs in all 4 domains. 98% of MCI patients exhibited a deficit (greater than 1.5 SD below the NEC mean) in at least one domain of executive functioning. Inhibitory control was the domain with the greatest frequency and degree of impairment, followed by planning, fluency, and working memory. However, the average degree of impairment only exceeded -1.5 SD for inhibitory control and planning. Performance of MCI patients was also compared to published normative data, which produced a different profile of impairment, but still indicated that inhibitory control was most affected.

Conclusions: These results indicate that executive dysfunction is common in MCI, particularly in the domain of inhibitory control.

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A.E. KANE, E.K. FESTA, W.C. HEINDEL & D.P. SALMON. The Integrity of Priming in Alzheimer's Disease Depends on the Nature of the Representation Rather than the Fate of Activation.

Objective: Findings of impaired word stem-completion priming and intact perceptual identification (PI) priming in Alzheimer's disease (AD) patients are taken as evidence of a dissociation in the disease's effects on cortically-mediated conceptual and perceptual processes. However, an adverse affect of AD on general cortical activation could also negatively impact priming, particularly if activation dissipates abnormally rapidly. Thus, we compared level of integrity and rates of decay of conceptual and perceptual priming in patients with AD.

Participants and Methods: Word-stem completion and PI priming tasks were administered to 14 AD patients and 15 elderly controls. In both tasks, priming was assessed immediately following study word presentation and after a 10-minute delay. Immediate and delayed explicit recognition was also examined.

Results: Although both groups showed priming ($p < .001$) and similar rates of decay ($p > .50$) on the word-stem completion task, priming was lower in AD patients ($p < .01$). Both groups showed priming on the PI task ($p < .001$), and did not differ in level or rate of decay. Recognition memory was lower, and fell off more quickly, in AD than controls in both tasks.

Conclusions: A pattern of impaired conceptual and intact perceptual priming in AD was confirmed, but priming dissipated at a normal rate in both priming tasks. In contrast, AD patients' recognition memory was impaired and declined abnormally fast in both tasks. Results suggest that the integrity of priming in AD patients depends upon the nature of the representation (e.g., semantic vs. perceptual) rather than the fate of activation, and that their priming deficit is independent of explicit memory impairment.

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C.L. KARVER, T. TESHIBA, K. HAALAND, J. ADAIR & J. SADEK. Performance-based Functional Assessment: Correlation with Neuropsychological Functioning in a Dementia Sample.

Objective: Functional impairment is a criterion for the diagnosis of dementia. As the population ages and the prevalence of dementia increases, assessment of functional capacities will be important for treatment and placement decisions. The current study employs a performance-based assessment of everyday functioning (Functional Impact Assessment, or FIA) to gauge a subject's ability to shop, cook, manage finances and use of communication tools. The current study seeks to establish the validity of the FIA in dementia.

Participants and Methods: This study seeks to compare patients to demographically matched controls and correlate the FIA with demographically-corrected neuropsychological performance. The diagnosis of dementia (Alzheimer's disease or Vascular dementia) was made according to widely accepted criteria and was made independent of study data.

Results: Patients with dementia scored significantly worse than controls on the FIA total score ($p < .001$). Better FIA scores were associated with a higher mean t-score across all neuropsychological tests ($r = .919$ for controls, $r = .900$ for patients). For the patient group, the cognitive domains that correlate most highly with FIA total score were language ($r = .930$), speed/executive functions ($r = .761$) and learning ($r = .780$), while attention, memory, and motor were not significant. For the control group, only learning ($r = .946$) and attention ($r = .650$) were correlated with FIA scores.

Conclusions: The FIA is sensitive to dementia and is associated with cognitive abilities. Further research is required to demonstrate that performance-based assessments have better construct and predictive validity than traditional neuropsychological assessment to determine whether such assessment is clinically necessary.

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N. MAHENDRA, A. APPLE & D. REED. Computer-Assisted Training of Face-Name Associations in Persons with Dementia.

Objective: This study was designed to study the efficacy of computer-assisted cognitive interventions (CACIs) for training familiar and unfamiliar face-name associations in persons with Alzheimer's disease (AD). With the pervasiveness of computers, their low cost, and increasing levels of computer literacy among seniors, it is very timely to study the feasibility and applicability of CACIs for older adults with dementia. Further, with the graying of the population and related rising incidence of dementia, it is imperative that researchers continue to develop innovative non-pharmacological interventions.

Participants and Methods: Ten individuals (4 men, 6 women) with mild to moderate dementia were administered a CACI using a laptop computer. This intervention involved spaced retrieval (retrieval over increasing time intervals) of novel and previously familiar face-name associations. Participants were screened for sensory impairments (hearing and vision), vascular etiology, cognitive status, and depression. Participants were administered the Dementia Rating Scale to quantify dementia severity and the Rivermead Behavioral Memory Test to quantify existing memory impairments.

Results: Preliminary results indicate that CACIs were effective in helping persons with AD to learn novel and familiar (previously known but forgotten) face-name associations. In general, participants learned previously familiar but forgotten face-name associations more quickly than novel ones. Eight out of ten study participants retained these face-name associations for over six weeks after interventions ceased.

Conclusions: These initial findings reveal the promise of CACIs for training recall of factual information in individuals with AD. Future directions include studying the use of CACIs for teaching novel and previously familiar procedures (motor acts).

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L.D. MEDINA, P. LU, Y. RODRIGUEZ, J.L. CUMMINGS & J.M. RINGMAN. Memory Self-Appraisal and Actual Memory Performance in Mutation Carriers for Familial Alzheimer's Disease.

Objective: Evaluate insight of persons at-risk for familial Alzheimer's Disease (FAD) into their memory abilities.

Previous research in both demented and healthy persons has shown discrepancies between subjective memory complaints (SMCs) and objective memory function that may not always be related to underlying neurological pathology. By studying persons at-risk for fully-penetrant, autosomal-dominant FAD mutations, metamemory (ie memory self-appraisal) and its accuracy can be evaluated in those with and without the early pathological changes of AD.

Participants and Methods: 18 non-demented persons at-risk for FAD (4 for the APP and 14 for the PS1 substitutions) were assessed using the Memory Functioning Questionnaire (MFQ). Investigators were blind to subjects' mutation status. MFQ scores were correlated by Pearson correlations with z-scores for performance on memory for prose, word-list learning, and delayed recall of the Rey-O Figure.

Results: Ten subjects were FAD mutation carriers (MCs) and 8 were non-carriers (NCs). All had a CDR score of 0. Self-appraised memory in MCs was negatively correlated with performance on immediate word-list free recall ($r=-0.773$, $p=.009$), delayed word-list category recall ($r=-0.732$, $p=.016$), and delayed recall of the Rey-O figure ($r=-.642$, $p=.045$) that was absent in NCs ($p >.05$).

Conclusions: The non-demented MCs' low memory performance but high self-appraisal suggests that insight into memory abilities can be lost early in FAD. The loss in the retrieval capacity for word lists and the complex figure as well as the decline in awareness seen may be explained by early deficits in frontal lobe function.

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L.D. MEDINA, P. LU, Y. RODRIGUEZ, F. ORTIZ, J. FITTEN, D. GESCHWIND, B. SCHAFFER, J.L. CUMMINGS & J.M. RINGMAN. The Wisconsin Card Sorting Test in Presymptomatic Familial Alzheimer's Disease Mutation Carriers.

Objective: Assess prefrontal cortical function in non-demented persons at-risk for familial Alzheimer's Disease (FAD).

The Wisconsin Card Sorting Test (WCST) is commonly used to evaluate frontal lobe function requiring subjects to discover, and adapt to, a changing sorting principle for a deck of cards. Research on persons with early onset Alzheimer's disease has demonstrated a decline in frontal lobe abilities. Non-demented persons at-risk for fully-penetrant, autosomal dominant FAD mutations allow the study of this decline before clinical evidence of incipient dementia.

Participants and Methods: 20 persons at-risk for FAD (4 for APP and 16 for PS1) were assessed on the WCST. Investigators were blind to subjects' mutation status. Independent samples t-tests were used to evaluate group differences on the WCST.

Results: Eleven subjects were FAD mutation carriers (MCs) and nine were non-carriers (NCs), all with a CDR score of 0. MCs committed a significantly higher number of total errors, $t(18)=-2.211$, $p=.04$. NCs made more conceptual level responses, $t(18)=2.319$, $p=.032$, and completed more categories, $t(18)=2.603$, $p=.018$. There were no significant demographic differences between groups in age or years of education.

Conclusions: MCs who were not yet demented generally performed worse on the WCST than NCs. MCs were more likely to make errors and get 'stuck' in a category and had more difficulty solving the concept of the task. This may be explained by early prefrontal cortical dysfunction before the onset of AD.

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K. MILLER, C.R. FINNEY, K.J. MEADOR & D.W. LORING. A Comparison of Auditory Description Naming and Visual Confrontation Naming Performance in Dementia.

Objective: Dysnomia in dementia is typically assessed through visual confrontation naming; however, asking patients to name an object based on its auditory description may provide a more ecologically valid assessment of word-retrieval difficulty. In the current study, we compared visual confrontation naming and auditory responsive naming in a mixed dementia sample. We hypothesized that there would be greater impairment on auditory responsive naming tasks since it requires lexical retrieval based purely on semantic properties of words.

Participants and Methods: Fifty patients with dementia of various etiologies were administered abbreviated versions (25-item) of the Columbia Visual Naming (VN) and Columbia Auditory Naming (AN) tasks

(Hamberger & Seidel, 2003). Task words were matched in frequency, and thus represented comparable levels of difficulty. Accuracy data were analyzed via paired t-tests. Additionally, performance within two different diagnostic subgroups was examined (Alzheimer's Disease, $N = 11$; Mixed Alzheimer's Disease and Vascular Dementia, $N = 14$).

Results: The full sample of patients showed significantly poorer accuracy on AN versus VN. Within the subgroups, the AD + Vascular Dementia group had significantly lower accuracy on AN, but not VN, as compared to the pure AD group.

Conclusions: These findings suggest that breakdown of semantic networks in dementia may lead to greater word-finding impairment on tasks requiring lexical retrieval based on semantic properties rather than a visual cue. More widespread neuropathology in patients with mixed etiologies leads to greater differential AN impairment. Further research should examine the correspondence between AN deficits and self-reported dysnomia in dementia patients.

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R.I. MONTOYA, T.H. GOLLAN, E. DA PENA, D. GALASKO & D.P. SALMON. Does Bilingualism Delay Alzheimer's Disease Onset? Evidence from a Hispanic Cohort.

Objective: Bilingualism (Bialystok, 2006) and multilingualism (Kavé, in press) reportedly delay the onset of dementia. We aimed to determine whether increasing levels of bilingualism are associated with a greater degree of bilingual advantage, and whether the bilingual advantage could be replicated in a culturally more uniform population of bilinguals and monolinguals.

Participants and Methods: We compared the age-of-onset of bilinguals ($n = 27$) and monolinguals ($n = 17$) with dementia from the Hispanic Cohort at the UCSD Alzheimer's Disease Research Center. Patients were diagnosed by two senior staff neurologists. Estimated age-of-onset was taken from caregiver reports. Degree of bilingualism was determined by Boston Naming Test (BNT) scores in English and Spanish, patients' self-reported language history, and by Spanish-English bilingual psychometrists' knowledge from neuropsychological testing sessions.

Results: Bilinguals and monolinguals did not differ on dominant-language BNT scores, but bilinguals named significantly more pictures in the nondominant-language than monolinguals. An education-matched subset of monolinguals had a significantly lower estimated age-of-onset ($M = 65.3$, $SD = 7.6$) than bilinguals ($M = 76.7$, $SD = 12.8$). There was a significant correlation between degree of bilingualism and age-of-onset such that higher levels of ability to name pictures in the non-dominant language were associated with later ages of onset.

Conclusions: These findings provide clues as to the mechanism of the protective effects of bilingualism for delaying dementia. The appearance of a bilingual advantage within a culturally homogeneous population, and the demonstration of a continuous relationship between degree of bilingualism and degree of protective effect, confirm that bilingualism per se (not a factor correlated with bilingualism) introduce the protective effect.

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J.H. MOON, K.J. MILLER, G. LEE, J. KIM, S. TRIFSKIN, A. KAPLAN, D. DORSEY & C.W. SMALL. Aggregated Risk: The Contribution of Multiple Risk Factors in Alzheimer's Disease.

Objective: The goal of the present study is to examine how family history, which has not been previously been a strong predictor, and other individual risk factors can form an aggregated risk of AD in a small sample of age and education matched subjects.

Participants and Methods: A total of 22 participants, 11 with dementia and 11 control participants were matched for age and educa-

tion (Risk group: M age = 70.27, $SD = 11.06$, M education = 14.36, $SD = 2.46$; Control group: M age = 70.73, $SD = 10.16$, M education = 15.73, $SD = 2.20$); 45% of the dementia participants were women, 63% of the controls were women. 45% of the dementia participants had APOE 3/4, 18% of the controls had APOE 3/4.

Results: Using t-tests for analysis when considering the effect of aggregate risks for AD (family history, mental status, genetics, gender, alcohol use, vascular risks, head injury, and depression), the analysis revealed that that dementia group ($M = 3.82$, $SD = 1.47$) had more associated risks as compared to the control group ($M = 2.55$, $SD = 1.37$, $p = .05$).

Conclusions: To better understand predictors of AD, it may be important to investigate the effect of having multiple risk factors as opposed to individual risk factors. Aggregated risk may be significant in predicting the risk for AD. The composite information on family history, mental status, alcohol use, vascular risks, head injury, and history of depression may enhance the understanding of who is at risk for developing dementia.

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S. MUSIL & N. JOHNSON. Profiles of Phonemic and Semantic Fluency in Frontotemporal Dementia and Alzheimer's Disease.

Objective: It is well established that normal control subjects (NC) generate more words to a semantic than to a phonemic cue (semantic superiority). Semantic superiority also is seen in patients with frontotemporal dementia (FTD) but not in patients with probable Alzheimer's disease (PRAD). This has been interpreted to reflect a general deficit in semantic processing that is fairly specific to PRAD. This type of data often is used clinically to help classify patients. However, while test data may be normally distributed for NC, the distribution of scores on each test within dementia groups is not known. Variability in score distribution for each task could affect comparison between tasks and subsequent clinical interpretation. In this study, we investigate group and within group patterns of performance in verbal fluency.

Participants and Methods: Data on phonemic and semantic fluency were obtained from individuals enrolled in the Clinical Core of the Northwestern Alzheimer's Disease Center. Based on history and clinical profile, they were classified as NC ($n = 249$), FTD ($n = 39$), or PRAD ($n = 52$).

Results: As expected, semantic superiority was seen in NC (semantic 38% > phonemic) and was even more pronounced in FTD (semantic 67% > phonemic). In contrast, PRAD patients generated 6% fewer words to a semantic than to a phonemic cue. Although these patterns were not seen in all individuals within a group, 87% of NC and 80% of FTD show category superiority compared to 49% of PRAD. Investigation of score distributions within each group revealed that NC and FTD show greater semantic superiority at low levels of phonemic fluency. Semantic superiority lessened with increasing phonemic fluency scores. The reverse pattern was seen in PRAD.

Conclusions: Although a lack of semantic superiority is not always seen in PRAD patients, it is much more rarely seen in FTD. Performance level on phonemic fluency tasks should be taken into account when interpreting the clinical significance of phonemic and semantic fluency differences. Correspondence: *Suzanne Musil, Ph.D., Psychiatry and Behavioral Sciences, Northwestern University Feinberg School of Medicine, 320 E. Superior St., Searle 11-504, Chicago, IL 60611. E-mail: smusil@northwestern.edu*

C.A. NIEVES, M. BURKE, T. GIOVANNETTI & D.J. LIBON. Serial Order Errors and Everyday Action Performance in Dementia.

Objective: Everyday functioning is impaired in people with dementia; often difficulties arise due to serial order errors. This study compared the serial order of everyday task steps in dementia patients to serial order standards established by healthy controls.

Participants and Methods: Forty-six participants with Alzheimer's disease (n=24) or subcortical vascular dementia (n=22) were recruited from a memory assessment program. All participants were administered a neuropsychological protocol and the Naturalistic Action Test (NAT), a performance-based test of everyday actions that includes 3 tasks of increasing complexity. Sequence Violations were defined as instances when patients performed task steps in an order that differed from healthy controls (e.g., butter on bread before toasting).

Results: On average, dementia participants made 7.36 Sequence Violations (out of 38 possible violations; i.e., 20% of steps were performed in the wrong order). Violations were significantly more frequent within a subgoal (e.g., taking coffee from jar) versus across subgoals (e.g., making toast then coffee; $z=3.69$, $p<.01$). Violations also occurred more frequently, as task complexity increased [Item 3 > (Item 2=Item 1); $z > 1.93$, $p < .05$]; this finding was noted even after controlling for differences in violation opportunities across tasks. Diagnosis and neuropsychological measures of executive control, memory, and language were not significantly related to Sequence Violations.

Conclusions: Dementia patients ordered everyday task steps in a sequence that differed considerably from healthy controls. Serial order errors were significantly influenced by subgoal boundaries and task complexity. However, future research is needed to understand the mechanisms that contribute to serial order deficits. Weak relations between serial errors and traditional neuropsychological measures suggest that direct observation of functional abilities is necessary to further explicate this phenomenon.

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Y. OH, J. CHIN, A. PARK, S. KIM & D. NA. Differences in Neuropsychological Functions between Early Onset and Late Onset of Alzheimer's Disease.

Objective: Previous studies compared early-onset Alzheimer's disease (EOAD) with late-onset Alzheimer's disease (LOAD) in neuropsychological performances, the results of which, however, are inconsistent. One of the factors that contribute to this inconsistency might be the arbitrary criteria of onset age of 65. Onset age relies on the memory recall of caregivers, thus many patients in their 60s cannot be exactly classified. Another important factor might be white matter high signals which usually increase as the subjects are getting older especially into their 80s. The aim of this study was to compare the neuropsychological performances between EOAD patients with onset age of 50s and LOAD patients with onset age of 70s.

Participants and Methods: The participants were 57 EOAD (female: 66.7% mean age: 58.5 ± 3.1) and 208 LOAD patients (female: 60.76% mean age: 76.6 ± 3.0) who met the probable AD criteria of NINCDS-ADRDA. Patients were given comprehensive neuropsychological tests.

Results: Compared with LOAD patients, EOAD patients were better at Boston Naming Test and the immediate recall of the Seoul Verbal Learning Test, whereas they were worse at backward digit span, praxis, calculation, phonemic COWAT, and the color reading of the K-CWST.

Conclusions: The EOAD patients showed better performances than LOAD patients in the naming test and verbal memory test, suggesting that EOAD has better verbal ability and memory than the LOAD. In addition, the poor performances of EOAD on the Digit Span, the K-CWST, and the COWAT suggest that the frontal involvement is greater in EOAD than the LOAD.

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M.M. PADILLA-VELEZ, M. TABERT & D. DEVANAND. Self-Reported Use Of Mnemonics Has Unique Predictive Ability For Daily Function Beyond That Of Neuropsychological Measures Of Memory.

Objective: We sought to determine whether self-reported use of mnemonic aids (e.g. making lists, putting things in a prominent place, etc.) is a unique predictor of daily functional status over and above the association of neuropsychological measures of memory with daily function.

Participants and Methods: Data from the initial visit in a longitudinal memory study were assessed for 156 study participants who were diagnosed with "questionable dementia" (defined as having significant memory complaints OR performance greater than one standard deviation below the demographically adjusted mean on at least one neuropsychological measure in a standard battery), and 63 control participants with no complaints or impairment on neuropsychological tests. Those with dementia, stroke, or severe psychiatric disorder were excluded. Logistic regression was used to predict presence or absence of any functional impairment based on the Blessed Functional Activity Scale). Predictors included age, gender, education, ethnicity, performance on the Buschke Selecting Reminding Test (SRT; total and delayed recall), WMS Visual Reproduction (delayed recall), Benton Visual Retention Test (shape recognition), MMSE 3-word recall (following a 5-minute delay), and Memory Functioning Questionnaire (MFQ; Use of Mnemonics subscale total); with age, gender, education, and ethnicity included as covariates.

Results: Two predictors were significant in this model, SRT delayed recall ($p=.049$, $B=-.181$) and Total Use of Mnemonics ($p=.001$, $B=.054$).

Conclusions: These results imply that in addition to including neuropsychological memory measures in assessments of function at baseline, it might be clinically prudent to inquire about reliance on mnemonics to achieve function.

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C.M. PERSSON, . WALLIN, S. LEVANDER & L. MINTHON. Cognitive Development During 3 Years in Patients with Alzheimer's Disease.

Objective: Alzheimer's Disease (AD) is associated with a major reduction in cognitive function. The aim of the present study was to describe the cognitive development during 3 years by studying subgroups of AD patients based on cognitive level and change over time.

Participants and Methods: AD patients (n=435) were recruited from eight memory clinics in Sweden to follow a clinical study program (the SATS study) including cognitive assessments (MMSE and ADAS) every six months during three years, in total 7 sessions. All patients received medical therapy by means of choline esterase inhibitors starting directly after baseline. After dropouts and exclusion of patients with missing data, 163 patients (56 men and 107 women) remained for the analyses. Characteristics at baseline: $M \pm SD$ for age: 73.8 ± 7.0 ; $M \pm SD$ for time ill: 3.1 ± 2.6 and $M \pm SD$ for MMSE: 22.9 ± 4.3 . MMSE and ADAS scores were used to create subgroups and study development over time.

Results: Confirmatory cluster analyses were run on MMSE over time, resulting in a 4-cluster solution. Neither group changed much over the first three sessions but differed substantially in terms of the first session. Over the following sessions there were large differences among the groups reflecting the entry value - lower scores at entry was associated with more deterioration. The groups were compared by ANOVAs with respect to age and time ill and by X^2 with respect to sex, heredity and apo E. The best preserved group was younger and comprised a larger proportion men ($p<.05$) and apo E-4 non-carriers ($p<.05$). The least cognitively preserved group had been ill longer. Corresponding cluster analysis with ADAS resulted in a very similar pattern.

Conclusions: Baseline cognitive status was related to slope of deterioration; lower scores at baseline was associated with faster deterioration. Men might come earlier to treatment and appear to have better prognosis.

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A.L. REPP, M. WANG, R. DE ARRIBA, S. COLLINS & C. MURPHY. The Presence of the $\epsilon 4$ Allele and Semantic Clustering in Olfactory Episodic Memory Tasks Using the COLT.

Objective: The normal aging process is associated with declines in episodic memory. These deficits are more profound in those with Alzheimer's disease (AD) and the $\epsilon 4$ allele is a known risk factor for AD. Research suggests that individuals with the $\epsilon 4$ allele ($\epsilon 4+$) display impairments in olfactory abilities. Additionally, preclinical AD has been correlated with impairments in learning and reductions in learning strategies, such as semantic clustering. However, little research has examined learning strategies and $\epsilon 4$ status in the olfactory domain. The present study investigated the observed semantic clustering ratio (SCR) on the California Odor Learning Test (COLT) and the California Verbal Learning Test (CVLT), demonstrated by older $\epsilon 4+$ ($n=15$) and $\epsilon 4-$ ($n=23$) adults.

Participants and Methods: Participants were administered the COLT and CVLT on two separate days. Differences between $\epsilon 4+$ and $\epsilon 4-$ participants in semantic clustering ratios were assessed with analyses of variance (ANOVA).

Results: Although comparable SCRs were found on the CVLT for $\epsilon 4+$ ($M=1.94$) and $\epsilon 4-$ ($M=1.89$) groups, SCRs for $\epsilon 4+$ participants ($M=0.83$) were significantly lower than for $\epsilon 4-$ participants ($M=1.97$) on the COLT ($F=9.15$; $p=0.005$).

Conclusions: These findings suggest that $\epsilon 4+$ individuals are less likely than $\epsilon 4-$ individuals to incorporate strategies such as semantic clustering to enhance learning on odor learning and memory tasks, and that the COLT may contribute to an understanding of preclinical cognitive decline in $\epsilon 4+$ individuals.

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L. RITCHIE & H. TUOKKO. Patterns of Neuropsychological Decline and Conversion Rates for Three Classification Models of Mild Cognitive Impairment (MCI).

Objective: Mild cognitive impairment, with an estimated population prevalence of 16.8%, (Graham et al., 1997), poses a large challenge to the health care system. The generation of effective treatment options for cognitive decline requires knowledge of its rate of progression, which is currently limited to specific diagnostic criteria (Busse et al., 2003). Our objectives were to: 1) elucidate the demographic and neuropsychological characteristics of persons meeting the criteria for a diagnosis MCI according to Petersen's (2004) definition of aMCI-sd, aMCI-md, naMCI-sd, and naMCI-md, Zaudig's (1992) definition of MCI Type 1 and MCI Type 2, and the CSHA's definition of CIND Type 1 and CIND Type 2 (Tuokko et al., 2001); 2) determine the associated sample prevalence rates in a longitudinal population study of elderly Canadians; and 3) determine the associated five-year conversion rate to dementia, with the goal of identifying the utility of the respective classifications as a marker for incipient dementia.

Participants and Methods: We examined the utility of existing, well-documented criteria for MCI using data from persons who underwent a clinical examination in the second wave of the Canadian Study of Health and Aging (CSHA; $N=1114$). Prevalence rates, demographic characteristics, and average neuropsychological test performance were calculated for each classification.

Results: MCI definitions requiring both long- and short-term memory impairment, and impaired functioning in at least one other cognitive domain identified a greater percentage of individuals who progressed to dementia within five years.

Conclusions: We confirm that the progression of cognitive impairment is reliant upon the MCI case definition. To our knowledge this is the first study to jointly examine these MCI classifications in a population sample.

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H.C. ROSSETTI, M. CULLUM, L. HYNAN & L. LACRITZ. Impact of Demographic Variables on Progression of Alzheimer's Disease Using the CERAD Neuropsychological Battery Total Score.

Objective: To determine the impact of demographic variables on AD progression as measured by annualized CERAD Total Change Scores (CTCS). Based upon previous literature, greater annualized change was expected in African-Americans, females, subjects with lower education (≤ 12), and subjects with younger age-at-baseline (≤ 65).

Participants and Methods: Subjects included 383 Normal Control (NC) and 655 AD subjects of similar age and education from the National CERAD Registry who had serial data. The contribution of race, gender, education, and age-at-baseline were examined via multiple regression and independent samples t tests. Variables found to differ at baseline were used as covariates in subsequent ANCOVAs, though results were similar.

Results: The regression results were significant, [$R^2 = .05$, adjusted $R^2 = .04$, $F(3, 649) = 10.10$, $p < .001$], suggesting that male Caucasians with a younger age-at-baseline exhibited greater annual decline on the CERAD battery; however, the overall predictive value of the model was relatively weak, accounting for only 5% of the variance in CTCS. Greater annualized decline ($p < .001$) was observed in Caucasians ($M = -7.64$, $SD = 6.82$) vs. African-Americans ($M = -4.60$, $SD = 7.03$), males ($M = -8.22$, $SD = 6.70$) vs. females ($M = -6.44$, $SD = 7.04$), and in those with a younger age-at-baseline ($M = -8.72$, $SD = 6.44$) vs. older age-at-baseline ($M = -6.85$, $SD = 7.01$).

Conclusions: Results provide further information regarding the influence of individual characteristics on cognitive functioning in AD and suggest that demographic factors play a significant, albeit small, role in progression of cognitive decline.

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A. RUEDA & M. SCHMITTER-EDGEcombe. Time Estimation in Alzheimer's Disease.

Objective: Little is currently known about the impact of severe memory deficits on temporal cognition. Given the important role that time estimation plays in structuring daily activities (e.g., driving, planning future actions), we investigated the impact of Alzheimer's disease (AD) on temporal cognition.

Participants and Methods: Sixteen participants with AD and 16 age and education matched healthy older adult controls provided prospective, verbal time estimations for intervals of 15, 25, 45, and 60 seconds. To prevent subvocal counting, participants read aloud numbers that appeared randomly on a computer screen during each trial. The following measures of time estimation were examined: mean time estimation, absolute deviation, and coefficient of variance.

Results: Participants with AD demonstrated greater absolute deviation between their estimations and true clock time compared to healthy older adults. In addition, the AD group demonstrated greater variability in estimating intervals of the same duration compared to controls. Alzheimer participants did not differ from controls in overall mean estimates, with

both groups containing subsets of individuals who overestimated time and others that underestimated time. Correlational analyses with neuropsychological tests of attention, memory, and executive functioning revealed no clear relationship with time estimation variables among the AD sample.

Conclusions: These findings indicate that decreased accuracy and greater variability in estimating time is associated with AD. However, while some AD patients overestimated time considerably, others underestimated time. Future research should continue to investigate cognitive correlates of time estimation and how specific timing deficits translate to impairments in daily activities.

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K.A. RUSSELL & L.J. TIPPETT. Procedural Learning of Daily Tasks in Alzheimer's Disease.

Objective: Alzheimer's disease (AD) typically involves development of wide-ranging cognitive impairments. These contribute to progressive decline of functional ability, which can severely reduce the quality of life for those with AD and for their families. We investigated: (1) the effectiveness of using procedural learning (a relatively preserved learning mechanism in AD) to improve performance of self-care tasks and activities of daily living (ADLs) in AD participants, and (2) whether improvements in performance were maintained over time.

Participants and Methods: The study incorporated both a group and single-subject design (multiple baseline across tasks) and involved 12 tasks. Participants comprised 8 individuals with mild-to-moderate AD and 8 control individuals matched pair-wise for age, ethnicity and gender. AD participants were trained on six tasks for 10 days, while six tasks remained untrained (tasks counterbalanced across subjects). Follow-up measures were conducted up to 12 weeks post-training.

Results: The AD group performed trained tasks significantly faster at post-test (than at baseline) and with significantly fewer errors, whereas untrained tasks showed no significant change. At post-test no significant differences were found between the performances of the AD and control groups on trained tasks. Single subject analyses revealed that 7/8 AD participants showed significant improvements in overall performance time (binomial analyses) and errors (visual analyses) for trained tasks only. Furthermore, significant training effects were maintained at a 12-week follow-up. There was some variability in extent of training effectiveness between individuals and tasks.

Conclusions: We conclude that procedural learning methods can assist individuals with mild-to-moderate AD to relearn and maintain self-care skills and ADLs.

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D.P. SALMON, V. FILOTEO, K.L. POSSIN, B. DITORO & D. GALASKO. Modality-Specific Patterns of Working Memory Impairment in Alzheimer's Disease, Huntington's Disease, and Parkinson's Disease with Dementia.

Objective: Although working memory (WM) impairment is common to most neurodegenerative disorders that cause dementia, distinct disorders may differentially affect WM for specific types of information. Prefrontal cortex pathology in Alzheimer's disease (AD) may produce a general WM deficit that affects all modalities, whereas basal ganglia pathology in Huntington's disease (HD) or Parkinson's disease with dementia (PDD) may create modality-specific WM deficits related to the caudate-cortex interactions most affected.

Participants and Methods: To test this notion, Recognition Span Tests with spatial, verbal, and facial stimuli were administered to AD, HD, and PDD patients. In each condition, subjects had to remember an increasing number of stimuli presented, in series, across trials. Memory span length was the number of stimuli correctly identified until the first error was made.

Results: Results showed that AD patients were equally impaired (compared to controls) across modalities (mean $z = -1.54, -1.33, \text{ and } -1.75$ for spatial, verbal, and facial, respectively), whereas HD patients were more impaired with spatial and facial ($z = -1.85 \text{ and } -2.00$, respectively) than verbal ($z = -0.98$) stimuli ($p < .001$). PDD patients were similar to HD patients with greater impairment for spatial and facial ($z = -2.00 \text{ and } -1.57$, respectively) than verbal ($z = -0.97$) stimuli ($p < .001$).

Conclusions: These results indicate that AD patients exhibit equivalent WM deficits in all modalities consistent with extensive primary prefrontal cortex pathology. HD and PDD patients, in contrast, exhibit a greater WM deficit for spatial locations than for verbal (written words) information, perhaps due to disruption of posterior caudate connections to parietal cortex.

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L.V. SAUNDERS, B.M. KLUGER, S. KIRLI, D. EFROS, G. CRUCIAN, A. CHAU, C. GARVAN, C.R. FINNEY & K.M. HEILMAN. Validation of a Self-administered Computerized Screening Test for Cognitive Impairment and Dementia.

Objective: Early detection of dementia can lead to treatments that can reverse, stop or slow deterioration. Therefore, early identification and diagnosis of these disorders is critical. Current screening instruments require administration by trained personnel and are not widely available to the public. We developed a self-administered computerized cognitive battery to screen for dementia. In this study, we tested the ability of this battery to distinguish healthy older adults from those with dementia and assessed the correlation between the computerized subtests with standard neuropsychological tests.

Participants and Methods: We administered the Dementia Screening Battery (DSB) to 98 participants. Sixty participants were diagnosed with cognitive impairments by a behavioral neurologist [probable Alzheimer's diseases (16), MCI (15), Fronto-temporal dementia (5), other dementias of an undetermined etiology (24)]. Length of administration was approximately 15 minutes. The battery included tests of memory, naming, praxis, and orientation. Standard neuropsychological tests were given to all participants diagnosed with dementia and 11 healthy controls.

Results: Over 95% of subjects were able to complete the computerized test. The area under the receiver operating characteristics (ROC) curve was high (0.94) and comparable to other screening tests (MMSE = 0.95) in our sample. Sub-tests from the DSB significantly correlated with standard domain related neuropsychological tests (r^2 range from 0.4 to 0.7).

Conclusions: These results suggest that the DSB has comparable efficacy with the MMSE and adequate validity when compared to standard neuropsychological tests. As this test is rapid and self-administered, it may facilitate public health efforts to screen for cognitive impairment.

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W. SCHULTZ, L. BAXTER & R. CASELLI. Longitudinal Evidence for Sex Differences in Verbal Memory Decline in APOE e4 Carriers.

Objective: The APOE e4 allele is a known genetic risk factor for Alzheimer's disease. Verbal memory tests such as the AVLT have been

shown to be sensitive to cognitive decline in e4 carriers before symptomatic presentation of mild cognitive impairment or dementia. We have previously shown that this preclinical decline in verbal memory is limited to male e4 carriers, while female carriers do not show significant changes. We presently examined whether this effect persists over time with continued evaluation.

Participants and Methods: Participants were 116 cognitively normal adults (35 males, 81 females; 58 e4 carriers, 58 e4 non-carriers; average age 56 years) participating in a longitudinal APOE study at the Mayo Clinic in Arizona. Participants completed 4 epochs of neuropsychological testing (average span 72 months) including the AVLT.

Results: A significant interaction was found between sex and APOE e4 status over time on the AVLT Long Delay task $F(1, 112) = 3.87, p = .05$, with only male e4 carriers showing significant decline over time. When age was limited to 50 years and older, results continued to approach significance but were likely limited in power by the reduced number of participants. No significant differences were observed on AVLT Total Learning, BNT, or COWA, suggesting that verbal decline may be specific to memory testing.

Conclusions: This study suggests that decline in verbal memory may be an important preclinical indicator of cognitive decline in APOE e4 carriers; however, this trend was observed only in male carriers of the allele. Correspondence: *Wil Schultz, PhD, Clinical Neuropsychology, Barrow Neurological Institute, 222 W. Thomas Road, Suite 315, Phoenix, AZ 85013. E-mail: Wil.Schultz@chw.edu*

A.M. SEELYE, D.B. HOWIESON, K.V. WILD, T.L. HAYES, L.R. SAUCEDA & J.A. KAYE. Two Behavioral Interventions for Patients with Mild Cognitive Impairment: A Pilot Study.

Objective: Until effective medicines are discovered, the development and evaluation of behavioral interventions to assist in managing symptoms and maintaining independence and quality of life in persons with MCI is critical. The present outcome study examined the efficacy of two behavioral interventions to improve daily function and quality of life in individuals with MCI.

Participants and Methods: Participants included 16 individuals with MCI, aged 59-90 years ($M = 73, SD = 7.5$) and their collaterals. MCI diagnosis was based on most recent evaluation at two Alzheimer clinics. Two multifaceted interventions that included education about MCI and training in compensation techniques were compared to a wait-list control condition. One training involved the use of electronic memory aids to compensate for memory impairment and the other training used cognitive-behavioral therapy techniques to improve subjective appraisal of memory abilities and perceived control over memory in addition to training in the use of non-electronic memory aids.

Results: Paired t-tests showed the group who received training in electronic memory devices (EMD) functioned significantly better in their daily activities at the end of the intervention ($p < .05$). The group who received training in non-electronic memory aids and cognitive-behavioral therapy techniques (CBT) had significantly better subjective memory appraisals ($p < .01$) and used memory compensation strategies more frequently at the end of the intervention.

Conclusions: Findings suggest that individuals with MCI can benefit from behavioral interventions and training in aids to compensate for memory loss. Further development and validation of behavioral techniques to assist MCI patients are needed.

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M.G. SHEROD, H.R. GRIFFITH, A. PERKINS, K. BELUE & D.C. MARSON. Overestimation of Financial Ability in Alzheimer's Disease: When Does the Loss of Awareness First Occur?

Objective: The gradual loss of financial abilities is an important aspect of functional decline associated with Alzheimer's disease (AD).

Patients with AD lack awareness of their deficits and tend to overestimate their own financial abilities. One unanswered question is when loss of awareness first occurs. The present study examines when patients begin to overestimate financial capacity abilities as they progress from the prodromal stage (mild cognitive impairment; MCI) to mild and moderate AD.

Participants and Methods: All participants were recruited through the Alzheimer's Disease Research Center (ADRC) at UAB. Participants were assigned to the following diagnostic categories based on team consensus: older controls ($N=77$), MCI ($N=58$), mild AD ($N=100$), and moderate AD ($N=28$). All participants were administered the Financial Capacity Instrument (FCI), a comprehensive direct assessment measure of financial abilities. In addition, participants were asked to estimate their overall financial abilities as either capable (independent), marginally capable (needs assistance), or incapable. This estimate of financial ability was compared to level of FCI performance (intact, marginal, impaired).

Results: Overestimation of financial ability was observed for 26% of the MCI participants, 69% of the mild AD participants, and 96% of the moderate AD participants ($p < 0.001$). In contrast, overestimation was present in only 5% of the older controls.

Conclusions: Overestimation of financial abilities first occurs in a small portion of MCI patients, expands rapidly in mild AD patients, and encompasses a majority of moderate AD patients. These findings suggest that anosognosia regarding declines in financial skills occurs early in the AD dementing process.

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S. SONG, S. CORREIA, E. SCHLICHTING, P. MALLOY & S. SALLLOWAY. Executive Impairment and MOCA Performance in Mild Cognitive Impairment and Alzheimer's Disease.

Objective: (1) To determine whether patients with mild cognitive impairment (MCI) and mild Alzheimer's disease (AD) who have higher vs. lower levels of executive impairment perform more poorly on the Montreal Cognitive Assessment (MoCA) than on the Mini-Mental State Examination (MMSE). (2) To examine the relationship between the MMSE and MoCA and behavior change as assessed by the Frontal Systems Behavior Scale (FrSBe).

Participants and Methods: Participants were 18 patients with MCI, 20 patients with mild AD (MMSE score > 16), and 10 healthy elderly controls. All participants completed the MoCA and MMSE; patient participants also completed neuropsychological testing including informant ratings on the FrSBe. Patients in each diagnostic group were assigned to high vs. low Executive groups based on their performance on five executive tests.

Results: Compared to controls, MCI and AD patients performed more poorly on both measures but the differences were significant only for the AD group. The Executive MCI group performed significantly more poorly than the non-Executive MCI group on the MoCA ($p=.02$) but not on the MMSE. The opposite pattern was observed among the AD patients: the Executive AD showed a statistical trend toward poorer MMSE but not MoCA performance compared to the non-Executive group ($p=.07$). The MMSE was significantly correlated with change in FrSBe apathy and disinhibition scores in the AD group.

Conclusions: The MoCA appears to be more sensitive than the MMSE to executive impairment in MCI. The MMSE may be a more robust marker of cognitive functioning in later stages of dementia.

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M. SUH, J. YOON & D. NA. Aphasia types in early and late onset Alzheimer's disease.

Objective: There are reports on deteriorated language functions in patients with Alzheimer's disease (AD). The results are inconsistent in that some report language dysfunctions in early onset AD and in others, in late onset AD.

Imaging studies revealed greater hypometabolism in early onset AD compared to late onset AD patients, especially in the parietal lobe. Based on these results, the authors expected a different pattern of language deterioration between the two AD groups, and therefore we report their aphasia types.

Participants and Methods: Thirty-seven early onset AD and fifteen late onset AD patients performed the Korean version of the Western Aphasia battery.

Results: In early onset AD, CDR 0.5 patients showed no aphasia or anomic aphasia. In CDR 1, one patient had no aphasia and the others had anomic, conduction, transcortical sensory and Wernicke aphasia. In CDR 2, there were anomic, conduction, transcortical sensory, and Wernicke type. All patients with CDR 3 showed Wernicke aphasia. In late onset AD, all patients with CDR 0.5 had no aphasia. In CDR 1, two had no aphasia and 5 were anomic. All patients with CDR 2 showed anomic aphasia.

Conclusions: Late onset patients showed no aphasia in the early stage of the disease, and when the disease progressed, they had mild degree of aphasia. In early onset patients, some showed aphasia even in the beginning stage of the disease, and as the disease progressed, patients manifested diffuse type of fluent aphasia. All were Wernicke aphasic when the disease was severe. This may be the result of greater degree of hypometabolic involvement in the temporoparietal areas of these patients as is reported in previous studies.

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T. TAKAHASHI, M. MIMURA, A.J. ISOMURA, B. YAMAGATA, H. TOMIOKA, H. KOBAYASHI, M. YANO & H. YOSHIMASU. Cerebral Blood Flow in Alzheimer's Disease with Depression.

Objective: Presence of comorbid depression and/or anxiety is considered to be one of predictive factors of Mild Cognitive Impairment (MCI) or mild stage of Alzheimer's disease (AD) for progression. The purpose of the present study was to investigate possible difference in cerebral blood flow (CBF) of depressed and nondepressed mild AD individuals.

Participants and Methods: Participants were 27 individuals with very mild to mild AD. Their Clinical Dementia Rating was 0.5 or 1.0 and their Mini-Mental State Examination score was > 20 points. Those who scored >15 on the Hamilton Rating Scale for Depression (HRSD) (N=14) were classified as depressed whereas those whose score was < 7 (N=13) were classified as nondepressed. Each participant received ECD single photon emission tomography and the voxel-based CBF data were analyzed using the Statistical Parametric Mapping 02.

Results: The AD individuals as a whole demonstrated reduced CBF in broad areas including the posterior cingulate and precuneus, the lateral parietal and the prefrontal cortices as compared to the age-matched healthy control data. As compared to the nondepressed participants, the depressed participants demonstrated reduced CBF in the bilateral orbitofrontal cortices, the right medial temporal and temporoparietal cortex.

Conclusions: In addition to wide range of decreased cerebral perfusion which is well demonstrated in mild dementia, depressed AD individuals presented with frontal and temporal hypoperfusion.

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E. TENG, B.W. BECKER, E. WOO, D.S. KNOPMAN, J.L. CUMMINGS, M.F. MENDEZ & P.H. LU. Utility of the Functional Activities Questionnaire for Distinguishing Mild Cognitive Impairment from Mild Alzheimer's Disease.

Objective: To determine the diagnostic utility of a standardized assessment of instrumental activities of daily living (IADLs) for distinguishing mild cognitive impairment (MCI) from very mild Alzheimer's disease (AD).

Participants and Methods: We identified 1801 subjects in the National Alzheimer's Coordinating Center Uniform Data Set with MCI (n=1108) or very mild AD [Mini-Mental Status Exam (MMSE) score \geq 24; n=693] who were assessed with the Functional Activities Questionnaire (FAQ). Subjects were stratified by diagnosis and randomized to the development or test sets. Receiver-operator curve (ROC) analysis was used in the development set to determine optimal cut-points, sensitivity, and specificity of FAQ measures for differentiating MCI from AD. Cut-points were validated with the test set.

Results: ROC analysis of total FAQ scores in the development set among subjects with complete FAQ data produced an area under the curve (AUC) of 0.903. A cut-point of 5/6 yielded 82.9% sensitivity and 83.9% specificity for distinguishing MCI and AD and correctly classified 83.6% of subjects. In the test set, this cut-point yielded 80.3% sensitivity, 87.0% specificity, and 84.7% classification accuracy. Stepwise logistic regression indicated that bill paying, transportation, and games/hobbies ($p \leq 0.001$) were the FAQ items of greatest diagnostic utility. Cut-points derived from single items had poorer predictive power than the cut-point derived from the total score. The predictive power of total FAQ scores survived adjustments for demographic variables and MMSE or neuropsychological testing scores.

Conclusions: The FAQ exhibits good sensitivity and specificity when used as a standardized assessment of IADLs in the differential diagnosis of MCI and AD.

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E. TENG, B.W. BECKER, E. WOO, A.J. YAU, J.L. CUMMINGS, M.F. MENDEZ & P.H. LU. Instrumental Activities of Daily Living in Subtypes of Mild Cognitive Impairment.

Objective: To determine whether performance of instrumental activities of daily living (IADLs) differs between cognitive subtypes of mild cognitive impairment (MCI).

Participants and Methods: We identified 1108 subjects in the National Alzheimer's Coordinating Center Uniform Data Set who met diagnostic criteria for amnesic (n=872) or non-amnesic (n=236) MCI and were assessed with the Functional Activities Questionnaire (FAQ). Total FAQ scores were compared between amnesic and non-amnesic groups using analysis of covariance incorporating demographic variables and Mini-Mental Status Examination (MMSE) scores. The association between total FAQ scores and composite cognitive domain-specific neuropsychological measures (memory, attention, information processing speed/executive function, language) was explored using multiple regression analysis.

Results: Among subjects with complete FAQ data, total FAQ scores were significantly higher (reflecting poorer performance of IADLs) in amnesic MCI than in non-amnesic MCI [2.74 vs. 1.30; $t(782)=3.82$; $p < 0.001$]. This finding persisted after adjustments for demographic variables and MMSE scores [$F(1,769)=5.77$, $p=0.017$]. Total FAQ scores did not differ between single- vs. multiple-domain amnesic MCI (2.84 vs. 2.58; $p=0.47$) or single- vs. multiple-domain non-amnesic MCI (1.33 vs. 1.23; $p=0.90$). Multiple regression analysis adjusted for demographic variables suggested that higher total FAQ scores were strongly associated with poorer memory function ($p < 0.001$) and more modestly associated with poorer information processing speed/executive function ($p=0.028$).

Conclusions: Deficits in IADLs are more frequent and severe in amnesic MCI than in non-amnesic MCI. However, performance of IADLs is similar in single- and multiple-domain amnesic MCI. Impaired IADLs were more strongly associated with impaired memory function than with impaired information processing speed/executive function.

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T. TESHIBA, K. HAALAND, J. ADAIR & J. SADEK. Performance-based Functional Assessment: Correlation with Self- and Informant Report in a Dementia Sample.

Objective: Impaired daily functioning is a diagnostic criterion for dementia. Most research on functional decline has relied on caregiver report. These questionnaire-based measures may be susceptible to error due to lack of comprehensiveness or lack of a reliable informant. Performance-based tests may offer the advantage of greater ecological validity without requiring an informant. We report here pilot data on the association between informant- and self-report and performance-based assessment of everyday functioning in dementia.

Participants and Methods: A patient group of Alzheimer's disease and Vascular Dementia and a group of cognitively normal elderly controls, matched on age and education, were assessed with the Functional Impact Assessment (FIA) on 5 areas of instrumental activities of daily living: finances, communications, shopping, medication management and cooking. The Dementia Deficits Scale and the Geriatric Depression Scale, traditional questionnaires used to assess functional deficits and depressive symptoms, were administered to participants and to qualified informants.

Results: Worse FIA performance was associated with informant report of greater functional deficits in the patient group ($p = -.72$) but not in the control group ($p = -.11$). Worse FIA performance was associated with self-report of greater functional deficits in the control group ($p = -.46$). No correlations were found between FIA performance and reports of depressive symptoms. Patients spent more time with their informants than did controls (128 hrs/week vs. 51 hrs/week).

Conclusions: Informant reports were correlated with a performance-based measure of IADLs, and may be more accurate when informants spend more time with subjects of their report. However, informant report failed to explain most of the variance in actual performance. Studies with larger samples will be necessary to confirm these findings and to determine whether performance-based assessment has sufficient advantage over questionnaires to warrant wider usage.

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S. TOMASZEWSKI FARIAS, D. CAHN-WEINER, B. REED & D. MUNGAS. Changes in Memory and Executive Functioning are Associated with Change in Instrumental Activities of Daily Living.

Objective: Impaired everyday function is a diagnostic criterion for dementia, and a determinant of healthcare utilization and caregiver burden. Although many previous studies have examined cross-sectional relationships between cognition and everyday function in older adults, very little is known about longitudinal relationships between these domains. This study examined the association between longitudinal change in episodic memory (MEM) and executive functioning (EXEC) and change in everyday function.

Participants and Methods: Participants were a cognitively heterogeneous group of 100 elderly persons including those with normal cognition, as well as those with mild cognitive impairment and dementia.

Results: Random effects modeling showed that change in both MEM and EXEC were independently associated with rate of change in informant-rated instrumental activities of daily living (IADLs), even after controlling for age and education.

Conclusions: Findings indicate that declines in MEM and EXEC over time make unique and independent contributions to declines in older adults' ability to function in daily life.

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E. VALDIVIESO & C. MURPHY. Cognitive Function Predicted from Odor Memory, Body Mass Index and Apolipoprotein Status in Older Adults.

Objective: Age-related changes in cognition have been associated with a decrease in Body Mass Index (BMI). Evidence suggests that Apolipoprotein (APOE) e4 status and odor memory are hallmarks of Alzheimer's disease. The aim of the present study was to investigate the influence of BMI, APOE and odor memory performance on cognitive functioning of older adults.

Participants and Methods: Participants were 223 older adults ($M = 72.4$) recruited from the Alzheimer's Disease Research Center at UCSD (96 healthy adults, 92 probable AD, and 35 possible AD). APOE genotyping, height and weight were obtained from the ADRC. MMSE was used to assess cognitive functioning. An odor recognition memory test was administered. Hits and correct rejections were summed to form an odor memory composite score. Raw scores for hits and false-positive errors were also analyzed.

Results: Two regression analyses were conducted with MMSE as the outcome variable. The three factors under study significantly contributed to predict MMSE scores: BMI ($B = .13$), APOE ($B = -1.8$) and odor memory ($B = 6.3$). The model including hits and false-positive errors was also significant ($B = .7$ and $B = -.6$, respectively).

Conclusions: Cognitive function of older adults was inferior in those e4 positive individuals with low BMI and poor odor memory. Specifically, in e4 positive individuals, the inability to correctly remember odor stimuli and a tendency toward false-positive errors, and low BMI levels were associated with impaired cognitive function.

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D. WAMBACH, S. FITT, T. GIOVANNETTI, D.J. LIBON, J. EPPIG & L. BRENNAN. The Question Makes the Difference: Caregivers' Descriptions versus Predictions in Relation to Everyday Action Performance in Dementia.

Objective: Everyday action impairment is a diagnostic criterion for dementia; however there is no consensus on the best methods to assess functional abilities. This study explored relations among two types of caregiver reports and dementia patients' performance of everyday tasks.

Participants and Methods: Nineteen participants with mild/moderate dementia (M MMSE = 22.7) and their caregivers were recruited from a memory assessment program. Patients were administered the Naturalistic Action Test (NAT), a performance-based test of everyday action that includes 3 tasks of increasing complexity. A comprehensive array of distinct and uncorrelated error types, including omissions and commissions, were coded. Caregivers were asked to report 1) the patient's current ability to perform everyday tasks in the home (i.e., functional status) and 2) predictions regarding the patient's ability to perform the NAT tasks (i.e., prediction).

Results: Partial correlations, controlling for dementia severity (MMSE), showed that the caregiver reports were differentially related to particular aspects of performance. Functional status reports were significantly related to omissions ($r = -.50$, $p = .03$) but not commission errors ($r = -.22$). By contrast, caregiver predictions were significantly related to commissions ($r = -.43$, $p = .05$) but not omissions ($r = -.30$).

Conclusions: Overall, caregiver reports were significantly related to actual task performance. However, different forms of questioning may have provoked caregivers to consider different aspects of patients' functional abilities. Questions regarding functional abilities in the home may have urged caregivers to consider patients' tendency to omit task segments. By contrast, when caregivers were asked to predict patients' performance, they may have focused on patients' tendency to perform tasks inaccurately (i.e., commissions). Thus, questionnaire phraseology and patient performance patterns should be carefully considered when assessing functional abilities in dementia.

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C. WIERENGA, N.R. HORNE, L. DELANO-WOOD, A. MCCAULEY, K.A. BANGEN, A.J. JAK, D.P. SALMON & M.W. BONDI. Changes in the Neural Substrates of Semantic Memory in Alzheimer's Disease.

Objective: Confrontation naming deficits are a prominent feature of Alzheimer's disease (AD). To examine whether word retrieval deficits result from difficulty accessing lexical word forms or whether they reflect degradation of semantic memory known to be disturbed early in the course of AD, we examined the neural substrates of word retrieval in AD.

Participants and Methods: Ten right-handed, native English speaking adults with mild AD and 10 age- and education-matched nondemented controls performed an overt event-related confrontation naming task during fMRI. This task has previously been shown to differentiate between the neural substrates responsible for processing category and object attributes in healthy older adults.

Results: Behavioral results indicated no group differences in naming accuracy ($p=0.10$). Results of group BOLD analyses revealed that adults with AD showed decreased activity in inferior temporal regions (e.g., left fusiform gyrus and right middle temporal gyrus) and greater activity in the inferior frontal gyrus and anterior cingulate bilaterally. An interaction between group and category was found in the inferior frontal gyrus, pre-supplementary motor area and the middle temporal lobe bilaterally. Notably, AD adults generally demonstrated less categorical differentiation than their healthy peers in these regions.

Conclusions: Current findings reveal a deterioration of the neural substrates involved in categorical knowledge in AD. Adults with AD also showed decreased activity in inferior temporal regions typically involved in semantic processing and less categorical differentiation. These findings are consistent with the compensatory hypothesis whereby increased activity occurs in ostensibly intact frontal regions whereas activity decreases in posterior regions pathologically affected earlier in the disease process.

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D. WITTENBERG, C.A. RACINE, K. RASCOVSKY, B.L. MILLER & J.H. KRAMER. Differential Rates of Decline in Verbal Episodic Memory, Working Memory, and Spatial Abilities in Alzheimer's Disease Vs. Fronto-Temporal Dementia.

Objective: Cross-sectional studies indicate that individuals with Alzheimer's Disease (AD) have deficits in episodic memory and spatial abilities whereas those with Fronto-temporal Dementia (FTD) are im-

paired in working memory and executive function. There are few reports of longitudinal data characterizing progression of cognitive impairment. The objective of the current study was to compare rates of decline on verbal episodic memory, working memory, and spatial abilities in these two dementias.

Participants and Methods: Thirty-two AD and 23 FTD subjects with baseline and follow-up neuropsychological data were studied, with a mean follow-up interval of 13.6 months. The California Verbal Learning Task – Short Form, Digits Backward, and Modified Rey tests were administered at each time point to measure episodic memory, working memory, and spatial abilities, respectively. Data were analyzed using a repeated measures MANOVA.

Results: Overall, there is a significant three-way Diagnosis X Time X Task interaction. Post-hoc analyses indicated that FTD subjects showed a greater rate of decline on the digits backward task as compared to those with AD, whereas there were no differences in decline in verbal episodic memory or spatial function.

Conclusions: FTD subjects showed a greater decline in working memory than AD subjects. However, there is a comparable rate of decline of both episodic memory and spatial abilities between the two neurodegenerative diseases. Results indicate that as FTD progresses, cognitive impairment becomes more diffuse to greater resemble AD.

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J.T. WONG, N. DAFEEBOINI, N. TORRENCE & J. RAZANI. The Relationship between the Mini Mental Status Exam and the Direct Assessment of Functional Status in Patients with Mild Cognitive Impairments.

Objective: There is sparse research examining the predictive ability of the Mini Mental State Exam (MMSE) and everyday functional ability. The purpose of this study was to examine the relationship between the MMSE and the Direct Assessment of Functional Status (an observation-based activities of daily living task) in cognitive impaired individuals. We were also interested in the ability of the MMSE subscales to predict specific functional domains.

Participants and Methods: We examined the performance of 61 patients with cognitive deficits due to Alzheimer's disease, cerebrovascular accidents, and mild cognitive impairment. All participants were administered the MMSE and the DAFS. The MMSE is a brief 30-item cognitive screening measure that assesses domains such as orientation, attention, recognition memory, and language. The DAFS is an observation-based activities-of-daily living task that assesses domains of functioning such as communication skills, and the ability to carry out financial and shopping tasks.

Results: Correlation analyses revealed multiple significant relationships between the MMSE subscales and the specific DAFS domains of functioning. Stepwise regression analyses revealed that Orientation and Language subscales of the MMSE were the strongest predictors of all DAFS functional domains, with the exception of the DAFS shopping task. MMSE Recognition and Orientation subscales of the MMSE were the best predictors of how well patients carried out the DAFS shopping task.

Conclusions: The relationships found between the MMSE and DAFS, as well as the ability of the MMSE to predict specific daily functions in patients with dementia is quite useful for healthcare professionals and will be further discussed.

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J. YOON, M. SUH, Y. JEONG, S. MOON & D. NA. Hangul Agraphia in Early-Onset Alzheimer's Disease.

Objective: Agraphia is manifested in various forms according to the specific graphemic system of a written language. Korean alphabet,

Hangul, is a phonogram on a linguistic aspect. Graphemes within a syllable are constructed in a square pattern. Such visuospatial/constructional features of Hangul differ from those of other language (i.e., English) that is written only in a horizontal orientation. Thus, these characteristics might be susceptible to deficit of visuospatial function in patients with Alzheimer's disease (AD). However, since the early-onset AD patients have more degeneration involved in the parieto-temporal area, it is likely that these patients would show agraphia due to visuospatial dysfunctions. The aim of this study was to investigate if there were any language specific error patterns in terms of 'linguistic/phonological' and 'visuospatial/constructional' points of view.

Participants and Methods: Thirty-five patients diagnosed as early-onset AD and eighteen normal controls performed a writing task. The task consisted of 60 single syllables that had one-to-one correspondence between phoneme-to-grapheme. The stimuli were asked to write to dictation. We analyzed the errors according to the criteria the authors made.

Results: The means of error rate in patients and controls were 50.1% and 3.6%, respectively ($p < .001$). The patients showed four types of errors: linguistic only, the visuospatial/constructional only, linguistic plus visuospatial/constructional and the others. These error patterns were a significant difference between the two groups.

Conclusions: Our patients manifested visuospatial/constructional errors that are not commonly observed in English-writing patients. These findings support the notion that the visuospatial/constructional nature in Hangul writing might be vulnerable to impaired writing ability of early-onset Alzheimer's disease.

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R.F. ZEC, N.R. BURKETT & S.J. MARKWELL. Individual Differences in Performance on the Boston Naming Test in Alzheimer Disease patients and "Normal" Controls.

Objective: To examine individual differences in confrontation naming performance as measured by the Boston Naming Test (BNT) in a group of Alzheimer disease (AD) and a demographically-matched "normal" control group.

Participants and Methods: There were 48 patients diagnosed with dementia of the Alzheimer type whose performance on the BNT was compared to 48 demographically-matched "normal" elderly. For both groups, the mean age was 77 years and mean education was 11.8 years, and the groups were 52% male.

Results: The mean (\pm SD) performance on the BNT for the AD group was 40.71 (\pm 9.91), which was significantly lower (t -test, $p < .0001$) than 52.75 (\pm 4.92) for the control group. Comparing BNT z-scores for AD patients and their demographically-matched controls, 60% of AD patients were clearly impaired (moderately to very severe compared to age norms) as compared to only 6% of controls. Conversely, 40% of the AD patients were not clearly impaired (21% clearly intact, 19% mildly impaired) versus 94% of controls (77% clearly intact, 17% mildly impaired). When examining the AD group as a function of the ADAS total error score, clear impairment on the BNT was found in 50% of 12 very mildly demented patients (ADAS=6-10), 62% with mild dementia (ADAS=11-15), 46% with mild to moderate dementia (ADAS=16-20), and 90% with moderate dementia (ADAS>20).

Conclusions: BNT confrontation naming was clearly impaired in an AD group with very mild to moderate dementia compared to a demographically-matched control group. However, there were considerable individual differences in BNT performance among the AD patients within each of the four levels of dementia studied with roughly half of patients impaired in the very mild, mild, and mild/moderate dementia groups, whereas 90% of patients were impaired in the moderate dementia group. Thus, confrontation naming performance may or may not be clearly impaired in an individual AD patient with mild dementia but is much more likely to be impaired in moderate dementia.

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Dementia: Other (e.g., Semantic Dementia, FTD, VaD)

J. CHIN, S. SEO, A. PARK, H. AHN, S.J. KANG & D.L. NA. Frontal Behavioral Dysfunctions in Patients with Subcortical Vascular Mild Cognitive Impairment versus Subcortical Vascular Dementia.

Objective: Detection of subcortical vascular dementia (SVaD) in its earliest stage would be critical since modifying vascular risk factors would prevent the preclinical stage of SVaD (subcortical vascular MCI, svMCI) from progressing to SVaD. Frontal/executive dysfunctions have been known as the most distinctive feature in patients with SVaD. However, compared to the dorsolateral prefrontal dysfunctions, less is known about the ventro-medial/orbitofrontal dysfunctions in SVaD. Furthermore, few studies examined frontal and behavioral dysfunctions in patients with svMCI. The purpose of this study was to learn how svMCI is distinctive from SVaD in terms of not only dorsolateral prefrontal functions but also ventro-medial/orbitofrontal functions.

Participants and Methods: Participants were 23 patients with SVaD, 15 svMCI and 26 healthy individuals. All the subjects underwent neuropsychological tests for frontal functions, the Frontal Behavioral Inventory (FBI), and Neuropsychiatry Inventory (NPI).

Results: Compared to patients with svMCI, those with SVaD were worse at the FBI and NPI total scores, contrasting program, semantic word fluency, Stroop, and motor sequencing tests. Further analyses on items of FBI and NPI showed that SVaD patients were more remarkable for 'spontaneity', 'poor judgment', 'loss of insight', 'appetite/eating change' and 'aberrant motor behavior' items, whereas svMCI patients were more notable for 'inflexibility', 'logopenia', 'irritability' and 'agitation' items.

Conclusions: These results suggest that svMCI is predominantly affected orbitofrontal/dorsolateral aspects of prefrontal functions, and SVaD is more affected medial and dorsolateral prefrontal functions.

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J. ELDER, A. MCDERMOTT & L. KIRKLAND-CULP. Alzheimer's Disease and Vascular Dementia: Are the Memory Indices of the RBANS Sufficient for Differential Diagnosis?

Objective: Alzheimer's disease (AD) and Vascular Dementia (VaD) are two of the most common types of neurodegenerative dementias. The RBANS, which is commonly used to screen for dementia, has an Immediate Memory Index (IMI) comprised of two measures of immediate recall, and a Delayed Memory Index (DMI) comprised of four diverse measures of delayed recall. This study examined whether there were significant differences in both immediate and delayed memory for patients with AD and VaD. It was hypothesized that VaD patients would perform significantly better than AD patients on both the IMI and DMI, and that VaD patients would perform significantly better on subtests of delayed recall with a contextual or recognition component.

Participants and Methods: NINCDS-ADRDA criteria were used to identify 36 probable AD cases, and the NINDS-AIREN criteria were used to identify 30 probable VaD cases. Diagnoses were made by neurologists and neuropsychologists at the Atlanta Veterans Affairs Medical Center. The IMI, DMI, and their respective subtests were analyzed, utilizing age as a covariate.

Results: Consistent with previous findings, there was a significant difference between AD and VaD cases on the DMI ($p < .001$). At the subtest level, VaD patients performed significantly better than AD patients

on measures of verbal recognition ($p < .02$) and contextual memory ($p < .02$). There was no significant difference between groups on list and figure recall. Contrary to previous research, there was no significant difference between groups on the IMI. Further analysis of IMI subtests also revealed no significant differences between AD and VaD patients.

Conclusions: Results suggest that the interpretative value of the IMI and the immediate memory subtests appears limited. Examination of the overall DMI alone is also not sufficient for accurate differential diagnosis. A review of the delayed memory subtests is necessary for diagnostic clarification. The normative data provided for the DMI subtests can be utilized to improve diagnostic accuracy.

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J.M. HAMILTON, D.P. SALMON & D. GALASKO. Visuoconstruction Deficits Are Related to the Presence of Visual Hallucinations in Autopsy-Proven Dementia with Lewy Bodies.

Objective: Compared to Alzheimer's disease (AD), Dementia with Lewy bodies (DLB) is associated with more frequent visual hallucinations and more pronounced visuoconstruction deficits. The relationship between these cardinal features of DLB is uncertain. Therefore, this study examined the relationship between severity of visuoconstruction deficits and the occurrence of visual hallucinations in autopsy-proven DLB or AD patients.

Participants and Methods: WISC-R Block design (BD) scores and results from a psychiatric symptom interview were examined for 22 DLB patients and 44 AD patients with autopsy-confirmation. The groups were matched for age (DLB: 73.3 ± 6.2 ; AD: 72.0 ± 5.6), education (DLB: 15.0 ± 3.0 ; AD: 14.7 ± 2.8), and MMSE score (DLB: 22.6 ± 3.2 ; AD: 22.8 ± 3.6).

Results: Poor initial construction ability ($BD < 20$) predicted a precipitous decline in cognition across two years in the DLB but not AD group ($p < .001$). Ninety-two percent (11/12) of DLB patients whose Block Design performance was more severely impaired experienced visual hallucinations during the course of their illness compared to only 10% (1/10) of DLB patients with mildly impaired Block Design performance ($p < 0.001$). Importantly, this pattern was unique to DLB. In the AD group, 9.5% (2/21) of the patients with severe visuoconstruction deficits and 13% (3/23) of the patients with mild deficits experienced visual hallucinations during the course of their illness.

Conclusions: These results suggest that there is a relationship between visuoconstruction deficits and the development of visual hallucinations that is specific to DLB and not dementia in general. Moreover, the occurrence of these symptoms is related to a more malignant disease course in DLB. Future research will be needed to determine the underlying basis of this relationship.

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M.L. HENRY, P.M. BEESON & S.Z. RAPCSAK. The Evolution of Reading and Spelling Impairments in Progressive Aphasia.

Objective: The purpose of this study was to examine the nature and progression of reading and spelling impairments in two individuals with progressive aphasia.

Participants and Methods: One individual with semantic dementia (SD) and one with progressive nonfluent aphasia (PNFA) were included in the study. They were administered reading and spelling tasks comprising regular words, irregular words, and nonwords, at two points in time approximately 20 months apart (T1 and T2).

Results: Effects of regularity (regular versus irregular words) and lexicality (real words versus nonwords) were examined at each time point using Chi square tests of association and Fisher's exact probability tests.

Results indicated diverging patterns of performance in SD versus PNFA. The SD patient showed a regularity effect at T1 that was more pronounced at T2 for spelling and the emergence of a regularity effect at T2 for reading. In contrast, the PNFA patient showed lexicality effects at T1 that persisted at T2 for reading and spelling. In addition, this individual began to show regularity effects at T2 for both modalities.

Conclusions: These findings suggest distinct patterns of progression for the reading and spelling impairments in SD versus PNFA. In SD, the evolving semantic deficit likely contributes to an increased reliance on phonology and thus a progressively larger regularity effect over time. Conversely, in PNFA, worsening phonological abilities contribute to increasing difficulty reading and spelling nonwords. The emergence of regularity effects in PNFA may suggest development of a subtle lexical-semantic impairment necessitating reliance on residual phonological abilities.

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S. JESSO, M. HARCIAREK & A. KERTESZ. Semantic Dementia - Looking for Meaning.

Objective: Semantic dementia (SD) is characterized by progressive loss of semantic knowledge, fluent speech, anomia and defective single-word comprehension. SD is often difficult to differentiate clinically from less fluent primary progressive aphasia (PPA) and from Alzheimer's disease (AD). It is not clear whether a breakdown of semantics in SD is a language-specific phenomenon or whether it reflects the loss of other semantic domains as well. Thus, the aim of this study was to better characterize semantic impairment in SD.

Participants and Methods: Ten subjects with SD, 10 with PPA, and 10 demographically and cognitively matched individuals with AD participated in this study. All were given: Western Aphasia Battery, Pyramids and Palm Trees Test (P&P), and experimental tasks of defining words and naming pictures.

Results: ANCOVA, with duration of illness as a covariant and Bonferroni corrections, revealed that SD patients were impaired on naming pictures ($p < .001$), defining words ($p < .001$), and performing category fluency ($p < .05$). Interestingly, although SD patients were impaired on the word version of P&P, there was no difference between groups on the picture version. Moreover, SD's were the only patients asking the meaning of words throughout testing.

Conclusions: This study shows that, in comparison to AD and PPA, SD is characterized by severe anomia and an inability to define words, most likely due to defective single-word comprehension and a breakdown of semantics. Our results also suggest that not all semantic knowledge is lost in SD and that a semantic impairment may often reflect specific damage to the lexical-semantic network rather than to the object semantic system.

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A. KERTESZ, S. JESSO, M. BLAIR, P. MCMONAGLE, M. HARCIAREK & G. SARTONI. What Is the Meaning of Semantic Dementia (SD)?

Objective: 1. To determine the boundaries and diagnostic features of SD beyond existing criteria. 2. To establish the place of SD in the frontotemporal dementia (FTD) spectrum. 3. To determine the course and outcome of SD.

Participants and Methods: 47 SD patients chosen by the Neary et al. criteria (1988) were followed 3.8 years on average with neuropsychological testing including MMSE; DRS; COWAT; CDT; WAB; naming and definition of low frequency and polysemous words and Snodgrass pictures. Neuroimaging with MRI, CT and SPECT was evaluated. 105 Alzheimer's disease (AD) and 54 primary progressive aphasia (PPA) patients were controls

Results: Pragmatic and anomic deficit was early, later the questioning of the meaning of things (“What is steak?”), while retaining good articulation and syntax was diagnostic. Half of patients began with the behavioral features of FTD. Absence of phonological paraphasias helped to distinguish it from AD and PPA. Stage related development of visual agnosia implicates the right hemisphere according to imaging data. Disinhibited behavior and loss of fluency developed in patients who were followed long enough. Extrapyramidal disorder and delusional states, occurred in two cases each. We report on the pathology of 9 patients (20%).

Conclusions: SD is part of the FTD spectrum. Definition as a fluent aphasia is insufficient, even misleading as AD and initial PPA are also fluent. Later transcortical sensory aphasia with the questioning of the meaning of things is typical. Behavioral abnormality of FTD occurs regularly before or after SD

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J.C. KWON, S. AHN, K. PARK & N. CHOI. The correlation of ischemic burdens and neuropsychological abnormalities in Binswanger type Vascular Cognitive Impairment.

Objective: Because of evolving criteria and heterogeneous pathophysiological mechanisms of vascular cognitive impairment (VCI), the research of vascular cognitive impairment is difficult to design and perform. To overcome these problems, the selection of more homogeneous group has been needed. We performed the analyses of neuropsychological abnormalities and ischemic burden in Binswanger type VCI quantitatively.

Participants and Methods: We selected 37 VCI patients with Binswanger type ischemic changes (age ; 73.0 ± 6.6 , education ; 7.5 ± 4.9 , MMSE ; 20.9 ± 5.2). All subjects were performed detailed neuropsychological tests and brain magnetic resonance imaging. Two neuroradiologists rated severity of ischemia in periventricular white matters which were divided to five areas - frontal horn, body and occipital horn of the lateral ventricle, frontal and parietal centrum semiovale - quantitatively on PACS. We analysed the correlations of ischemic burdens in each areas and neuropsychological abnormalities in subtests of each domains.

Results: There were no significant correlation of ischemic burdens in occipital horn, body area of lateral ventricle and parietal centrum semiovale with any neuropsychological subtests. There were no significant differences between each hemispheres. There were negative correlation between ischemic burden in frontal horn area with delayed recall ($p < 0.01$), Korean version Boston naming test ($p < 0.01$), Rey figure copy ($p < 0.01$) and contrasting program ($p < 0.01$). And in frontal centrum semiovale areas, there were also negative correlations with immediate verbal recall ($p < 0.01$) and instrumental ADL ($p < 0.01$).

Conclusions: We suggested patients with moderate to severe Binswanger type VCI showed significant correlations with specific neuropsychological abnormalities in frontal white matters. This significant correlations may suggest therapeutic implication of acetylcholine esterase inhibitor for subcortical vascular dementia, especially for Binswanger type.

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J. MEDINA & S. WEINTRAUB. Assessing Depression in Primary Progressive Aphasia.

Objective: PPA is a clinical dementia syndrome in which language functions decline over time while other cognitive and behavioral domains remain relatively preserved for at least 2 years after symptom onset. PPA patients are likely to experience depression due to their progressively diminishing communication skills. The assessment of mood in aphasic pa-

tients is difficult, given that most measures rely heavily on the use of language. This study was designed to 1) validate the Visual Analog Mood Scale (VAMS) as a nonverbal measure of mood in PPA; and 2) determine whether PPA patients' caregivers can reliably report on patients' mood symptoms.

Participants and Methods: PPA patients with intact language comprehension were administered the VAMS and the Geriatric Depression Scale (GDS). Caregivers were interviewed using the Cornell Scale of Depression in Dementia (CSDD).

Results: Preliminary results reveal that PPA patients who do not have clinically significant scores on the GDS (< 10) also have VAMS scores that are not clinically indicative of a negative mood state, revealing that the VAMS may accurately capture mood symptoms in this population. Caregiver report of patient mood is correlated with patient report of mood ($p < 0.05$), such that an elevated GDS score corresponds to an elevated CSDD score.

Conclusions: A multi-faceted assessment of PPA patient's mood, including a nonverbal scale and informant ratings, may help to better identify symptoms of depression in PPA patients, especially in those who cannot complete standard verbal measures.

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C. MILLIKIN, G. BROUSSEAU & A. KILGOUR. Dementia Assessment of Three 50 Year-Old Women Reveals Two Rare Conditions.

Objective: Dementia is rarely diagnosed in people younger than age 65. Memory difficulties in middle-aged adults can often be attributed to psychological distress or other causes (e.g., physical illness, medications). Although Alzheimer's disease accounts for a sizable proportion of early onset dementia cases (25-34%), most are due to other disorders such as frontotemporal dementia, Creutzfeld-Jacob disease, or alcohol-related dementia. The objective of the current work was to describe the differential diagnosis of three 50 year-old women who were referred to the first author for assessment of possible dementia.

Participants and Methods: The three women underwent comprehensive neuropsychological assessment in an out-patient setting using standardized clinical tools.

Results: Case 1 had undergone assessment one year previously and the results had been consistent with dementia. Follow-up testing revealed severe impairment in naming and receptive vocabulary, suggesting a semantic dementia. Neuropsychological assessment of Case 2 was very limited due to severe apraxia. Given her overall clinical presentation, corticobasal degeneration appeared to be the most likely explanation for her impairment. Case 3 was more typical of middle-aged individuals referred for dementia evaluation. Her test scores were nearly all in the average to high average range. Measures of psychological distress suggested significant depressive symptoms and possible Axis II psychopathology; therefore, she was referred for further psychodiagnostic assessment.

Conclusions: Neuropsychological assessment revealed quite different profiles for these three women, with none being suggestive of probable Alzheimer's disease. The value of neuropsychological testing in the evaluation of early onset dementia will be discussed in the context of other clinical information and neuroimaging results.

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J. OSHER, S. MUSIL & S. WEINTRAUB. Emotional Word Processing in Frontotemporal Dementia.

Objective: Research has shown that patients with frontotemporal dementia (FTD) have marked deficits in their ability to recognize emo-

tional facial expressions; however, processing of emotional information imbedded in language has not yet been examined. The present pilot study was carried out to determine whether the emotional deficits previously described in FTD extend to the recognition of emotional valence in words.

Participants and Methods: FTD and healthy control (NC) subjects were presented with words selected from the Affective Norms for Emotional Words registry, which are normed for valence (i.e., emotionally positive, negative or neutral). For this study, words were divided into “emotional” and “neutral” based on these valence ratings. These words were also subdivided into “concrete” and “abstract” based on the MRC Psycholinguistic Database concreteness ratings to determine whether subjects’ difficulty with emotional words is based on the abstractness or emotional content of the word. Subjects indicated whether a word presented via computer was emotional or neutral. Accuracy and reaction time were recorded.

Results: NC subjects associated emotionality with abstractness, performing near ceiling at identifying abstract emotional words but performing poorly at identifying emotional valence in concrete words. In contrast, FTD subjects could not identify emotional content in either abstract or concrete words.

Conclusions: Cognitively intact individuals seem not to assign emotional valence to concrete words but are sensitive to the emotional valence of abstract words. Patients with FTD cannot appreciate emotional valence in either type of word. Failure to recognize the emotional content of words may contribute, along with other emotional processing deficits, to the progressive social and emotional alienation of individuals with FTD.

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A. PLOWHEAD. Working Memory in Differing Sub-types of Dementia in Male Veterans.

Objective: Assessment of working memory impairment is a vital element of neuropsychological testing used to determine dementia diagnosis. More information about the specific measures used is needed to help clinicians distinguish between the myriad of dementia diagnosis that are possible. This study attempts to determine preliminary findings that can be used to generate hypothesis for future study.

Participants and Methods: The data for this study was extracted from archives of clinical neuropsychological testing performed over a two year period at two VAs. Five hundred forty eight patient records were reviewed for participant selection. Participants were included in the study if the neuropsychological evaluation resulted in a diagnosis of dementia and were administered a battery that consisted of a minimum of four common tests of working memory. Participants were male veterans from the age of 52 to 83, the AD group included 13 participants, VD group had 14 participants, Dementia NOS group consisted of 6 participants, and the FTD group had 6 participants.

Results: Significant findings were established, using a multivariate analysis, for differences in AD, VD, FTD, and Dementia NOS on a measure of rapid forgetting (Delayed Word Recall Test) and a measure of working memory (Arithmetic subtest Wechsler Adult Intelligence Scale III). Differences were found to be moderately significant on other neuropsychological tests.

Conclusions: Few studies focus on gender in relation to the use of neuropsychological tests in differential diagnosis of dementia. The information from this study could be used to stimulate future research focusing on differences in working memory between men and women with dementia.

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L. QUITANIA, D. CAHN-WEINER, C. RACINE, D. DEAN, R. KETELLE, D. DELIS, B. MILLER & J.H. KRAMER. Ecological Validity and Neuroanatomical Correlates of the D-KEFS California Card Sorting Test.

Objective: Card sorting tasks are neuropsychological instruments thought to measure problem solving ability and to reflect frontal lobe function. We hypothesized that the D-KEFS California Card Sorting Test (CCST) would significantly correlate with real world problem solving ability as measured by Judgment and Problem Solving (JPS) subtest of the Clinical Dementia Rating scale (CDR) as well as with quantified MRI volumes of the frontal lobes in patients with dementia.

Participants and Methods: We studied 68 patients from the UCSF Memory and Aging Center (25 AD, 29 FTD, 14 SD; mean age 59.6 ± 7.0 and mean MMSE 24.1 ± 4.3). The CDR, CCST, and MRI were administered within 90 days of each other. MRI images were processed with BRAINS2 software. Hierarchical multiple regressions were employed, with each subscale of the CDR as the criterion and CCST as the predictor after controlling for age and MMSE in the first step of the model. Separate models for left and right lobar volumes were constructed to test their relationships with the CCST.

Results: CCST independently predicted JPS, accounting for 7% of the variance ($\beta = -.29$; $p < .05$). It did not predict any other domain of function from the CDR. Left ($\beta = .33$; $p < .05$) and right ($\beta = .40$; $p < .01$) frontal volumes accounted for 5% and 9% of the variance, respectively, on CCST performance independently of other brain regions.

Conclusions: The CCST is an ecologically valid instrument specific to real world problem solving ability, and reflects frontal lobe integrity, in a mixed sample of dementia patients. In conclusion, the CCST is a valuable instrument that bridges the relationships between neuropsychological assessment, real world abilities, and frontal lobe functioning.

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K.P. RANKIN, H. ROSEN, C.M. STANLEY, S. GLENN, M.W. WEINER & B.L. MILLER. Neuroanatomy Underlying Ecologically Realistic Emotion Identification in Dementia.

Objective: Emotion comprehension deficits have been demonstrated in dementia patients, but the underlying neuroanatomy has been investigated only using static pictures of faces or isolated audioclips as testing stimuli. Functional imaging of emotional prosody recognition shows bilateral temporal and inferior frontal activations, while emotional faces activate right temporal areas. We investigated whether patients ability to name emotions from more realistic, multimodal stimuli would correlate with expected patterns of focal atrophy.

Participants and Methods: Eighty-seven subjects (19 Frontotemporal Dementia, 10 Semantic Dementia, 4 Progressive Nonfluent Aphasia, 5 Corticobasal Degeneration, 9 Progressive Supranuclear Palsy, 27 Alzheimer’s, 13 Normal controls) were tested with the Emotion Evaluation subtest of the Awareness of Social Inference Test (TASIT), in which actors display 7 basic emotions (happiness, surprise, neutral, sadness, anger, fear, disgust) in 20-second video clips. We analyzed the relationship between brain volume and TASIT scores using voxel-based morphometry of structural MRI scans, including age, sex, and total intracranial volume as covariates.

Results: Only ADs, FTDs, and SDs showed, impaired recognition of emotions overall ($p < 0.01$ vs NCs). After rigorous FWE correction ($p < 0.05$), bilateral atrophy to the insula, inferolateral frontal language areas, left middle temporal gyrus, and striatum correlated with poorer scores on emotion naming, consistent with functional imaging research.

Conclusions: Even with ecologically realistic reinforcement of an emotional signal from multiple input modalities, AD, FTD, and SD patients still have deficits naming others’ emotions, which appear to originate in damage to subcortical structures involved in primitive emotion processing, as well as temporal and frontal structures involved in interpreting speech prosody.

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K. RASCOVSKY, W.W. SEELEY, J.K. JOHNSON, G. RABINOVICI, J.H. KRAMER & B.L. MILLER. Neuropsychological Patterns of Behavioral Variant Frontotemporal Dementia (bvFTD) and Alzheimer's Disease (AD): An Autopsy-Confirmed Study.

Objective: To determine whether a brief neuropsychological battery can discriminate between patients with behavioral-variant frontotemporal dementia (bvFTD) and Alzheimer's Disease (AD).

Participants and Methods: We compared the performance of patients clinically diagnosed with bvFTD (n=15) (later confirmed to have frontotemporal lobar degeneration (FTLD) pathology) and autopsy-confirmed AD patients (n=15) on a one-hour bedside neuropsychological battery. Both groups had comparable dementia severity as measured by the Mini-Mental State Examination (bvFTD MMSE=25.8, AD MMSE=23.1, $p>.05$). The battery assesses multiple cognitive domains including memory (California Verbal Learning Test–Short Form, recall of the Modified Rey–Osterrieth figure), language (15-item Boston Naming Test), working memory (Digits Backward), visuospatial ability (Modified Rey–Osterrieth figure), generation (letter fluency, category fluency, D-KEFS Design Fluency), mental flexibility (Modified Trail-Making Test) and response inhibition (Modified Stroop Interference).

Results: BvFTD patients performed significantly worse than AD patients on letter fluency, but significantly better on the copy and 10-minute recall of the Modified Rey–Osterrieth figure ($p<.05$). A logistic regression model that included the Rey figure copy and letter fluency correctly classified 93% of patients with bvFTD and 87% of patients with AD.

Conclusions: BvFTD and AD produce distinct neuropsychological profiles, which may improve antemortem prediction of underlying histopathology. BvFTD patients were more impaired in letter fluency (sensitive to frontal lobe dysfunction), whereas patients with AD were more impaired in visual memory and visuospatial abilities (sensitive to medial temporal and parietal association cortex dysfunction). Overall, a brief neuropsychological battery utilizing tests of visual memory, visuospatial abilities and letter fluency can help differentiate bvFTD from AD.

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J. REILLY, J.E. PEELLE & M. GROSSMAN. Semantic Naming Errors in Alzheimer's Disease and Frontotemporal Dementia: Evidence for Interactivity in Semantic Memory.

Objective: To examine the neural substrates of semantic processing in patients with frontal versus temporal lobe atrophy.

Participants and Methods: Participants included patients with Alzheimer's Disease (AD, n=36), Semantic Dementia (SD, n=21), or Progressive Nonfluent Aphasia (PNFA, n=12). Patients named 60 line drawings representing a range of semantic categories. Stimuli were matched for frequency, imageability, and visual complexity. Naming errors were coded as one of the following types: superordinate (animal for dog), subordinate (Labrador for dog), coordinate (cat for dog), functional (cut with it for knife), contextual (lives in the jungle for elephant), or physical attribute (orange for pumpkin). We correlated semantic naming errors with regional gray matter atrophy using voxel-based morphometry (VBM).

Results: Semantic error distributions were distinct across patient groups. AD patients produced more coordinate and superordinate errors than SD, whereas SD patients approached significance for producing more functional-associative errors than AD. SD patients made significantly more functional-associative errors than PNFA, whereas PNFA patients

produced more superordinate errors than SD. A VBM correlation of semantic errors with regional cortical atrophy revealed that functional naming errors and associative errors correlate with left lateral temporal lobe atrophy, whereas hierarchical categorization errors (e.g., superordinate) correlate with inferior frontal lobe atrophy.

Conclusions: Distinctive error patterns associated with specific distributions of cortical atrophy in these patients are consistent with the differential impairment of components supporting semantic cognition. These findings are interpreted in support of a theory of semantic memory involving an interaction between distributed sensorimotor representations (e.g., context in parietal cortex, visual form in ventral temporal lobe) and amodal object knowledge in lateral temporal cortex, both mediated by a frontal lobe semantic working memory system.

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K. SCHENK, A. BERHEL, S. VERDE M.A., M. WIDMEYER & J. KRAMER PSY.D. Assessing the Mental Rigidity of FTD Patients Using a Random Number Generation Task.

Objective: Mental rigidity and inflexibility are supportive diagnostic features of fronto-temporal dementia (FTD). This study evaluates random number generation (RNG) as a novel measure of cognitive inflexibility in FTD patients. We analyzed patients' performances using a general randomness measure and a measure of their ability to inhibit and alter an over learned production schema, ascending counting.

Participants and Methods: Seven FTD (MMSE 25.9 +/- .69, Age 64.7 +/- 7.3) and nine age-matched normal control (AMNC, (MMSE 29.4 +/- .88, Age 68.4 +/- 12.2)) subjects were asked to generate a set of 100 numbers randomly, avoiding any obvious or predictable patterns. As an "inflexibility measure" we summed the number of ascending counting instances of length 2-10 in each set of 100 responses. Sets containing more strings of numbers in numerical order reflected greater mental rigidity. As a measure of "randomness" we used the sum of the number of unique sequences of length 3 and 4. Higher sums reflected a greater tendency to be random.

Results: FTD patients were found to have significantly more instances of ascending counting ($p=.016$ by t-test) and significantly less sum of unique sequences of length 3 and 4 than our AMNC group ($p=.042$).

Conclusions: FTD subjects were less capable of avoiding over learned sequencing behaviors when instructed to generate numbers randomly. Within a set of 100 responses they generated numbers in numerical order significantly more frequently, and had lower sequence sums, than AMNC subjects. These results indicate that the RNG task assessed in this way can measure mental rigidity and inflexibility in FTD patients. Correspondence: *Katrin Schenk, Ph.D., UCSF, 350 Parnassus, San Francisco, CA 94143. E-mail: schenk@phy.ucsf.edu*

N.F. SZCZERBACKI, J. MEDINA & S. WEINTRAUB. A Comparison of Geriatric Depression Scale Scores in Alzheimer's Disease and Primary Progressive Aphasia.

Objective: Primary Progressive Aphasia (PPA) is a dementia syndrome in which language functions decline over time while other cognitive domains remain relatively preserved. This is in contrast to Alzheimer's disease (AD), where memory is the salient domain of impairment. AD and PPA patients are both known to experience depression. The purpose of this study was to examine whether there are differences in symptoms of depression between these two groups.

Participants and Methods: Geriatric Depression Scale (GDS) scores from PPA (n=61) and AD patients (n=35) were compared. Responses to individual items on the GDS were explored in each group and the relationship between GDS and neuropsychological tests scores from each group was examined.

Results: Although total GDS scores for PPA (median = 8.00, range = 0-24) and AD (median = 4.00, range = 1-18) patients were not significantly different, PPA patients' scores were more likely to fall in the depressed range than those of AD patients (34% vs. 27%, respectively). In PPA, but not AD, the number of symptoms endorsed on the GDS correlated with severity of naming impairment. Symptoms of sad mood, agitation/restlessness, and social withdrawal, were more frequent in PPA patients than in AD patients.

Conclusions: Symptoms of depression may manifest differently in PPA and AD, and severity of language impairment is associated with greater depression in PPA but not AD. Given the differential pattern of depressive symptoms between these two groups, future research should explore in more depth whether the relationship between depression and other cognitive factors (i.e. memory, insight) differs between these two groups of dementia populations.

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Y. TONOMURA, K. SAITO, M. OTSUKI, Y. NAKAGAWA, T. KIRIYAMA, H. KATAOKA & S. UENO. Brain Imaging of Progressive Nonfluent Aphasia.

Objective: The early diagnosis of progressive nonfluent aphasia (PA) can be difficult without objective evaluation method when the symptoms are trivial. The aim of this study is to elucidate the useful objective methods to scrutinize for the abnormal region on the patients of PA.

Participants and Methods: We examined the clinical symptoms of two patients with PA comparing the effectiveness between two methods: I-123 iomazenil (IMZ) SPECT and Tc-ECD SPECT. Eight neurologists also judged these images blindly for comparison of effectiveness.

Results: Two Japanese women (80 and 76 y.o.), who had recognized gradually progressive difficulty in speech since several years before consultation. Their general intelligence was preserved without the change of personality. They did not show stereotyped behavior, agnosia, nor apraxia. Frontal signs such as grasp reflex were negative. Their speech was nonfluent with anarthria (or apraxia of speech). MRI imaging of the patients demonstrated general cortical atrophy. Tc-ECD SPECT of the patients showed mild hypoperfusion in the vicinity of the left frontal lobe. In contrast, IMZ SPECT showed evident focal abnormality in their left frontal lobes. Seven of eight neurologists judged IMZ SPECT more effective than Tc-ECD SPECT. One year after the first consultation in one of the patients showed progression of aphasia.

Conclusions: We concluded that IMZ SPECT is proper methods for diagnosis of PA in early stage. The reason why IMZ SPECT is more sensitive for evidencing the lesion on degenerative disease than Tc-ECD SPECT, is that IMZ SPECT may reflect direct neural loss.

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Emotion

M. DIEUVIL, Y. ROGALSKI, B. KLUGER, D. BEVERSDORF, A. RAYMER, D. WILLIAMSON & K. HEILMAN. Assessment of Emotional Semantics in Early Alzheimer's Disease.

Objective: Whereas it has been recognized that deficits in propositional semantics are found in Alzheimer's disease (AD), it is unknown whether patients with AD have deficits in emotional semantics. Deteri-

oration of emotional semantic networks in AD could interfere with social interactions and compound behavioral disturbances. To learn if patients with AD have deficits in emotional semantics, we asked AD patients and controls to rate the emotional connotations of pictures and words. We hypothesized that AD affects emotional semantic networks.

Participants and Methods: We recruited seven experimental participants (mean +/- SD: age = 73 +/- 8.7; MMSE = 23 +/- 3.4) who met NINCDS-ADRDA criteria for probable AD and twenty control participants (age = 76 +/- 10; MMSE = 29 +/- 1.4). Participants made affective ratings of stimuli selected from the Affective Norms for English Words and the International Affective Picture System using the Self-Assessment Manikin scale. Participants also completed the Boston Naming Task (BNT) and made expense ratings of words to assess propositional semantics and lexical retrieval.

Results: Participants with AD scored lower than controls on the BNT (mean +/- SD: 48 +/- 12 versus 56 +/- 7) but did not show differences in their ratings of expense words. There were no significant differences between these groups in their affective ratings of pictures or words.

Conclusions: These findings suggest that emotional semantic networks are relatively intact in mild AD despite neuropsychological evidence showing medial temporal and left parietal dysfunction. Ratings of emotional valence might depend on frontal networks that are unlikely to be involved in early AD.

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Other

A. MIELE, G. TREMONT, M.M. SMITH & H. WESTERVELT. Cross Task Consistency of Memory Performance in Mild Cognitive Impairment.

Objective: Clear guidelines have not been established to indicate the best method for defining memory impairment in Mild Cognitive Impairment (MCI). We investigated whether consistent performance was observed between the Hopkins Verbal Learning Test- Revised (HVLT-R) and Logical Memory (LM) from the Wechsler Memory Scale-III in patients with MCI.

Participants and Methods: 68 individuals (30 males, 38 females) who met Petersen's criteria for amnesic (n= 18) or amnesic plus (n=50) MCI completed the HVLT-R and LM as part of a clinical evaluation. Participants' mean age and education were 76.18 (SD=6.65) and 13.50 years (SD=3.05), respectively. Average MMSE score was 26.78 (SD= 2.08).

Results: On HVLT-R delayed recall, 85.3% of participants performed in the MCI range (≥ 1.5 SD below the mean) compared to only 33.8% on LM-II. LM impairment almost always corresponded to HVLT-R impairment, but only half the cases showed a correspondence between HVLT-R impairment and LM impairment. After dividing participants into two groups based on HVLT-R delayed recall (58 impaired, 10 not impaired), we found that the impaired group performed significantly worse on delayed recall of LM story A than the non-impaired group ($p=0.048$). Groups did not differ on any other aspect of LM.

Conclusions: Our results demonstrate that patients with amnesic MCI show more frequent impairment on HVLT-R compared to LM, suggesting that LM performance may not be the best method for early detection of memory impairment in older adults. Our findings, however, suggest that delayed recall of a story presented once may be sensitive to early memory loss.

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SATURDAY AFTERNOON, FEBRUARY 9, 2008

Poster Session 12: Neurocognitive Functions

1:00–2:30 p.m.

Attention

M.T. ACOSTA, F.X. CASTELLANOS, K.L. BOLTON, J.Z. BALOG, M. ARCOS-BURGOS & M. MUENKE. Latent Class Subtyping of Attention-Deficit/Hyperactivity Disorder and Comorbid Conditions.

Objective: Genetic studies of Attention-Deficit/Hyperactivity Disorder (ADHD) generally use discrete DSM-IV subtypes to define diagnostic status. To improve correspondence between phenotypic variance and putative susceptibility genes, multivariate classification methods such as latent class analysis (LCA) have been proposed.

Participants and Methods: To perform LCA in a sample consisting of 1010 individuals from a nation-wide recruitment of unilineal nuclear families with at least one child affected with ADHD and another either affected or clearly unaffected. Methods: LCA models containing one through ten classes were fitted to data derived from all DSM-IV symptoms for ADHD, Oppositional Defiant Disorder (ODD), and Conduct Disorder (CD), as well as seven items that screen for anxiety and depression from the National Initiative for Children's Healthcare Quality (NICHQ) Vanderbilt Assessment Scale for Parents (VAS-P).

Results: We replicated six to eight statistically significant distinct clusters, similar to those described in other cross-cultural studies, which are mostly stable when comorbidities are included. For all age groups, anxiety and depression are strongly related to inattention symptoms and combined subtypes. Externalizing symptoms, especially CD, are strongly associated with the combined subtype of ADHD. ODD symptoms in young children are associated with either CD or anxiety-related symptoms.

Conclusions: Multivariate classification methods such as LCA allow inclusion of information about comorbidities to be quantitatively incorporated into genetic studies. In addition, LCA permits incorporation of milder, but still impairing, phenotypes than are allowed in the DSM-IV framework. Such methods may be essential for analyses of large multi-center datasets and may be relevant for future clinical classifications. Correspondence: *Maria T. Acosta, MD, Neurology; Children's National Medical Center, 111 Michigan Av NW, Washington DC, DC 20010. E-mail: macosta@cnmc.org*

J.W. ANDERSON, A. CROW & S. FERRELL. "Time Flies When You're Having Fun": Estimating Time during Demanding and Non-Demanding Attention Tasks.

Objective: The ability to accurately estimate the passage of time plays an important role in helping to structure daily activities. We examined whether there is a difference between time estimations made during demanding and non-demanding attention tasks.

Participants and Methods: Forty-eight participants completed a prospective verbal time estimation paradigm to investigate time perception during demanding (serial addition) and non-demanding (saying numbers aloud) attention tasks. Verbal time estimations were made for filled intervals of 10, 25, 45, and 60 seconds. Measures of time estimation included absolute discrepancy, duration judgment ratio, and coefficient of variance scores.

Results: We found that the absolute difference between estimated and actual time increased to a greater degree with longer time durations on the attention demanding task. The duration judgment ratio revealed that participants consistently underestimated time by a similar ratio across intervals, with larger underestimations of time on the demanding task. The coefficient of variance revealed greater response variability on the demanding task than the non-demanding task.

Conclusions: Overall, participants had more difficulty estimating time during demanding than non-demanding attention tasks. These findings suggest that attention demanding tasks take away cognitive resources necessary to make accurate time estimations, providing additional support for the attentional model of timing.

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A.E. ASBJORNSEN, T. MANGER, L. JONES, L.H. MUNKVOLD & J.E. OBRZUT. Can a rating scale for attention deficits identify attention problems among prison inmates?

Objective: Attention deficit and hyperactivity disorder (ADHD) is frequently found among prison inmates, and the inmate population is therefore optimal for testing assumptions about screening procedures for ADHD in adults.

Participants and Methods: Twenty-eight male adult Norwegian prison inmates (mean age 30.2 years, sd = 8.9) were asked to complete the Wender Utha Rating Scale as a part of an examination of attention and reading skills. Further attention assessment included the Continuous Performance Test (CPT), Dichotic Listening with Forced Attention (DLFA), and a selective attention cancellation task (the D2 test).

Results: The correlation analyses yielded significant coefficients for the WURS-25 scores with CPT, D2, and DL during the forced left (FL) task but not during the forced right (FR) task. The intra-correlations between the attention tasks were also significant. Fifty seven percent of the sample scored above the cut-off of 46 on the WURS-25 scale, and 32 percent of the sample achieved a CPT confidence index score above 50. Twenty-five percent of the sample scored above cutoff on both scales. The impairment score found on the WURS-25 was not confirmed by the other attention tests in 32 percent of the sample.

Conclusions: The results supported the assumption that the WURS-25 score shares a significant part of the variance with tests of attention commonly used in clinical assessment. However, the risk of making both false positive and false negative inferences is present, as the specificity and the sensitivity of the rating scale needs to be further explored.

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J.P. BAERWALD & G. RYAN. The Effects of Interstimulus Timing on Modal and Bimodal Response Sensitivity and Bias in a Continuous Test of Focus Attention.

Objective: This study examined interstimulus timing variability in an auditory and visual attention task, called the Test of Modal Attention Functioning (TOMAF; Baerwald, 2007). TOMAF is a computer generated task of focused attention that presents auditory and visual targets ("O") and foils ("X"); essentially this task is based on go/no go paradigm of attention measurement. TOMAF is structured in 4 sets of 100 trials. The order of stimulus presentation, while in a pseudorandom pattern within each set, is identical across all four sets with the exception of interstimulus timing. The interstimulus timing in Set 1 = 1000msec, Set 2 = 2000msec, Set 3 = 3000msec. The interstimulus timing in Set 4 is a pseudorandom distribution of the timing in the prior three sets.

The primary purpose of this study is to examine the effects of interstimulus timing on response sensitivity, not only for unimodal responses but also looking at patterns of response sensitivity in crossmodal (Auditory to Visual; Visual to Auditory) and ipsimodal conditions (Auditory to Auditory; Visual to Visual). It is our hypothesis that response sensitivity will decrease from Set 1 to Set 3 across all conditions, i.e., as a function of increased interstimulus timing. It is also hypothesized that the response sensitivity of Set 4 will not be statistically distinct from Set 1, but will significantly differ from Set 2 and 3.

Participants and Methods: This study was conducted on 130 undergraduate students controlling for age, gender and prior history of learning disability and/or diagnosed attention dysfunction.

Results: Preliminary results, using d' (a measure of response sensitivity) indicates significant differences between timing sets for crossmodal attention functioning but not for unimodal responding.

Conclusions: The implications of employing varied interstimulus timing routines in computerized assessment will be discussed as well as the distinctions between unimodal and crossmodal attention functioning.

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D.W. BEEBE, M. DIFRANCESCO, S. HOLLAND, S.J. TLUSTOS, K. MCNALLY & R. AMIN. Neural Response to Chronic Sleep Restriction in Adolescents: A Pilot fMRI Study.

Objective: Chronic sleep restriction is endemic among adolescents. Little is known about the effect of chronic sleep restriction on neural functioning in adolescents or any other population. In adults, there is evidence that preserved neuropsychological performance while sleep-deprived depends upon compensatory brain mechanisms, including intensified suppression of "default mode" brain regions, such as the medial frontal lobes and posterior cingulate. In well-rested individuals, activation of default-mode regions is associated with attention lapses.

Participants and Methods: In this pilot study, we compared the neural response to a protracted working memory task in 6 healthy adolescents under conditions of optimized sleep duration versus chronic sleep restriction. The protocol called for a baseline week followed, in counterbalanced order, by weeks in which time in bed for 5 consecutive nights was either restricted to 6 hours or extended to 10 hours. Objective monitoring verified adherence to this protocol. The morning after each 5-night sequence, subjects completed a 17-min blocked series of alternating 0- and 2-back tasks while undergoing fMRI monitoring in a 3T scanner.

Results: Task accuracy was comparable across sleep conditions. However, in the sleep restriction condition subjects displayed greater suppression of activation during 2-back relative to 0-back in a region of interest (ROI) comprised of the medial frontal lobes and posterior cingulate.

Conclusions: Suppression of default mode brain regions may be particularly important to maintain attention while sleep-deprived. These preliminary findings have potential implications for understanding the brain response to chronic sleep restriction and for understanding neurological conditions that disrupt sleep or involve altered default mode activation patterns.

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A. CLARK, E. ROY, R. PARAKH, D. SMILEK, J. LYONS & R. STAINES. Inducing Slips of Action by Manipulating a Well Learned Action Routine.

Objective: Many of our daily activities are achieved through goal-oriented routines which illustrates the adaptability and efficiency of information processing. Nevertheless, slips of action do occur. This study was designed to determine if slips of action can be induced in a well learned task and if so, how these slips affect specific indicators of task performance.

Participants and Methods: Thirty (12 male) right-handed undergraduate participants were taught, with arrow cues, a sequence of dominant hand movements. Following this learning phase, a portion of the sequences were altered by either changing the spatial location of the arrow cue or by changing the actual movement goal.

Results: Results revealed that participants made numerous action slips which were most prevalent when the movement goal was altered. This

suggests that participants were unable to disengage their expected movement plan and thus were vulnerable to errors. In addition to exploring the frequency of action slips we also looked at participants' reaction and movement times on trials that preceded and followed errors and found that a speed-accuracy trade-off could not account for the slips. We also showed that frequency of slips on our task could reliably predict performance on the SART ($r=0.549$, $p=.002$), a measure of inhibitory control, and the frequency of attention failures in daily living on the ARCES questionnaire ($r=0.488$, $p=.006$).

Conclusions: Overall, the results of this study reveal that action slips can be induced by manipulating a well learned action routine and that the frequency of these induced slips reflects a participant's tendency to commit action slips in everyday life.

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R. COHEN & J. GUNSTAD. Adaptive Rate Continuous Performance Test: Standardization and Validation.

Objective: The Adaptive Rate Continuous Performance Test (ARCPT) is computerized test of sustained attention and vigilance that has been used in a large number of research studies, though clinical normative data is not widely available. This study was conducted to provide normative and validation data for the ARCPT.

Participants and Methods: The cohort consisted of 243 healthy male and female volunteers without history of neurological or psychiatric disorder. Participants ranged in age from 16-88, with at least 25 participants in each decade of life. Each completed the ARCPT, a computerized test that involves conditional binary response (yes-no) based on the occurrence of a two letter Analyses were conducted to examine the tests reliability and validity. Comparison of performance across by age and also sex were conducted.

Results: Age associated decrements in sustained attention were evident. Declines in performance increased after age 60, with worsening performance in people with more advanced age. Greatest decrements were evident on the Final ISI, though increased variability on the inconsistency index and decreased discrimination ability were also evident with advanced age. Test-retest reliability was strong ($r = .95$) on the discrimination index.

Conclusions: The ARCPT is a reliable and valid test of sustained attention that shows significant age-associated changes in attention and speed of processing performance with advanced age. This study provides normative data on this test. The ARCPT provides an alternative to standard CPT measures and has a number of advantages.

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R. COHEN & J. GUNSTAD. Attention performance on the ARCPT: A comparison of clinical brain disorders.

Objective: To compare attention performance on the Adaptive Rate Continuous Performance Test (ARCPT) for patients with different types of brain disorders. We examined indices of sustained attention, processing speed and discrimination ability as a function of brain region containing lesion.

Participants and Methods: Participants consisted of patients with neurological brain disorders assessed over a 20 year period with the ARCPT. Five clinical groups were studied (Alzheimer's Disease ($n=36$), Stroke ($n=76$), VaD ($n=33$), TBI ($n=26$); Cingulotomy ($n=19$), Seizure Disorder ($n=31$); Parkinson's Disease ($n=16$, Multiple Sclerosis ($n=$

26) and Brain Neoplasm (n=22). The ARCPT enables the assessment of sustained attention (Inconsistency Index, Vigilance Decrement), processing speed (Final ISI) and discrimination (d'). It can be completed in a shorter period of time than standard CPT. Patients were compared to healthy controls.

Results: Attention impairments were evident in all clinical groups compared to healthy controls of similar age. Final ISI was the most sensitive impairment index with all groups having significantly slowed processing speed compared to healthy controls. Patients with AD and VaD showed impairment across indices. Stroke and brain tumor patients showed differences in performance based on localization. Anterior lesions were associated with significantly greater performance inconsistency, whereas patients with posterior brain lesion had greater impairment on the discrimination index. Final ISI was impaired in MS and PD patients. MS patients also showed performance inconsistency, whereas PD patients showed greater relative impairment of processing speed.

Conclusions: The ARCPT is highly sensitive to neurological brain disorders. The fact that patients with Alzheimers Disease were markedly impaired illustrates that attention is impaired when assessed on a demanding task. Performance characteristics for other disorders tended to reflect affected functional neuroanatomy.

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S.E. COOK, M. MARSISKE & S.M. SISCO. The Impact of Distraction on Lane Navigation in Older Adults With and Without Cognitive Impairment.

Objective: In healthy adults, many driving skills have become automatic, requiring little cognitive effort. However, drivers are at heightened risk of driving failures in unfamiliar situations due to increases in cognitive effort, and particularly if experiencing losses in attention due to cognitive impairment. Much research has examined the risk of driving with cognitive impairment in usual, low-challenge driving situations and not found an effect. This study simulated complex driving, under safe and controlled conditions, to assess whether increases in challenge (single-task to dual-task), put persons with cognitive impairment at additional risk of driving errors.

Participants and Methods: Sixty-one community-dwelling participants over 65 were recruited. A consensus panel determined group status (healthy control or memory impaired) based on neuropsychological performance. Participants were administered an experimental dual-task paradigm. A driving-related task, lane navigation, was administered both alone and simultaneously with a memory recall task.

Results: When participants completed the dual-task, they showed less lane deviation than when only completing the lane navigation single-task. Results from paragraph recall show worse performance under dual-task condition. It is believed that participants became more vigilant to the driving task while sacrificing paragraph recall. Since no impairment interactions were found with the driving task, it is possible that the dual-task measures were not sensitive enough to detect the subtle changes in ability in those with memory impairment.

Conclusions: While this study explored dual-task costs using measures between-modalities (visual-manual and auditory-verbal), further work should explore dual-task driving using secondary tasks also requiring visual-manual processing to determine if within-modality interference is greater in this population.

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L. HARDER, K.R. KRULL, W. HAVINS & J. POYSKY. The Relation Between Visual-Motor Integration, Attention, and Executive Functioning in School-Aged Children with AD/HD.

Objective: Research has established that children with Attention-Deficit/Hyperactivity Disorder (AD/HD) are at risk for motor impair-

ment. Further, such deficits noted in childhood have been linked to enduring academic and social-emotional disturbance. Little research has focused on the specific role of performance-based measures of attention and executive functioning for predicting graphomotor skills. As such, it was hypothesized that attention and executive function would be predictive of fine-motor skills in children with significant symptoms of AD/HD.

Participants and Methods: To examine this relationship, archival data derived from a clinical sample referred to the Clinic for Attention Problems at Texas Children's Hospital was analyzed. Inclusion criteria included a verbal IQ score of 70 or higher, diagnosis of AD/HD, and/or score of 65 or higher on standardized parent ratings of attention problems and/or hyperactivity. Thirty-nine subjects, age 7 to 13 years, were included. Twenty-eight were male and 11 were female.

Results: A standard multiple regression model, including measures of sustained attention and executive function, was significant for predicting visual-motor integration scores ($R^2 = .299, p = .015$). Measures of cognitive flexibility and inhibition made statistically significant ($p = .006$ and $p = .047$, respectively) unique contributions to the prediction of visual-motor integration skills in this model.

Conclusions: Children with executive dysfunction, particularly impulsivity and cognitive inflexibility, are at increased risk for visual-motor integration problems. Results provide important information that will be useful in predicting fine-motor deficits in children with AD/HD, thereby allowing for improved intervention and treatment planning.

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T. KUMADA, C. NIKI, T. MARUYAMA & Y. MURAGAKI. Abnormal Spatiotemporal Dynamics of Visual Attention in Patients without Unilateral Spatial Neglect.

Objective: Recent studies have demonstrated non-spatial as well as spatial deficits in allocating attention in patients with right parietal or frontal damages. We examined whether spatiotemporal attentional deficit was observed in patients with right frontal lobe damages, using a PC-based attention-demanding task similar to the attentional blink (AB) task.

Participants and Methods: Seven patients who underwent resection of brain tumor in their right frontal lobe were participated. All showed no sign of unilateral spatial neglect in a standard test and no extinction in a confrontation test. Two streams of letters were rapidly presented in one left and one right of fixation with the rate of 133 ms / letter on a PC display. Participants task was to report two target letters presented in each stream with variable onset times.

Results: When two targets were presented closer in time, patients, as well as normal control participants, failed to identify the second target, consistent with the AB effect. However, two patients had an abnormally severe and protracted AB. In addition, these two patients showed extinction-like omission of a unilateral target when two targets were simultaneously presented. Preoperative diffusion tensor images of patients' brain revealed that association fibers between frontal lobe and temporal or parietal lobes were damaged in the two abnormal AB patients, relative to the other patients.

Conclusions: Even though no attentional deficit was detected in clinical tests, some patients showed attentional deficits in a high attention-demanding task. The deficit might be due to impairment of a front-temporo-parietal cortical network for spatiotemporal control of attention. Correspondence: Takatsune Kumada, PhD, Human Science and Biomedical Engineering, National Institute of Advanced Industrial Science and Technology, Central 6, 1-1-1 Higashi, Tsukuba 305-8566, Japan. E-mail: t.kumada@aist.go.jp

S. LUNDY, R.J. THOMA, L.K. PARKS & J. SMITH. Classic and Emotional Stroop Performance in Female Undergraduates "At-Risk" for Anorexia Nervosa and Obsessive-Compulsive Disorder.

Objective: Prior research has demonstrated numerous symptomatological, biological, neuroanatomical, and neuropsychological similarities between Anorexia Nervosa (AN) and Obsessive-Compulsive Disorder (OCD). Neuropsychological similarities in particular may be useful in understanding cognitive traits associated with these disorders. Symptoms of AN and OCD can be seen in less extreme forms in individuals who may have subclinical versions of these disorders. Neuropsychological studies with these "at-risk" populations have been somewhat helpful in determining which cognitive deficits may be underlying in both disorders, but conclusions have been limited by methodological differences. The present study examined performance on identical neuropsychological tests sensitive to frontal lobe functions in females at-risk for AN, OCD, or both. We hypothesized that the at-risk groups would perform worse than controls on tasks measuring cognitive flexibility and attentional biases.

Participants and Methods: Sixty female undergraduates (15 AN-R; 14 OCD-R; 19 AN/OCD-R; 12 NC) were administered a neuropsychological battery which included both the classic Stroop and an emotional Stroop task.

Results: MANOVAs were used to compare AR groups to the NC group on both Stroop measures. Consistent with hypotheses, the AN-risk group showed disorder-relevant attentional biases on the emotional Stroop task ($p < .05$). The OCD-risk group, however, did not show the expected attentional bias. Nonsignificant trends in line with hypotheses were found for performance on the original Stroop, with at-risk groups showing poorer outcomes.

Conclusions: Results indicated that cognitive profiles regarding flexibility and attentional biases in these at-risk groups are similar to each other and, though lesser in degree, to those in the corresponding clinical groups.

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T. MANI, R. NAKASE-RICHARDSON, T. HART & J. WHYTE. Validation of the Moss Attention Rating Scale (MARS) with an Acute Traumatic Brain Injury Sample.

Objective: Behavioral observation rating scales can provide a more ecologically sensitive measure of functioning and are useful with severely impaired and acutely injured populations. This study investigated the convergent and divergent validity of the Moss Attention Rating Scale (MARS), by comparing performance on the MARS to measures of attention, orientation, cognition, and motor restlessness.

Participants and Methods: Participants were 81 moderate-severe TBI patients admitted to a neurorehabilitation hospital over a 3-year period, as part of the TBI Model Systems program. Inpatient occupational and physical rehabilitation therapists rated participants behaviors using the 22-item version of the MARS, a Likert-type scale of attention-related behavior.

Results: Non-parametric Correlational analyses revealed that the average MARS ratings correlated strongly with other measures of attention, including individual items from the Cognitive Test for Delirium (CTD) and the Delirium Rating Scale-Revised (DRS-R) ($r = .62$ to $.70$), as well as overall scores from these measures ($r = .74$ to $.78$). On items thought to be less reflective of attention (disorganized thinking, motor agitation, lability of affect), correlations were reduced ($r = .23$ to $.48$).

Conclusions: Overall, the MARS demonstrated good convergent validity with other attentional measures, supporting its use as a measure of attention with clinical populations. The MARS is particularly advantageous in acute clinical settings, given its usefulness with populations that are significantly cognitively impaired and unable to participate in structured cognitive tasks. Further, since it may be completed by multiple rehabilitation clinicians, it is ideal for use in multi- and interdisciplinary settings.

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L. MIARMI & E. MOES. Awareness of the Environment: Cross-Modal Inattention Blindness.

Objective: Most theories of attention focus on directed attention, rather than awareness of the environment. Following Lavie's (1995) theory, we hypothesized that people are more likely to detect unexpected changes in their environment while performing a task under conditions of low perceptual load than under conditions of high load.

Participants and Methods: 53 undergraduates participated. Each person performed the Simon task under low and high perceptual load conditions. On each trial, a fixation cross was followed by a target word (LEFT or RIGHT) presented to either the left or right side of fixation. Participants were instructed to respond rapidly to the meaning of the word regardless of its location. To increase perceptual load, four red Xs were presented opposite to the target. During the task, the experimenter surreptitiously introduced four environmental changes (light, sound, odor, temperature) in each of two testing blocks. Recall, cued recall and recognition questionnaires followed the Simon task.

Results: High perceptual load yielded slower response times than low load. However, participants' ability to detect unexpected sensory changes in their environment during this task was equally poor regardless of perceptual load. Exploratory analyses revealed that participants were more sensitive to detection of changes in sound and temperature than changes in odor and light.

Conclusions: The ability to focus on a specific object or task may be advantageous when engaged in a goal-driven task, but come at the expense of damping down signals from unattended stimuli in the environment. Current findings suggest that inattention blindness is robust to stimuli from different sensory modalities.

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G.P. REYNOLDS, D.N. ALLEN & G.P. STRAUSS. Attention Bias for Positive and Negative Emotional Information.

Objective: While a number of studies have demonstrated that there is an attention bias for negative or threatening information, few studies have examined attention bias for positive information. The current study attempted to determine whether attention bias is specific to negative information or whether, under certain conditions, positive information might also capture attention. It was hypothesized that an attention bias for negative information would be particularly prominent during times of increased stress, and that an attention bias for positive information would be present during periods of decreased stress.

Participants and Methods: Participants included 33 healthy adults who completed three emotional Stroop tasks conditions that conveyed positive, negative, or neutral words. Each of the three conditions was presented twice, once under short ISI conditions (100 ms) and a second time under long ISI conditions (1000 ms) in order to determine the effects of time pressure on attention bias for positive and negative information. ES tasks were presented in a counterbalanced order.

Results: Results indicate that time pressure influenced attention bias, such that negative emotional words were more interfering under the short ISI condition (high time pressure), while positive emotional words proved more interfering under the long ISI condition (low time pressure).

Conclusions: The results are interpreted to suggest that the attention system is flexible, or that it is biased toward negative or threatening information during times of stress (high time pressure condition) but under low stress conditions is biased toward positive information.

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S.P. VERNEY, R.E. JUNG & C. GARCIA. Sustained Attention Correlates of Cognitive Ability.

Objective: Sustained attention, or the allocation of cognitive resources in a consistent manner over time, is constrained both by rapid execution and error minimization, resulting in higher performance. The Work Samples Test is a sustained arithmetic calculation measure of attention. This study investigated the relationship between intelligence and sustained attention in an undergraduate sample.

Participants and Methods: Undergraduate students ($n=402$) completed a brief cognitive ability measure (Shipley Institute of Living Scale; SILS) and 10-minute measure of sustained attention (Work Samples Test; WST). The SILS provides verbal and abstract scores and a WAIS-R IQ estimate. The WST consists of a series of arithmetic problems completed as quickly as possible over 10 minutes of sustained activity.

Results: Students' SILS performance was: WAIS-R estimate mean =102.4 (SD=8.6), verbal =28.3 (SD=3.9), and abstract =29.4 (SD=5.7). Work Samples tests performance (number and SD for correct and incorrect items) accounted for 7.7% of WAIS-R estimate ($p<0.01$), 3% of verbal ($p<0.05$) and 7.8% of abstract ($p<0.01$) scores controlling for socio-economic status. WST total correct was associated with WAIS-R and abstract scores; total incorrect was associated with WAIS-R, verbal, and abstract scores. While students had significantly more WST correct items in the first 30 sec interval compared to the other 19 time intervals, no differences were found for number or variance of correct and incorrect responses among time quartiles.

Conclusions: Sustained attention and intelligence were significantly associated in this sample. The WST may be useful as a brief measure of sustained attention and consistency in responding over time. Ethnic differences will also be discussed.

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Electrophysiology/EEG/ERP

L. BALTAZAR, G. THIBAUT, K.P. O'CONNOR, E. STIP & M.E. LAVOIE. Effect of Cognitive-Behavioral Therapy on Brain Activity Related to Stimulus-Response Conflict Processing in Gilles de la Tourette Syndrome.

Objective: Gilles de la Tourette's syndrome (GTS) is characterized by involuntary movements or sounds, also known as tics. Those suffering from the disorder develop both multiple motor tics and at least one vocal tic not necessarily appearing at the same time. There is no known cure for GTS, but a proper medication along with an efficient cognitive behavioral therapy (CBT) program can improve tic severity in adults suffering from GTS. The therapy used in our study places a special emphasis on motor execution and inhibition in tics. We hypothesized that CBT will improve tic symptoms, which in turn, will normalize brain activity related to stimulus-response motor conflict processing.

Participants and Methods: One clinical group comprised fourteen unmedicated GTS patients, free of comorbid diagnosis, matched for gender and age to a control group of sixteen participants free of any neurological or psychiatric disorder. Both groups were compared on a measure derived from the EEG, the Lateralized Readiness Potentials (LRP) during the completion of the stimulus-response compatibility task (pre-post therapy for the GTS and once for the control group).

Results: After CBT, our results indicate that tic severity and behavioral problems improved by more than 50% among all GTS participants. CBT also have a significant impact on the onset latency of the LRPs, particularly during the processing of the incompatible stimulus. In addition, both symptoms improvement and LRP change appear to be correlated.

Conclusions: The current research clearly shows that CBT have not only a behavioral and cognitive impact on tics symptoms, but also on electro-cortical activity.

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D.E. COX, K. HOLLAND, J.E. CARMONA, K. GOLKOW, S.E. VALENTINO & D.W. HARRISON. Cerebral Lateralization and Gustation: A Quantitative Electroencephalography Study.

Objective: The proposed research investigated the functional cerebral systems that may be involved in lateralized gustatory processes under a well-established theoretical framework provided by the functional cerebral systems approach (Luria, 1973). Electrophysiological measures were utilized to assess the associated neuroanatomical regions associated with gustation.

Participants and Methods: A small group ($n=11$) of undergraduate students provided the sample population. Individuals with a history of stroke, traumatic brain injury, diagnosed eating disorders, or any impairment that would limit their ability to participate in the current research were excluded. All procedures were completed in a single session. Participants completed a brief health-screening form will be to assess for inclusion criteria. The Coren-Porac-Duncan Laterality Test (CPDLT; Coren, Porac, & Duncan, 1979) was administered to assess handedness. Participants were then fitted with an electrode cap (Electrocap International) to have quantitative EEG measured via the NeuroSearch 24 system (Lexicor Medical Technology Inc., Boulder, CO). EEG was recorded and digitized at a sampling rate of 256 Hz, with filter settings of 0.5 Hz (High-pass) and 32 Hz (Low pass). Impedance did not exceed 5 kohms (across all sites) and will be arranged according to the International 10/20 standard with linked ear references. Baseline EEG data will be gathered and the participants were then instructed to consume a food bolus consisting of food of their choice. Immediately following completion of the meal, qEEG data was recorded in 4 30-second epochs.

Results: Significant laterality effects pre and post eating were found at the F1-F2 sites. The F1 site demonstrated significantly increased beta activity in the post eating condition ($F=7.4$, $p<0.05$).

Conclusions: Digestion may be intricately linked to the right frontal region. These findings may provide promising direction in the study of obesity and eating disorders.

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A.P. KEY, W. STONE, S.M. WILLIAMS, S. BRADSHAW & K. KNOEDELSEDER. Visual Processing of Facial Features in Infants at Low and High Risk for Autism.

Objective: The purpose of this project was to investigate whether infant siblings of children with autism who are at elevated risk for a diagnosis of autism process facial features differently from typical infants.

Participants and Methods: Visual event-related potentials (ERPs) and eye tracking data were recorded in 20 infants with no family history of autism and 8 infant siblings of children with autism, mean age 9 months +/- 15 days. Infants viewed photographs of smiling unfamiliar female faces. On 30% of the trials, the eyes or the mouth of the standard face were replaced by corresponding parts from a different female face to examine brain responses to changes in facial features.

Results: Condition effects were present for the peaks previously identified in infant studies as reflecting general face processing (N290, P400) but not for familiarity/novelty detection (Nc). A change in the eyes resulted in larger and faster N290 and smaller P400 peaks. In the high-risk sample, changes in the mouth rather than the eyes resulted in larger N290 component, while eyes change delayed N290 latency. Eye change resulted in increased number of fixations on eyes by all infants, how-

ever, low risk infants also increased duration of eye fixations, while high risk infants looked longer at the mouth.

Conclusions: Infants at low and high risk for autism utilized similar face processing mechanisms but differed in their preference for specific facial features. Because a reliable diagnosis of autism cannot be made at 9 months, our follow-up study will investigate whether observed altered patterns of face processing may be an early marker for autism.

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M.E. LAVOIE, G. THIBAUT, T. IMBRIGLIO, L. BALTAZAR, E. STIP & K.P. O'CONNOR. Evaluation and treatment of Tourette syndrome: An integrated behavioral and neurocognitive approach focusing on motor processing.

Objective: Our research focused on the hypothesis that significant symptom improvements, after CBT, are related to a cerebral activity modification in Gilles de la Tourette syndrome (GTS). GTS is manifested by fluctuating motor tics and one or more phonic tic. The CBT efficiency was considered an effective adjuvant to medication, but the cerebral effect of CBT has not so far been explored with that population. The aim of our research program was to compare the brain Event-Related Potentials (ERP) pre and post CBT in a population of GTS, during two distinct motor tasks.

Participants and Methods: We recorded the EEG of 16 un-medicated GTS patients, matched with 16 control participants on the basis of laterality, age and intelligence. The lateralized Readiness Potentials (LRP) was computed from double subtractions of ERPs, to isolate the supplementary motor area (SMA) activity related to response activation during the stimulus-response compatibility task. The traffic light task was also administered to extract motor ERPs related to error processing generated by the anterior cingulate cortex (ACC).

Results: Our results revealed that LRP are faster and larger in GTS than in the control group, revealing overactive SMA activation. Secondly, the GTS had a reduced cortical activation related to the inhibition of errors. Both types of measures were followed by normalization after CBT.

Conclusions: Based on these results, ERPs related to SMA are overactive, while those related to ACC are less active, which seems in accord with basic research model of GTS. CBT probably induces cerebral changes that significantly improved both motor performances and brain activity.

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M.J. MAGUIRE, M. REAGOR, G.D. TILLMAN, C. CALLEY, J. GAMINO, M. BRIER & G. HANTEN. The Neurological Underpinnings Of Individual Differences In Learning: Relating ERP Responses To Self-Reported Learning Strategies.

Objective: Learning effectively includes storing important information and inhibiting unimportant information. Individuals depend on various strategies to accomplish this goal. Here we investigated the relationship between self-reported learning strategies to the Early Frontal Old-New Effect (FN400), which is thought to be a measure of level of familiarity of an item, in a strategic learning task.

Participants and Methods: Fourteen participants were required either to attend to or to ignore visually presented words (all concrete nouns) based on perceptual features (upper or lowercase print). Event Related Potentials (ERPs) were recorded during the recognition phase, which included learned words ('old'), ignored words (IW), and novel words ('new'). After four experimental sets containing 24 words each (8 of

each type) participants' strategies were collected and then categorized by a blind rater.

Results: Although there were no significant differences in error rates or reaction times between those who used visual strategies (i.e., forming mental images of items) and those who used auditory strategies (i.e., repeating words, creating relevant sentences), the FN400 showed significant strategy differences. The FN400 was as expected for those who used visual strategies. Namely the amplitude of the IW fell between the old and new words indicating some familiarity with the item. People who reported using auditory strategies however showed a significant attenuation of the IW compared to new and old words.

Conclusions: These data indicate that even in the absence of reaction time or error rate differences the neurological underpinnings of various strategies vary greatly. Implications for education, primarily for children with ADHD, are discussed.

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P. MOES, J. VAN ROEKAL & K. WITTINGEN. Asymmetry of ERP-derived Interhemispheric Transfer Times for Facial Stimuli.

Objective: Several studies have found an asymmetry in Interhemispheric Transfer Time (IHIT) as measured by Event Related Potentials (ERPs), with right-to-left transfer times being shorter than left-to-right transfer times. A recent study also found that females had faster and more symmetrical transfer times than males (Moes, Brown & Minnema, 2007). Most studies have presented letter pairs, or unstructured stimuli to induce the ERP. The present study sought to determine if this asymmetry of IHIT, along with gender differences, were the result of structural/functional differences in the corpus callosum.

Participants and Methods: Using visual half-field presentations of face pairs, IHITs in each direction were calculated based on the time difference in N1 latency between hemispheres. If callosal structure or function were the primary factor causing differences in IHIT, then changing the nature of the stimulus should have little impact on the typical pattern of results. If hemisphere processing speed or hemisphere specialization were the primary factors, then changing the stimulus to one with features associated with right-hemisphere-dominant processing should alter the pattern of results.

Results: Results showed that the typical asymmetry of transfer speed was still evident, with right-to-left IHIT being shorter than left-to-right. While females were no longer significantly faster or more symmetric than males, there was a trend for females to be faster.

Conclusions: Therefore the weight of evidence from the present study favors a callosal structure/function explanation for transfer time differences, with differences in fiber type, or fiber quantity, being utilized for transfer in each direction as the primary factor in determining IHIT. Correspondence: *Paul Moes, Ph.D., Psychology, Calvin College, 1734 Knollcrest Circle SE, Grand Rapids, MI 49506. E-mail: pmoes@calvin.edu*

P.J. MOLFESE, V.J. MOLFESE, J. BESWICK, J. JACOBI-VESELS, A.P. KEY & D.L. MOLFESE. Dynamic Links Between Emerging Cognitive Skills and Brain Processes.

Objective: To determine whether differences in prereading skills impact the neural responses and organization for a different skill.

Participants and Methods: Participants included 18 children (7 females, mean age=52.83 mo., SD=4.42 mo., range: 46-60 mo.). DAS General Conceptual Ability scores indicated a low to above average range. Children were divided into 2 groups based on a median split (11.5 out of 20) for Get Ready to Read scores that measure emergent reading skills in preschool children (GRTR; Whitehurst & Lonigan, 2001). Visual ERPs were recorded using a 128 electrode high density array (EGI, Inc) while children viewed a high-resolution screen and pressed one but-

ton when 2 common geometric shapes were identical or a second button if shapes differed.

Results: A Principal Components Analysis (PCA)-ANOVA with Greenhouse-Geisser correction for Pre-Reading Skill (2: High, Low) x Stimulus Category (2: Match, Mismatch) x Electrode Region (5: frontal, central, parietal, occipital, and temporal) x Hemisphere (2: left, right) noted that ERPs from High Skill children discriminated matched from mismatched shapes 200 ms earlier than for Low Skill children, $F(4,64) = 3.04$, $p < .023$, power = .78, and $F(4,64) = 10.38$, $p < .0001$, power = 1.0, respectively. Source localization identified earlier activation of medial frontal and anterior cingulate areas during shape matching tasks for children with High prereading skills while those with Low skills engaged both more areas as well as more diverse areas including amygdala and inferior temporal gyri.

Conclusions: Data suggest that skill advances in one domain result in different neural organization for subsequent skill development in unrelated domains.

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A.E. MOLNAR, M.C. WAGNER, P.J. MOLFESSE, J.L. BESWICK, D.L. MOLFESSE & V.J. MOLFESSE. Electrophysiological Differences from Two Executive Functioning ERP Paradigms in the Same Children 5-to-8 Years of Age.

Objective: Event-related potentials (ERPs) were used to study processing differences from two separate executive functioning (EF) paradigms. It was hypothesized that latency and spatial topography would differ because of differences in cognitive demands.

Participants and Methods: Children (N = 94) ages 5-to-8 years participated. Scalp ERPs were recorded using a 128- high-density electrode array during Stroop and oddball tasks.

Results: A temporal principal components analysis (PCA) was conducted on the data. Factors were then submitted to an Analysis of Variance (ANOVA). Stroop data yielded 5 factors, accounting for 88.6% of the total variance; these factors were analyzed in a 2 (sex) x 3 (condition) x 5 (electrode site) x 2 (hemisphere) ANOVA. Factor 1 accounted for 61.55% of the variance and a condition x electrode [$F(8, 800) = 4.522$, $p < .01$] interaction was found at 356 ms post-stimulus presentation for the inhibition condition. Oddball data yielded four factors that accounted for 84.8% of the total variance. These factors were submitted to a 2 (sex) x 5 (electrode site) x 2 (hemisphere) x 2 (condition) x 4 (age) ANOVA. Factor 1 accounted for 61.1% of the variance and a condition x electrode [$F(4, 356) = 2.671$, $p < .05$] interaction was found at 472 ms post-target stimulus presentation.

Conclusions: Data indicate that EF performance varied by task demands in childhood and support the view that different executive function paradigms do not measure the same underlying mechanism.

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A. ROMAN, J. BESWICK, A. MOLNAR, V. MOLFESSE, D. GOZAL & D. MOLFESSE. Impact of Minor Sleep Loss on Speech Perception in 7 Year Olds.

Objective: A growing body of research indicates that even minor sleep loss can impact adult cognitive performance. The present study investigates whether minor sleep loss (1 hour/night less for 1 week) would alter event-related brain potentials (ERP) in 2 groups of children during a simple speech perception task.

Participants and Methods: 25 children screened for normal sleep participated (12 females, mean age=7.53 yrs., SD=.25 yr.). Twelve children (6 females) maintained their normal sleep schedule over 2 weeks while

13 (6 females) in the sleep loss group reduced their sleep by 1 hour in the second week. Sleep times were verified by actigraphs as well as parent maintained sleep logs.

Results: A Principal Components Analysis (PCA) ANOVA with Greenhouse-Geisser correction on the ERP data included a between factor of Sleep loss (2: 0 loss, 1 hour) and repeated measures for Consonant (3: b, d, g) x Electrode Region (5: frontal, central, parietal, occipital, and temporal) x Hemisphere (2: left, right) noted that children who slept one hour less a night for one week generated ERP components between 68 and 196 ms that differed across frontal vs. central and parietal scalp regions, $F(2.03, 4.6) = 4.68$, $p < .014$, obs. power=.76.

Conclusions: Children who maintained their baseline sleep levels over the 2 weeks showed no differences in ERP components at this latency across the scalp. Findings were interpreted to indicate that sleep loss impacts the coordination of information processing, forcing more brain areas to become differentially activated in a non-systematic manner.

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H.W. SESMA, M.K. GEORGIEFF, S.S. WEWERKA, A.J. WESTERLUND & C.A. NELSON. Assessing Cognitive Development in Infancy: Relations Between Electrophysiological and Behavioral Measures.

Objective: Diabetes mellitus during pregnancy adversely affects fetal brain development through metabolic changes secondary to chronic hyperglycemia. Maternal glycemic control and socioeconomic status (SES) moderate cognitive outcomes for infants of diabetic mothers (IDMs). This study investigated the sensitivity of event-related potentials (ERPs), visual paired comparison (VPC), and standardized cognitive measures to differences in glycemic control and SES in a longitudinal sample of IDMs and controls. We also examined the predictive validity of experimental infant cognition measures to scores on standardized cognitive tests in early childhood.

Participants and Methods: Infant participants (51 IDMs, 84 controls) were assessed by recording ERPs to familiar and novel auditory stimuli as newborns and familiar and novel visual stimuli at 6 months. Preferential looking time on the VPC also was assessed at 6 months. Standardized assessments included the Bayley Scales of Infant Development-Second Edition (BSID-II) at 12 and 30 months and the Wechsler Preschool and Primary Scale of Intelligence-Revised (WPPSI-R) at 48 months.

Results: IDMs did not differ significantly from controls on ERP or behavioral measures. Obstetric complications and macrosomia were related to ERP slow wave amplitude at 6 months. SES predicted performance on the BSID-II and WPPSI-R at 30 and 48 months.

Conclusions: Results indicate that cognitive functioning was related to biological risk in the first year, but more strongly related to environmental experiences after age 2 years. IDM group status did not affect cognitive outcomes independently from the metabolic effects associated with poor maternal glycemic control. ERPs were more sensitive to early biological risk than the VPC and standardized tests.

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G. THIBAUT, K.P. O'CONNOR, E. STIP & M.E. LAVOIE. Electrophysiological Manifestations of Stimulus Evaluation and Motor Processing in Patients with Gilles de la Tourette syndrome.

Objective: Gilles de la Tourette syndrome (GTS) is a neuropsychiatric disorder manifested by multiple fluctuating motor tics and one or more phonic tic. The cerebral mechanism responsible for its symptomatology is still uncertain, but hyperactivation of dorsolateral cortical regions, like the premotor cortex and supplementary motor area, has been demonstrated to be involved in GTS by past fMRI studies. Anomalies

in cerebral regions associated with motor processing are likely to interfere with accurate planning and execution of voluntary movements in GTS. The nature of these additional motor difficulties seen in GTS is still poorly understood and multiple comorbidities are often inadequately controlled.

Participants and Methods: The current study integrates this aspect and investigates both stimulus evaluation and motor processing in TS using event-related potentials (ERPs). ERPs constitute a useful tool for monitoring cerebral activity, recorded in synchrony with cognitive and motor processing stages. Sixteen adult with GTS were paired with 20 control participants matched on gender, laterality and intelligence. The P300 component as well as the Lateralized-Readiness Potentials (LRP) was elicited during a stimulus-response compatibility (SRC) paradigm. The Stroop test was also administered.

Results: Results revealed that participants with GTS processed incompatibility more rapidly than the control participants, whilst producing a delayed P300 peak latency. This suggests that stimulus evaluation occurs later in GTS, possibly due to fragile attentional resources. Secondly, the overlapping response selection processes would occur faster in TS, which could be explained by faster motor program selection.

Conclusions: This is congruent with the motor and dopaminergic over-activation hypothesis in GTS.

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G.D. TILLMAN. Estradiol Levels During the Menstrual Cycle Differentially Affect Latencies to Right and Left Hemispheres During Dichotic Listening.

Objective: Many behavioral studies have found high-estrogen phases of the menstrual cycle to be associated with enhanced left-hemisphere processing and low-estrogen phases to be associated with better right-hemisphere processing. However, in these studies phases of the cycle have been inconsistently defined and hormonal levels often only assumed. Electrophysiological studies too have found latency and amplitude changes associated with the hormonal fluctuation of the menstrual cycle, but have used only midline electrodes. Thus, electrophysiological corroboration of the behavioral findings regarding changes in hemispheric asymmetry has been lacking.

Participants and Methods: This study examined the changing of hemispheric asymmetry during the menstrual cycle by analyzing event-related potential (ERP) data from midline and both hemispheres of 23 women during their performance of a dichotic tasks shown to elicit a left-hemisphere response (semantic categorization) and a right-hemisphere response (complex tones). Each woman was tested during her high-estrogen follicular phase and during her low-estrogen menstrual phase. Salivary assays of estradiol and progesterone were used to confirm cycle phase.

Results: Analyses of the ERP data revealed that latency, but not amplitude, for each hemisphere was differentially affected by phase and target side, such that latencies to the left hemisphere and from the right ear were shorter during the follicular phase, and latencies to the right hemisphere and from the left ear were shorter during the menstrual phase.

Conclusions: The nature of these latency shifts suggest that the inhibitory coordination subserving the left and right hemispheres is different. These findings supply electrophysiological correlates of the cyclically-based interhemispheric differences evinced by behavioral studies.

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M.R. BRIER, M.J. MAGUIRE, G.D. TILLMAN, P. XAVIER, T.C. FERREE, M.A. KRAUT & J. HART. Neurophysiological Marker of Semantic Object Retrieval.

Objective: Semantic object memory retrieval has been shown to be disrupted in numerous neuropsychiatric disorders, yet clinical neural markers of this dysfunction have not been well delineated.

Participants and Methods: In this study, the temporal components of the semantic retrieval process were explored in 19 young, healthy subjects using the behavioral Semantic Object Retrieval Task while recording EEG. The task was to determine whether two features presented as visual words combine to activate the memory of a specific object (e.g., “desert” and “humps” → “camel”) or nonretrieval (e.g., “mane” and “wings”). EEG data were recorded from 100 ms before to 1500 ms after the event presentation, averaged by condition (retrievals vs. nonretrievals), subjected to a spatial PCA, and then subjected to a subsequent temporal PCA to isolate significant components of the event related potentials (ERPs).

Results: There was a significant ERP difference between successful retrievals and nonretrievals occurring in the left anterior temporal regions beginning at 750ms post-stimulus onset. Mean reaction time for correct retrieval was 1327ms and correct nonretrieval was 1648ms.

Conclusions: These findings suggest that semantic memory retrieval begins to differentiate from nonretrieval, anteceding reaction time by approximately 600 ms. The behavioral SORT has successfully detected semantic memory deficits in dementia and schizophrenia and the present study provides a potential neurophysiological marker of this dysfunction. The implications on early processing and discrimination as well as potential clinical applications are discussed.

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R. WAFORD, N. PRATT, C. WARREN, E. BRIAN & D. MOLFESE. Variations in Event-Related Potentials Across Time and Sleep Duration.

Objective: Utilize brain responses to predict performance on cognitive tasks and state.

Participants and Methods: Participants with no known sleep or neuropsychological disorders included 12 adults, 30-45 years of age (7 females, mean age = 37.43, SD = 4.46) who held a doctoral degree. A 256-electrode high-density array net recorded the event-related potentials (ERP) of participants who attended to frequent and infrequent tones that occurred on 70% and 30% of the trials, respectively. Participants also completed the WinSCAT, a spaceflight neurocognitive assessment battery. Participants completed both tasks during 2 successive weeks. In week 2, subjects were assigned randomly to 1 of 3 sleep conditions: control, reduction of 1 or 3 hours sleep time.

Results: Regression analyses used ERP data to frequent and infrequent tones from week 1 as predictors of WinSCAT performance in week 2. Analyses identified 3 significant models. Model 1 used ERP responses at right temporal and inferior temporal sites to predict reaction time on the WinSCAT mathematical processing subtest (adjusted R² = .687). Model 2 used ERPs from right and left inferior frontal sites to predict accuracy on the WinSCAT pattern memory subtest (adjusted R² = .574). Model 3 used ERPs from left inferior frontal and tempoparietal sites to differentiate variations in sleep time effects in week 2 (adjusted R² = .908).

Conclusions: These data indicate that ERPs can predict variations in cognitive performance across weeks and can identify individuals at risk for degradations in cognitive performance as a function of minor sleep loss.

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Hemispheric Asymmetry/Laterality/Callosal Studies

M.W. BRIDGMAN, M. SPEZIO, W.S. BROWN, M.K. LEONARD, R. ADOLPHS & L.K. PAUL. Eye-tracking During Facial Emotion Recognition in Primary Agenesis of the Corpus Callosum.

Objective: To date, psychosocial deficits in Primary Agenesis of the Corpus Callosum (AgCC) have been documented in non-literal language comprehension, humor, theory of mind, and social reasoning. This study examines facial emotion recognition in AgCC.

Participants and Methods: Nine individuals with AgCC and 9 controls completed 4 tasks involving Ekman emotional faces: emotion recognition of upright faces and inverted faces, gender naming, and passive viewing. Participants were assessed for accuracy on the three recognition tasks. Eye-movement data were gathered during face viewing, using the EyeLink II eye-tracking system, and were analyzed on all four tasks according to examiner designated facial regions of interest (ROI) for frequency of fixations, and duration of fixations.

Results: Individuals with Primary AgCC were less accurate than controls for naming emotions, especially fear and anger, for both upright and inverted faces. During emotion naming with upright faces, group comparison with controls showed that AgCC subjects exhibited smaller fractional dwell times and generally fewer fixations in the eye regions, and larger fractional dwell times and generally more fixations in the nose and mouth regions of the face stimuli. AgCC and control subjects exhibited a similar inversion effect on emotion naming (decreased accuracy for inverted compared to upright faces). Groups also did not differ in accuracy of gender identification.

Conclusions: These results support the hypothesis that a deficit in the ability to correctly identify emotions from facial expressions contributes to the psychosocial deficits evident in individuals with AgCC, and that abnormal scanning patterns may be partially responsible.

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R. CUTIONGCO, L.K. PAUL, M. SYMINGTON & W.S. BROWN. Semantic Analysis of the Awareness of Consequences Test in Agenesis of the Corpus Callosum.

Objective: Anecdotal reports and previous studies have indicated that persons with agenesis of the corpus callosum (ACC) have deficits in social cognition that make it difficult for them to navigate the complex world of social relationships, including problems “reading” social cues, lack of social insight, and diminished psychosocial recognition.

Participants and Methods: This study examined the semantic content of responses to the Awareness of Consequences test of 16 adults with ACC (age 16 - 55), all with normal IQs (FSIQ 83 - 116). Results were compared to 13 controls matched for age (18 - 42) and FSIQ (88 - 111). The Awareness of Consequences test is composed of six vignettes where the main characters are confronted with social or moral dilemmas. The participants were asked to imagine themselves in the other persons' shoes and to describe what they would think or feel. Semantic content was analyzed using the Linguistic Inquiry and Word Count.

Results: The ACC group used more words per sentence ($p < .05$). When covarying total words, individuals with ACC used fewer words pertaining to cognitive processes such as insight and causation ($p < .05$), but were not different in the frequency of emotion or social words. Furthermore, the ACC group emitted more nonfluencies ($p < .05$) and fillers ($p < .05$).

Conclusions: These results suggest that callosal absence in ACC leads to diminished ability to either image or express important aspects of the cognitive processing of other individuals, and that this test was more difficult for individuals with ACC as evidenced by more pauses and fillers.

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K.M. HARRELL, E.J. MARCO, A. PORTER, E.H. SHERR, R.J. JEREMY, L.K. PAUL & W.S. BROWN. Color-word Inhibition in Agenesis of the Corpus Callosum.

Objective: Individuals with Agenesis of the Corpus Callosum (ACC) have been shown to have deficits in a variety of cognitive domains even when IQ is in the normal range. However, it is not as yet clear whether there exists a core deficit in ACC, such as processing speed, executive functioning, or problem solving. This research tested processing speed and executive functioning in individuals with ACC as measured by a color-word interference task.

Participants and Methods: Participants ($N=13$; ages 8-57) with complete ACC and with FSIQ in the normal to borderline range (>70) were administered the version of the color-word inhibition test (based on the Stroop test) from the Delis-Kaplan Executive Functioning System, involving four conditions: color naming, word reading, color-word inhibition, and color-word interference/switching.

Results: For all subtests individuals with ACC scored significantly lower than average as indicated by test norms. Mean scale scores for color naming (5.2 ± 3.4), word reading (6.4 ± 3.0), inhibition (4.6 ± 3.3), and the inhibition/switching (4.5 ± 3.6) were all significantly lower than a scale score of 10 ($p < .01$ in all cases). These scores were also all significantly lower than the participants' FSIQ (compared as scale scores). However, neither the inhibition contrast scores ($9.5 \pm 1.2.3$), nor the inhibition/switching contrast scores (8.3 ± 4.0), were significantly lower than normal.

Conclusions: Given that the contrast scores were not significantly below normal, these results suggest that individuals with ACC have deficits primarily in cognitive processing speed, rather than cognitive flexibility. Correspondence: *Warren S. Brown, Ph.D., Travis Research Institute, Fuller Grad Sch of Psych, 180 N. Oakland Ave., Pasadena, CA 91101. E-mail: wsbrown@fuller.edu*

S.M. HILLEARY, S.D. MARION, M. SHEA & W.S. BROWN. Factor Analysis of Computerized Bimanual Motor Coordination Reveals Independent Aspects of Motor and Interhemispheric Performance in Young Adults.

Objective: Tasks of bimanual coordination have become increasingly important in assessing structural and functional underpinnings of motor performance. The Bimanual Coordination Test (BCT) has underscored the importance of interhemispheric cooperation in the context of corpus callosum development and pathology. A previous factor analysis using the original version of the task found three distinct aspects of motor functioning in children: unimanual motor speed, general visuomotor coordination, and interhemispheric interaction. The goal of the present study was to determine if a similar factor profile would emerge using a computerized version of the BCT in an adult population.

Participants and Methods: Participants were 49 adults (63% female), ages 18.5 to 25.6 ($M = 20.7$) years. Participants completed the computerized Bimanual Coordination Test (cBCT), a task of speed and accuracy which requires participants to move a cursor along angled pathways projected on a monitor using a response box modeled after an Etch-A-Sketch toy. Principle components factor analysis of speed and accuracy measures was conducted.

Results: Results generally replicated the previous factor structure with unimanual trials serving as a marker of simple motor speed, bimanual trials as a marker of visuomotor coordination, and ratios of trials requiring bimanual asymmetric to symmetric hand-speed as a marker of interhemispheric functioning.

Conclusions: The consistency with previous versions of the task indicates that the cBCT is useful for examining three aspects of neuropsychological functioning. In addition, separate factors emerged based on whether mirrored or parallel movements were required, a finding consistent with previous research showing that these movements can be explained by distinct callosal mechanisms.

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K.A. HODGES & C.A. ABEARE. Handedness and Lateralized Semantic Priming.

Objective: The purpose of the current study was to compare the lateralization of semantic processing in left- and right-handers. It was expected that Consistent Left-handers (CLHs) would exhibit the strongest right-hemispheric dominance for semantic priming while Right-handers (RHs) would exhibit the strongest left-hemispheric dominance for semantic priming. It was predicted that Inconsistent Left-handers (ILHs) would not be strongly lateralized to either hemisphere.

Participants and Methods: Eighty-nine undergraduate participants completed the Edinburgh Handedness Questionnaire (Oldfield, 1971), the MNI Handedness Questionnaire (Crovitz & Zener, 1962), and the 36-item Waterloo Handedness Questionnaire – Revised (Steenhuis & Bryden, 1989) in order to thoroughly assess handedness. A visual half-field semantic priming paradigm, with lexical decision task, was administered using related and non-related word-pairs in order to assess hemispheric biases in semantic processing.

Results: As gender was a significant covariate, data was examined using an analysis of covariance. Overall, ILHs showed more right-hemisphere semantic priming than did CLHs or RHs. Right-handers showed the expected left-hemisphere advantage for semantic priming, while CLH failed to show a hemispheric bias in priming.

Conclusions: The present study did not support the prediction that CLHs would display the greatest right-hemisphere dominance for semantic priming. A mixed factorial ANCOVA, with gender as a covariate, found a significant interaction between visual field and handedness for ILHs in that they were both faster and more accurate than the CLHs or RHs at processing verbal information in the right hemisphere. This unexpected finding that varying degrees of left-handedness result in differential lateralization of verbal functions highlights the need for greater consideration of handedness issues in laterality research.

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C.A. JACKSON, D.C. JACKSON, W.D. SCOTT & E. DEARING. Patterns of frontal brain asymmetry among children living in low-income households.

Objective: The incidence of clinical mental health disorders is relatively higher among children in low income environments. Furthermore, environmental risk factors associated with low income status may exacerbate these problems. Although the relation(s) between clinical disorders and low income status is well documented, studies are needed to assess the role of biological diatheses underlying both vulnerability and resilience to psychopathology. Such research may help to reduce the time and cost of long term clinical care. Frontal EEG alpha asymmetry is one such system that has evidenced a role in affective style and emotional responding.

Participants and Methods: The current study examined the relation between low income status and frontal alpha EEG asymmetry, as measured by multiple baseline recordings over a four month period. Participants were 12, 4-6 year-old children recruited from low-income families in a western state.

Results: Hierarchical linear modeling was used to examine patterns of association between predictors and outcomes of interest. Trends in means-as-outcome models suggest that EEG asymmetry may differentiate those children who experience more risk factors. In particular, relations between income and midfrontal EEG asymmetry were detected where higher average monthly income was associated with more relative left-sided asymmetry scores (coeff = .03, $p = .014$).

Conclusions: Thus, children with more relative activity in the left frontal lobe at rest may show increases in activation in response to a more enriched environment. Conversely, children who display more relative right-sided activation may evidence change given that fluctuation in income in low-income homes relates closely to the amount of negative affect expressed.

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I.J. KIRK, K.E. WALDIE, J.P. HAMM & M. HAUSMANN. Steroid Modification of Interhemispheric Transfer Time during the Menstrual Cycle.

Objective: It seems well established that some cognitive processes are lateralised (predominantly processed in either the left or right cerebral hemisphere), and that these functional asymmetries are generally more pronounced in men. However, recent evidence suggests that women are not less lateralised per se, but, due to changes in gonadal steroids during different stages of the menstrual cycle, their functional asymmetries are less static than those of men. The degree of lateralization may depend in part on interhemispheric transmission time (IHTT) that may be affected by steroid levels. Here we employed EEG to obtain a direct measure of IHTT during different phases of the menstrual cycle.

Participants and Methods: The interhemispheric conduction time was estimated from the hemispheric latency difference of the N170 component of the visual potential evoked from left or right visual field presentation. Eighteen right-handed women with regular menstrual cycles were tested twice, once during the menstrual phase, when progesterone and oestradiol levels are low, and once during the mid-luteal phase when progesterone and oestradiol levels are high. Plasma steroid levels were determined by blood-based immunoassay at each session.

Results: It was found that interhemispheric transfer time (IHTT) during the luteal phase was significantly longer than that during the menstrual phase.

Conclusions: Differences in IHTT across the menstrual cycle as measured here support previous reports of, and may underlie, the differences in degree of cerebral laterality in women at different phases of the menstrual cycle. On this evidence sex differences in laterality may have to be re-evaluated.

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E.A. KNUTH, J.K. IRISH, J.B. ULLOM & S.D. MARION. The Relationship Between Verbal and Nonverbal Memory and Interhemispheric Functioning in Adults.

Objective: The literature documents an increasing interest in the role that interhemispheric functioning may play in mediating cognitive skills. Recent studies have shown a relationship between episodic memory and markers of interhemispheric performance. These studies have not included behavioral measures of interhemispheric cooperation in their assessment. The goal of the present study was to investigate the relationship between verbal and visual memory and interhemispheric functioning.

Participants and Methods: 39 college students ($N = 44$, $M_{age} = 20.74$, $SD_{age} = 1.58$) were administered several measures of tactile, sensorimotor, and bimanual motor coordination, all of which contain conditions relying on interhemispheric transfer or cooperation based on previous findings. Performance on these tasks was correlated with visuospatial and verbal memory.

Results: Results indicated that better visuospatial memory was related to better performance on cooperative tactile performance ($r = -.56$, $p < .001$). Visuospatial memory was also significantly related to intra-hand ($r = -.36$, $p = .02$) and inter-hand sequencing ($r = -.47$, $p = .001$). Additionally, the effect of memory on bimanual coordination was not significant. The relationship between performance on these tasks and verbal memory was not significant.

Conclusions: The behavioral data indicate a relationship between non-verbal encoding and tactile coordination and sequencing but not with aspects of the tasks shown to require the most interhemispheric involvement, which may imply that memory is not likely a confounding factor in the behavioral assessment of motor and tactile transfer. It says little, however, about potential callosal mechanisms in memory, which have been identified by other researchers.

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S. PAZIENZA, L.K. PAUL & W.S. BROWN. Alexithymia and Somatization in Agenesis of the Corpus Callosum.

Objective: Individuals with agenesis of the corpus callosum (ACC) exhibit a variety of both cognitive and social deficits, even when their FSIQ is in the normal range. Brown & Paul (2000) reported data suggesting a tendency for alexithymia in ACC (presumably due to the lack of transfer of emotional information between the right and left hemisphere), as well as more frequent somatic complaints. It was proposed that somatic complaints may work as a substitute for verbal expressions of emotion in individuals with ACC.

Participants and Methods: The subtest of the SCL-90-R that reflects the tendency for somatization and the Toronto Alexithymia Scale (TAS-20) were given to 4 individuals with ACC and 4 age- and IQ-matched controls.

Results: Scores on the TAS-20 from the ACC group and the control group did not differ significantly (Wilcoxon Two-Sample test, $W = 14$, $p > .05$; ACC $M = 51$; control $M = 39.75$). However, on the somatization subtest of the SCL-90-R, individuals with ACC reported significantly more somatic complaints than controls (Wilcoxon Two-Sample test, $W = 10$, $p < .05$; ACC $M = 63$; control $M = 50$). The distribution of SCL-90 scores for each group did not overlap.

Conclusions: Although we were not able to replicate the finding of alexithymia, the results give rather clear indication of somatization in individuals with ACC. Since both measures were based on self-report, further research will need to be done to determine whether other forms of behavior are consistent with these measures.

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J. POOCK, S. LANTING, V. DAL BELLO - HAAS & M. CROSSLEY. Dual-Task Performance Following Right vs. Left Hemispherectomy: A Case Study of Functional Brain Asymmetry.

Objective: Previous dual-task research indicates that speed and accuracy in automatized, manual tasks (e.g., walking, finger tapping, etc.) can be differentially affected by simple vs. complex cognitive tasks. The objective of this case study was to investigate the effects of hemispheric specialization on divided attention by comparing and contrasting the dual-task performance of two high functioning adult females who underwent a left (JH) or a right (SM) hemispherectomy during adolescence.

Participants and Methods: JH (49 yrs; left hemispherectomy) and SM (47 yrs; right hemispherectomy) performed speeded walking and finger-tapping in combination with simple and complex counting during 15 s single- and dual-task trials.

Results: During the tapping dual-task, consistent with previous research, SM (intact left hemisphere) demonstrated high levels of interference on the automatized tapping task during complex counting, with well-preserved counting. In contrast, for JH (intact right hemisphere), finger tapping was well preserved at the expense of concurrent complex counting task. During the gait dual task, walking and counting rates were relatively well-preserved for both JH and SM; however, interference effects were evident in the mechanics of walking (e.g., control of hemiplegic side, increased swing through time, decreased stability on turns) for both participants.

Conclusions: Dual-task performance following hemispherectomy varies across task-combinations and dependent measures, and appears sensitive to the effects of hemispheric specialization. During gait dual tasks, it is the mechanics of walking, not walking rate, that demonstrates the effortful nature of ambulation in these individuals, and the interference effects of concurrently performed cognitive tasks.

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A.E. PUENTE, A.N. PUENTE, J.J. GONTIER & A. BURE. Handedness and the Stroop Effect.

Objective: The scientific literature has been silent on the relationship of handedness on the Stroop effect.

The purpose of the present study was to determine whether handedness is related to the Stroop effect and whether that relationship is affected culturally.

Participants and Methods: Power analyses were completed prior to obtaining data to determine an appropriate sample for each study.

Study #1. 48 college students ($R = 30$; $L = 18$) were administered a computerized Stroop test with the reaction time (mS) for the three basic conditions (congruent, neutral and incongruent) and the total number of words answered correctly for the incongruent condition.

Study #2. Volunteers residing in Chile, Puerto Rico, and the Dominican Republic ($N = 120$, 40/country) were administered a paper & pencil version of the Stroop in Spanish. The total number of words in the color, word, color-word and the derived interference score were tabulated. Age, education and gender were not statistically different across the four samples.

Results: Experiment #1. Two-tailed t tests did not yield significant difference for any condition.

Experiment #2. Two-tailed t tests did not reveal significant differences across samples obtained from different countries for any of the measures.

Conclusions: Results suggest that handedness is not related to the Stroop effect, using a computer-based version using college students in the USA and a paper and pencil test across residents of three countries. The current study should be replicated with larger samples both in the United States as well as a variety of countries (e.g., non-Hispanic) to generalize these findings.

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S. VAN DYKE, V. ZUVERZA-CHAVARRIA, L. HILL, J. MILLER, L. RAPPORT & D. WHITMAN. Gender Differences in Lateralized Semantic Priming.

Objective: Men and women exhibit differences in the asymmetry of lateralized function on many tasks including verbal tasks, spatial tasks, and emotional processing tasks. Previous literature suggests that women evidence more bilateral cerebral organization, particularly in language

processing regions, whereas men show greater left hemisphere dominance for language. The current study expanded upon this general finding by comparing semantic processing in the left and right hemispheres of men and women utilizing a lexical decision task. Our primary hypothesis was that women would show more bilateral priming in comparison to men. Additional hypotheses relating to gender and lateralized priming in general were explored.

Participants and Methods: Eight-two participants (42 women, 40 men) ages 18-40 completed a semantic priming task as well as verbal and spatial ability measures.

Results: Women showed significantly more priming to contralateral stimuli than to ipsilateral stimuli, $t(34) = -3.76, p = .001$, whereas men did not show a significant difference between contralateral and ipsilateral priming, $t(33) = -1.68, p = .103$. In addition, women do not show a difference between right and left hemisphere ipsilateral presentations, $t(35) = 1.41, p = .167$. However, men show a left hemisphere advantage over the right hemisphere in ipsilateral presentations, $t(35) = 2.32, p = .026$. Several other significant differences were found.

Conclusions: The findings suggest gender related differences in semantic processing, suggesting that women process verbal stimuli more efficiently than men. More specifically, the hypothesis that women recruit bilateral hemispheric resources whereas men tend to process cognitive stimuli laterally is supported.

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D.R. WALLACE, A. LAUTZENHISER, K. MCBURNEY-REBOL, L.K. PAUL & W.S. BROWN. Facial EMG in Agenesis of the Corpus Callosum When Viewing Emotional Faces.

Objective: Recent studies have demonstrated that individuals with complete agenesis of the corpus callosum (ACC) and normal IQs have problems adequately describing the affective quality of pictures of social interactions (Paul, Schieffer, and Brown, 2004). These deficits have been hypothesized to be related either to an inability to talk about emotions (alexithymia), or to deficits in the perception of emotion. This study investigated whether individuals with ACC exhibit normal facial muscle responses when viewing affectively-laden stimuli, indicative of normal perception of emotion.

Participants and Methods: Participants rated the emotions in pictures of faces from the Diagnostic Analysis of Nonverbal Accuracy - 2 (DANVA - 2) while bilateral facial electromyographic responses (corrugator and zygomatic) were recorded. Stimuli included happy and sad facial expressions of high and low intensity. Participants included 11 individuals with ACC and 13 controls, all with normal IQ and of similar age.

Results: Individuals with ACC did not differ from controls in their ability to verbally categorize the stimuli into happy and sad. ANOVAs (2 groups x 2 emotions x 2 sides of the face) were run for high intensity emotional expressions. For zygomatic (smile) responsiveness, significant results were found for emotion and side ($p < .05$). However, there were no significant effects involving group.

Conclusions: Individuals with ACC produced emotion-related facial muscle responses similar to those of controls. While individuals with ACC have difficulty responding correctly to social emotions, these findings indicate that their difficulties are not evident in the emotional reactivity of their faces.

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D. YI, M. SHEA, W. BROWN & S.D. MARION. Normative Data for the Computerized Bimanual Coordination Task (cBCT) and its Relation to Standardized Motor Performance.

Objective: The Bimanual Coordination Task (BCT) has been shown to measure several aspects of motor functioning. Performance deficits have

been identified in individuals for whom the corpus callosum is immature, missing, or dysfunctional and in neuropsychologically-disordered individuals. Study goals were to report adult norms for an updated version of the computerized BCT (cBCT) and to investigate the relationship between bimanual performance and standardized motor performance.

Participants and Methods: 43 right-handed adults 18 to 26 (M age = 20.7) years were administered the cBCT as well as standardized motor tasks (Finger Tapping Test, FTT; Purdue Pegboard Test, PPT) used clinically to assess motor speed and coordination. The cBCT requires individuals to navigate a cursor through angled pathways projected on a monitor using unimanual and bimanual movements made via a response box designed after an Etch-A-Sketch toy.

Results: As cBCT performance was not significantly different across males and females, normative data were combined across gender. Correlational analyses indicated that more accurate bimanual performance on average was related to speed of assembly on the pegboard task ($r = -.40, p < .05$). After controlling for general visuomotor performance, the relationship between cBCT accuracy and pegboard assembly was rendered non-significant.

Conclusions: This study provides important normative information regarding the cBCT and its relationship to standardized motor tasks. Correlational analysis supports the implication that the cBCT measures distinct aspects of motor functioning. It was surprising that finger tapping was not related to unimanual cBCT performance, though this might be explained by restricted range in the computerized cBCT measurement. Correspondence: Dahyun Yi, Graduate School of Psychology, Fuller Theological Seminary, 262 N. Los Robles Ave. APT 333, Pasadena, CA 91101. E-mail: dahyunyi@hotmail.com

Memory

A. ARENTOFT, V. SWEAT, S. OLIVER & A. CONVIT. High Plasma BDNF Levels Are Associated with Decreased Explicit Memory in Females with Insulin Resistance.

Objective: Brain-derived neurotrophic factor (BDNF) plays a regulatory role in neuronal differentiation and synaptic plasticity. It may also be involved in learning, memory, glucose metabolism, and insulin sensitivity. This study sought to examine the role of BDNF in learning and memory in individuals with insulin resistance.

Participants and Methods: Forty-one participants (20 males and 21 females) with insulin resistance (ranging from impaired insulin function to type 2 diabetes) were matched with 41 healthy controls on gender, age, education, and IQ (age = 61.36 ± 7.93 , education = 16.05 ± 2.10 , IQ = 112.45 ± 9.72). Participants received complete medical, neurological, psychiatric, and neuropsychological evaluations. Plasma levels of glucose, insulin, and HBA1C were assessed.

Results: Plasma BDNF levels were associated with better cognitive performance in controls and worse performance in the insulin resistant group. These differences were driven by the insulin resistant females and were specific to hippocampal-based explicit memory. Insulin resistant females had lower BDNF levels than female controls (28.16 ± 17.54 vs. 16.97 ± 7.85). However, insulin resistant females with higher BDNF scored lower on explicit memory tests. Within the female insulin resistant group, after accounting for age, education, and HBA1C, regression analyses showed that BDNF predicted an additional and significant amount of the variance in immediate and delayed explicit memory (between 12.9% and 39.6%, depending on the test).

Conclusions: Given that insulin resistance has deleterious effects on the brain, the findings suggest that BDNF elevations may reflect the body's efforts to repair damage, and may not always be a reflection of health as typically assumed.

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T.M. ATKINSON, T.R. KONOLD & J.J. GLUTTING. A Normative Taxonomy of the Wide Range Assessment of Memory and Learning – Second Edition.

Objective: Memory is widely considered to be one of the most important of all cognitive abilities. Deficits on this construct can place individuals at a tremendous disadvantage in completing everyday activities. Given the multidimensionality of memory as a construct, the current study examined patterns of multiple indicators associated with memory across individuals using the Wide Range Assessment of Memory and Learning – Second Edition (WRAML-2).

Participants and Methods: Multistage cluster analysis with independent age replications was used to empirically identify normative profiles in a sample of ($N = 1172$) typically developing individuals ranging in age from 5 to 80 years. This procedure considered how various indicators of memory operate in concert by accounting for the non-linear multivariate relationships among them. In addition, a mixed clinical sample ($N = 107$) was evaluated in relation to the identified normative profiles to determine which patterns were most associated with known memory impairment diagnoses.

Results: Results supported nine common (or core) profile types that satisfied all formal heuristic and statistical criteria, including complete coverage, satisfactory within-type homogeneity, between-type dissimilarity, and replicability. Normative profile comparisons with those from a mixed clinical sample provide support for the clinical utility of interpreting WRAML-2 subtest scores within this framework.

Conclusions: The current study derived empirically-based profiles of memory likely to be found among typically developing individuals across the lifespan. Examination of profile configurations of these, and other known clinical groups, would be important next steps for extending the clinical utility of profile analyses as related to memory.

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C.J. BELZILE, J.S. CHAPIN, J.S. HAUT, P.A. KLAAS & R.M. BUSCH. The Family Pictures Subtest of the Children's Memory Scale: A Measure of Visual and Verbal Memory in Pediatric Patients with Intractable Temporal Lobe Epilepsy.

Objective: Recent research has suggested that the Family Pictures (FP) subtest of the WMS-III is not a pure visual memory measure but is also related to verbal abilities and verbal memory in adults with medically intractable epilepsy (e.g., Smerz et al., 2006). An analogous subtest is included as part of the Children's Memory Scale (CMS). The current study sought to examine the relationship between the FP subtest and other subtests of the CMS in pediatric patients with intractable epilepsy.

Participants and Methods: This retrospective study included 58 pediatric patients (mean age = 11.3, range 5-16 years) with left (LT; $n = 34$) or right (RT; $n = 24$) temporal lobe epilepsy (TLE). Analyses included Pearson correlations and stepwise regressions to examine the relationship between FP and visual and verbal subtests of the CMS. Separate regression analyses were conducted for immediate and delayed subtests.

Results: Groups did not differ on demographic or seizure variables. The FP immediate subtest score was significantly positively correlated with all CMS subtests in the RT patients ($r = .453-.595$) and with all subtests ($r = .488-.533$) except delayed face recognition ($r = .257$) and delayed word pairs ($r = .341$) in the LT group. In both LT and RT groups, the FP delayed subtest score was significantly positively correlated with all CMS subtest scores, both verbal and visual ($r = .401-.671$), except face recognition delayed ($r = .333-.398$). Regression analyses showed that FP immediate was most related to immediate face recognition in the LT group and to immediate dot learning in the RT group. In contrast, FP delayed was most related to delayed story recall in both TLE groups.

Conclusions: Consistent with findings in the adult literature, results indicate that the FP subtest of the CMS is not a pure measure of visual memory. Thus, FP may not be sensitive to lateralized temporal dysfunction.

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T. BEST, E. KEMPS & J. BRYAN. The Impact of Saccharide Supplementation on Cognition and Mood in Middle-Aged Adults.

Objective: The current study used a randomised, double-blind, placebo-controlled design to investigate the effects of saccharide supplementation on cognition and mood in middle-aged adults.

Participants and Methods: Participants ($N = 100$, 45-60 years) completed alternate forms of standardised tests of memory (working memory, immediate and delayed verbal recall, visual recall and recognition), speed of processing and attention, and self-report measures of depression, anxiety and stress before and after supplementation. Each participant took 2g of either a combination of saccharides (biological sugars found in certain vegetables and fruit) or a placebo twice daily for 12 weeks. The study also examined the relationship between dietary intake of these saccharides and cognition and mood. A self-report food diary was completed on three non-consecutive days during one week to provide an estimate of usual dietary saccharide intake.

Results: Preliminary results suggest that supplementation had a significant positive effect on several measures of memory performance, but not on mood. In addition, dietary intake status was associated with verbal memory recall only.

Conclusions: Saccharides may be beneficial in optimising cognitive function in middle-age when the first signs of age-related cognitive decline become apparent.

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F.C. BROWN, M. WESTERVELD, E. TUTTLE, M. VANDEMORRE & T. CHMIELOWIEC. Brown Location Test and WMS-III Performance Following Anterior Temporal Lobectomy for Medically Intractable Epilepsy.

Objective: Impaired verbal memory performance is often associated with left hippocampal dysfunction (e.g., temporal lobe epilepsy or hippocampal resections). The relationship between visual memory performance and the right hippocampus, however, is less consistent and may be related to verbal encoding strategies. The BLT consists of learning dot locations on a non-symmetrical circle array to reduce verbal encoding. This study examines BLT and WMS-III performance among individuals with right and left hippocampal resections.

Participants and Methods: Eighteen (9 RTL, 9LTL) right handed adults (age: $M = 47.5$, $SD = 10$) with unilateral hippocampal resections completed the BLT, WMS-III, WASI, and demographic surveys.

Results: A MANOVA indicated right sided surgery was associated with lower ($F(1,18) = 2.44$, $P = .016$) performance on BLT trials 1 - 5 than left sided surgery on age adjusted z-scores. Left sided surgery was associated with lower performance on the WMS-III verbal tests and Family Pictures from the WMS-III; with no significant differences on the Faces or Visual Reproduction, according to side of surgery.

Conclusions: These results support continued examination of the BLT using larger epilepsy samples. The relationship of Family Pictures with left hippocampotomy may be due to verbal retrieval demands, while the non-significant findings for faces and designs were consistent with several prior studies.

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R.C. CHAN, Y. QING & Q. WU. Validation of the Chinese versions of two prospective and retrospective memory questionnaires in healthy elder people.

Objective: his study aimed to examine the latent structure of the Chinese versions of the Prospective and Retrospective Memory Questionnaire (PRMQ) and the Comprehensive Assessment of Prospective Memory (CAPM) among a group of Chinese elder people using confirmatory factor analysis.

Participants and Methods: The PRMQ and CAPM were administered to a community sample of elder people (N = 156; 80 men and 76 women) ranging in age between 60 and 90. Several competing models of the latent structure of the two questionnaires were derived from theoretical and empirical sources and were tested using confirmatory factor analysis.

Results: The models with the best fit, in both PRMQ and CAPM, had a tripartite structure. For the PRMQ, it consisted of a general memory factor (all items loaded on this factor) and two orthogonal specific factors of prospective and retrospective memory. For the CAPM, it consisted of a general memory factor, loading all items on it, plus the basic activities of daily living as well as the instrumental activities of daily living factors. Age and gender did not influence both PRMQ and CAPM scores in the present sample.

Conclusions: The present findings suggest that both the PRMQ and CAPM have a stable latent factor structure across cultures.

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Y. CHANG, R.M. BAUER, D.W. LORING, M. MARSISKE, K.M. HEILMAN, T. KERKHOFF & L. ABRAMS. Medial Temporal and Frontal Lobe Involvements in Associative Memory.

Objective: The current study aimed to examine the relative contributions of medial temporal lobe (MTL) and frontal lobe (FL) in associative memory in aging populations. It was hypothesized that MTL plays a more important role than FL in associative memory, given the well-known contribution of the hippocampus to relational processing.

Participants and Methods: Thirty-five old adults were assigned into one of the four subgroups based on composite scores on neuropsychological measures contributing to Glisky's MTL and FL factors (Glisky, et al., 1995). Participants were also administered an object-location association test. In order to examine associative memory without confounding from item memory, a matching procedure was employed to ensure the four groups had comparable item memory (i.e., memory for the objects). Participants were given immediate and 30-minute delay recall.

Results: A mixed factorial ANOVA was conducted. The result suggested a significant Group x Measure interaction effect [$F(3, 31) = 3.73, p < .05, \eta^2 = .27$]. With comparable item memory across four groups, the low-MTL-low-FL group, but not the low-MTL-high-FL group, showed significantly lower performances on object-location associative memory compared to the two groups with high MTL function. No significant time effect was found.

Conclusions: These findings suggest that medial temporal lobe was important for associative memory and the role of frontal lobe is more likely to be secondary. The importance of frontal lobe contribution increases when temporal lobe function is compromised.

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N.S. CHAYTOR, J.J. TUCKER, D.L. DRANE & J.W. MILLER. The Impact of Symptom Validity Test Performance on the Ecological Validity of Memory Assessment.

Objective: The current study explored whether the ecological validity of memory assessment is impacted by symptom validity test (SVT) performance. Specifically, it was hypothesized that the ecological validity of memory testing would be higher in those who passed SVT compared to those who failed.

Participants and Methods: The sample consisted of 84 adults. Memory was assessed with the WMS-III immediate and delayed auditory and visual memory indices. Everyday memory was assessed with a self (N=84) and informant (N=68) version of the Everyday Memory Questionnaire (Sunderland et al., 1983). The Word Memory Test (WMT; Green et al., 1996) was used as a measure of symptom validity.

Results: For those patients who failed the WMT (self-report, N=43; informant, N=41), memory test scores accounted for 6% (adjusted $R^2 = .05, p > .05$) of the variance in self-reported everyday memory and 8% (adjusted $R^2 = .02, p > .05$) of the variance in informant ratings of everyday memory. For those patients who passed the WMT (self-report, N=41; informant, N=27), memory test scores accounted for 28% (adjusted $R^2 = .20, p < .05$) of the variance in self-reported memory and 27% (adjusted $R^2 = .14, p = .12$) of the variance in informant ratings of everyday memory.

Conclusions: Our study suggests that memory testing produced in the context of SVT failure is unrelated to everyday memory ability. However, when SVT is within normal limits, memory test scores are highly predictive of everyday memory ability. SVT should be included when evaluating the ecological validity of neuropsychological testing, and may be a factor that has contributed to disappointing results in previous ecological validity research.

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S. CHRISTMAN, J. HOELZLE & G. MEYER. Individual Differences in Ability to Simulate Malingering.

Objective: Inconsistent handedness (IH) is associated with superior memory relative to consistent right-handedness (CRH). The presence of superior memory in IH participants has implications for assessment of malingering, a phenomenon in which individuals feign memory impairment, as the better memory of IH participants may make it harder for them to malingering.

Participants and Methods: The current study assessed performance of IH and CRH participants on the Test of Memory Malingering (TOMM). There were three conditions: (i) a control condition in which participants were instructed to put forth their best effort (n=16), (ii) a coached malingering condition in which participants were given instructions on how to simulate malingering (n=18), and (iii) a warned malingering condition, in which participants were asked to feign malingering without any specific instructions (n=20).

Results: ANOVA yielded main effects of Condition and Handedness for the TOMM, with IC participants and participants in the malingering conditions yielding lower scores. Although the interaction between Condition and Handedness was not significant, this reflected the small sample size and attendant lack of power. Analyses of effect sizes indicated larger handedness differences in the coached ($d = .785$) and warned ($d = .772$) malingering conditions relative to the control condition ($d = .417$).

Conclusions: Results suggest that inconsistent-handedness is associated with decreased ability to feign memory impairment, as IC participants' performance in the malingering conditions fell further below the standard criterion for malingering diagnoses than that of CRH participants. In turn, this suggests that different norms for IC versus CRH participants should be developed for the TOMM.

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S. CHRISTMAN & R. PROPPER. Individual Differences in Performance on the Everyday Memory Questionnaire: Effects of Degree of Handedness.

Objective: The Everyday Memory Questionnaire (EMQ) is a measure of real-world memory and metamemory abilities used widely with various populations (e.g., children, Alzheimer's patients, etc.). Interestingly,

research has demonstrated a systematic individual difference in episodic memory, with inconsistent-handedness (IH) being associated with superior memory relative to consistent-right-handedness (CRH). The basis for this difference lies in the facts that (i) encoding versus retrieval of episodic memories is lateralized to the left versus right hemispheres, respectively, implying involvement of some form of interhemispheric interaction, and (ii) IH is associated with increased interhemispheric interaction. Thus, handedness differences in EMQ performance could complicate interpretation of group differences (i.e., if a control group has a shortage or overabundance of IH participants).

Participants and Methods: EMQ performance by IH ($n=40$) and CRH ($n=48$) participants was compared.

Results: Analyses of overall EMQ scores yielded a main effect of handedness, with IH scoring higher than CRH ($p=.033$). The EMQ is comprised of five factors: retrieval, task monitoring, conversational monitoring, spatial memory, and memory for activities. Significant IH advantages were found for task monitoring ($p=.022$) and conversational monitoring ($p=.009$) factors, with a trend towards an IH advantage on spatial memory ($p=.092$).

Conclusions: The current study extends previous reports of IH advantages in performance on laboratory tests of memory to more ecological conditions, as well as providing the first evidence that IH is also associated with superior metamemory. These results suggest that researchers using the EMQ should take into account participants' degree of handedness when interpreting EMQ scores.

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A.J. CRAMOND, J. PETRIE, C. WU, E.D. BIGLER & J.E. LAINHART. Memory Stability in Individuals with Autism Spectrum Disorder.

Objective: Stability of memory function was examined in a longitudinal study of individuals with autism spectrum disorder (ASD), compared to matched typically developing controls. Participants averaged 14.42 years in age.

Participants and Methods: A total of 59 participants (ASD, $n = 42$; Controls, $n = 17$) with the Full Scale IQ score > 65 were administered the Test of Memory and Learning (TOMAL) and readministered this measure an average of 2.83 years later in an established longitudinal NIH-supported investigation of ASD.

Results: As expected, memory function based on summary TOMAL Index Scores for Verbal Memory (VMI), Non-Verbal Memory (NVMI) and Composite Memory (CMI) scores were all higher in controls than those with autism. However, while memory for control participants was found to be stable across time, ASD participants demonstrated significant improvement on VMI ($p = .003$) and CMI ($p = .03$) scores, Delayed Recall Index ($p = .02$), and the supplementary index of Associate Recall ($p = .02$). In addition, on individual subtests of ASD participants, significant improvements were found on Memory of Stories ($p = .04$) and Digits Forward ($p = .05$).

Conclusions: Memory performance in control subjects on the TOMAL was stable over an almost three year period, but more variability was noted over this same time frame in ASD participants. Clinical and research implications of changing patterns of memory performance in ASD over time will be discussed.

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P.L. EBERT & N.D. ANDERSON. Heightened Memory Interference in Amnesic Mild Cognitive Impairment.

Objective: Although individuals with amnesic Mild Cognitive Impairment (aMCI) do not meet criteria for Alzheimer's disease, their mem-

ory difficulties are greater than those that occur with normal ageing. However, discrimination between aMCI and normal ageing remains difficult. This study examined memory interference on both clinical (California Verbal Learning Test, CVLT) and experimental (AB-AC) tasks in aMCI and normal ageing.

Participants and Methods: Participants included 27 young adults, 44 healthy older adults, and 15 older adults with aMCI. All completed a standardised neuropsychological battery, including the CVLT. In the AB-AC task, participants learned a first (AB) list of 12 related stimulus-response word pairs (e.g. knee-bone) to a criterion of 100% accuracy. Twenty minutes later, participants learned a second (AC) list of 12 related word pairs to the same criterion, but on this list same stimulus words were paired with new response words (e.g. knee-bend). Finally, participants attempted to recall the first (AB) list.

Results: On the CVLT, memory interference measures did not distinguish normal ageing from aMCI. On the AB-AC task, increased proactive interference (PI) in older adults was exaggerated among participants with aMCI, whereas both older groups showed comparably more retroactive interference relative to the young.

Conclusions: Increased susceptibility to PI appears to contribute to the memory difficulties seen in aMCI, an effect which may not be detected by standard clinical tests like the CVLT because such tests do not control for learning of the original lists. Early identification of aMCI may be improved by the addition of experimental tests sensitive to PI. Correspondence: *Patricia L. Ebert, Ph.D., Psychology Department, Queen Elizabeth II HSC, 5905 Veterans' Memorial Lane, Abbie J. Lane Building, Room 4060, Halifax, NS B3H 2E2, Canada. E-mail: pebert@sympatico.ca*

L. HAASE, M. WANG, A. REPP, M. CHEN, K. RATNER & C. MURPHY. Association Between Brain Activation and Learning Trials of the COLT and CVLT in Individuals with and without the $\epsilon 4$ Allele: An fMRI Study.

Objective: Deficits in olfaction and memory occur during the normal aging process and are more marked in Alzheimer's disease (AD). The $\epsilon 4$ allele of the apolipoprotein E gene is associated with an increased risk for the development of AD. Previous research suggests that individuals with the $\epsilon 4$ allele ($\epsilon 4+$) demonstrate deficits in olfactory memory performance prior to a general decline in cognitive functioning. Human neuroimaging studies examining olfactory memory describe patterns of cortical activation within olfactory processing regions and regions involved in memory processing.

Participants and Methods: The current study examined associations between neuropsychological test performance and brain activation during a cross-modal olfactory recognition memory paradigm in older adults who are $\epsilon 4+$ ($n = 15$) and $\epsilon 4-$ ($n = 21$). Prior to scanning, participants were presented with 16 odors. During two functional runs, names of odors presented before scanning (targets) or not presented (foils) were shown. Participants discriminated between targets and foils using a button box.

Results: A region of interest (ROI) analysis was conducted on regions known to be involved in olfaction and recognition memory. Fit coefficients were correlated with post-scanning performance on learning trials from the California Odor Learning Test (COLT) and California Verbal Learning Test (CVLT).

Conclusions: CVLT performance and activation in frontal lobe regions was negatively correlated in $\epsilon 4+$ individuals. Neither group showed an association between mesial temporal lobe regions and learning trials of the CVLT; however, correlations between ROI and COLT learning trials performance demonstrate allele-associated differences in relationships between performance and fMRI activation in mesial temporal lobe regions. Supported by NIH grant #AG04085 to C. Murphy

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T. HALL, C.E. FLACHSBART, S. HARLOW & W. ADAMS. The Everyday Memory Survey (EMS): Psychometric Properties of a Standardized Survey Instrument.

Objective: The purpose of the study was to examine the psychometric properties of the Everyday Memory Survey (EMS; Hall & Adams, 2004), a standardized memory questionnaire used to measure the behavioral expression of organic memory function. The EMS supplements the limited research aiding the translation of formal memory test findings to everyday life. It was hypothesized that both the Self-Report and the Observer forms of the EMS would demonstrate sound psychometric properties.

Participants and Methods: Internal consistency, test-retest reliability, content validity, criterion-related validity and construct validity were examined in the EMS Self-Report and Observer forms. The standardization sample included 920 U.S. males and females aged 18 to 85 + years, stratified using age, gender, ethnicity, and education level.

Results: Coefficient alphas for the EMS Self-Report and Observer forms were .96 and .97. Test-retest coefficients of .91 and .95 were obtained for the total EMS Self-Report and Observer scores. Criterion validity was established based on comparison to several Wide Range Assessment of Memory and Learning- 2nd Edition Index scores (Adams & Sheslow, 2003). Discriminant validity was established, demonstrating the ability to distinguish between clinical and non-clinical populations. Factor Analysis yielded a single factor accounting for 81.8% (Self-Report) and 85.8% (Observer) of total explained variance, suggesting a single factor solution (everyday memory) as the best fit for these data.

Conclusions: The EMS was found to be psychometrically sound to measure everyday memory, affording clinicians a quick, reliable, and valid way to ecologically monitor and treat patients with known or potential memory impairment.

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S. KARANTZOULIS & J.B. RICH. Retrospective Memory Failures May Underlie the Prospective Memory Deficit in Amnesic Mild Cognitive Impairment.

Objective: In addition to core memory deficits in amnesic mild cognitive impairment (aMCI), subtle reductions in executive functions have been reported. Involvement of the frontal system may account for weaknesses in more strategic aspects of cognition, including remembering to carry out intended actions (i.e., prospective memory). Therefore, we examined the relation between retrospective and strategic aspects of prospective memory in aMCI.

Participants and Methods: PM was assessed using the Memory for Intentions Screening Test (MIST; Raskin, 2004) in 27 individuals with aMCI (M age = 75; M Education = 13) and 27 healthy elderly controls (M age = 73; M Education = 14). Participants completed 8 different PM tasks, counterbalanced for delay interval (2 min vs. 15 min.), cue type (event- vs. time-based), and response (action vs. verbal), a recognition memory test of the PM tasks (max = 8), and a 24-hour PM probe.

Results: As expected, the aMCI participants scored significantly below the controls on all components of the MIST. Error type analyses revealed that the aMCI participants made more No Response errors and Loss of Content errors relative to the controls. Loss of Time errors, Task Substitution errors, and Place Losing Omissions were comparable between groups. Follow-up analyses of the No Response Errors revealed a greater difficulty among the aMCI participants to accurately retain and recognize the PM intention (i.e., a retrospective memory failure) relative to the controls.

Conclusions: Individuals with aMCI whose neuropathology affects both medial temporal and frontal lobe regions, demonstrated poorer PM than the controls, regardless of the type of cue involved. Importantly, it seems that aMCI group's deficit on the PM tasks was due more to failure to recall the content of to-be-remembered tasks than to an impairment in remembering to carry out the task at the correct time or following the appropriate cue.

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M.E. KRAMER & C. CHIU. Developmental Differences in the Neural Networks Supporting Associative Memory Encoding.

Objective: Through associative learning, previously unassociated ideas and experiences are linked in the mind, becoming part of the network of knowledge and leading to adaptive behaviors. While recent brain imaging studies have determined the neural substrates of associative learning in adults, it is unclear how this memory system functions in children. The goal of this project is to use functional magnetic resonance imaging (fMRI) to elucidate the neural circuits that are important for effective associative learning in healthy children and adults.

Participants and Methods: Ten healthy children (mean age 9.6 years) and ten healthy adults (mean age 23.7 years) were taught to remember word pairs using two mnemonic strategies differing in efficiency. During an fMRI scan, word pairs were presented auditorily. For half of the word pairs participants were asked to imagine the two items in the pair interacting in some way (imagery strategy), and for the other half they were asked to covertly repeat the word pair (repetition strategy).

Results: Behavioral performance on a post-scan cued recall test did not differ between groups. In a comparison of brain regions showing greater activation during use of the imagery strategy compared to repetition strategy, adults demonstrated greater activation than children in the medial temporal lobe, fusiform gyrus, inferior frontal lobe, posterior cingulate, and parietal lobe. Children demonstrated greater activation in the insula, caudate, and superior temporal lobe.

Conclusions: Although both groups were equally successful in memory strategy use, the neural networks supporting associative encoding differed. Children appear to activate a smaller subset of brain regions compared to adults.

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A.L. MACÉ, G. SAINT-DENIS & N. CAZA. Are False Memory Effects in Short Term Memory Associated with Verbal Output?

Objective: The DRM paradigm (Deese, 1959; Roediger & McDermott, 1995) is used to elicit false memory for non-presented semantically related words (critical lure). False memory effects in long-term memory are attributed to spreading activation in the semantic network. Adapting this paradigm to short-term memory (STM) provides a key instrument for studying how semantic knowledge influences performance (Macé & Caza, 2007). Under the redintegrative view (Hulme et al., 1991), lexical/semantic factors operate at recall when fading phonological traces must be reconstructed before verbal output. When no output is required, as in a matching span task, semantic effects such as false recognition should be minimal. Alternatively, psycholinguistic models (e.g., N. Martin & Saffran, 1997) assume that all levels of processing support temporary retention of word lists, predicting false recognition effects in the matching span task.

Participants and Methods: To test these hypotheses, eighteen young participants received a matching span task, in which they had to judge whether two successive lists of 6 words were the same or not. Following presentation of the first list, a second list was presented in which: (1) all words were identical to the first list, (2) one word had been replaced by a critical lure, or (3) one word had been replaced by a neutral distracter.

Results: Results showed that lists containing the lure were more falsely recognized than those with the distracter.

Conclusions: The finding of a false recognition effect in matching span suggests that semantic knowledge supports temporary retention of word lists, as predicted by language-based models of STM.

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C.P. MCFARLAND & E.L. GLISKY. Frontal Lobe Involvement in a Task of Time-based Prospective Memory.

Objective: Time-based prospective memory has been found to be negatively affected by aging, possibly as a result of the declining frontal function that often accompanies aging. In the present study we investigated the role of the frontal lobes in prospective memory, as well as their involvement in clock monitoring, plan generation, and time estimation, each of which may play a role in the execution of time-based prospective memory tasks.

Participants and Methods: Based upon their scores on a composite measure of frontal function, 32 older adults were characterized as possessing high- or low-frontal function, and were then tested on a time-based laboratory prospective memory task. Overall age effects were also assessed and each of the frontal groups was compared to a group of 32 younger adults.

Results: High-frontal functioning participants demonstrated better prospective memory than low-frontal functioning participants, and were not distinguishable from younger adults. Furthermore, frontal function predicted patterns of clock monitoring, the quality of plans generated to assist in the performance of the PM task, and the accuracy of time estimation. Again, on each of these measures the performance of the high-frontal group was equivalent to that of the younger adults.

Conclusions: The results of this study suggest that it is not aging per se that disrupts prospective memory performance, but it is instead the diminished frontal function seen in a subset of older adults. The authors discuss possible mechanisms by which the frontal lobes may mediate cognitive processes critical to prospective memory.

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S.E. PANOS, A. OFEK, S. MARION & R.S. KERN. Memory and Schizophrenia.

Objective: Schizophrenia is characterized by generalized cognitive dysfunction with the deficits in memory perhaps most severely affected. Investigations have consistently revealed impairments in learning, however the findings for retention and recognition have been more equivocal.

Participants and Methods: The present study compared a sample of schizophrenia outpatients ($n = 24$) with age-, sex-, and parental education-matched healthy adults ($n = 25$) on verbal memory measures of learning, retention, and recognition. The memory measures (California Verbal Learning Test and Wechsler Memory Scale-III) were administered as part of a larger memory battery. Testing was conducted in a single session and the order of test administration was counterbalanced across subjects to control for order effects.

Results: The results showed a group effect with patients impaired relative to healthy adults on learning measures from both the Logical Memory subtest of the WMS-III and the list learning trials of the CVLT. There was no significant difference between groups in retention on either test. Group comparisons on recognition ability differed according to test. Group differences were found on the WMS-III, but not the CVLT.

Conclusions: In sum, the findings from the study revealed impairments in verbal learning but intact retention for schizophrenia patients compared with healthy adults. The findings for recognition were equivocal with impairments noted on recognition of verbal material from prose passages but not a list learning test. These findings suggest that some of the variability in reports of recognition ability in the schizophrenia literature may be tied to methodological differences in the way recognition is measured.

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A. PARK, J. CHIN, S. SEO, H. AHN & D. NA. Verbal versus Visual Memory loss in Amnestic-Mild Cognitive Impairment: Prediction Value of Conversion to Dementia.

Objective: aMCI can be divided into 3 subgroups: aMCI with verbal (aMCI-ver), visual (aMCI-vis), and both verbal and visual memory loss (aMCI-both). This study was to investigate 1) the frequency and 2) the patterns of cortical thinning of these 3 subtypes, and 3) to learn which subtype more frequently converts to dementia.

Participants and Methods: We selected 306 patients with a-MCI. Among them, 88 patients had been followed with the time interval of 21.1 months, and 52 underwent 3D volume MR images for cortical thickness analysis across the entire brain.

Results: Of the 306 patients, aMCI-both was most common (43.8%) which was followed by aMCI-vis (34.6%) and aMCI-ver (21.6%). On cortical thickness analyses (aMCI-ver:13, aMCI-vis:13, aMCI-both:26), aMCI-ver patients showed cortical thinning in the left inferior temporal and parahippocampal gyri, and left precuneus; no brain regions with cortical thinning were noted in aMCI-vis patients; aMCI-both patients showed cortical thinning in the left superior/inferior temporal and parahippocampal gyri, left uncus, and the right superior temporal gyrus. Follow-up neuropsychological tests (aMCI-ver:14, aMCI-vis:25, aMCI-both:49) revealed that, 21.4% of aMCI-ver still remained as verbal memory only, while 42.9% of aMCI-ver had progressed to involve both verbal and visual memory. 44% of aMCI-vis had been converted to normal, 32% remained the same, and 24% progressed to affect both verbal and visual memory. Majority (71.4%) of patients with aMCI-both still showed the impairment in verbal & visual memory.

Conclusions: These findings suggest that verbal memory loss more than visual memory loss in aMCI has predictive value of conversion to dementia.

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C.M. PERSSON, M. ERIKSDOTTER JÖNHAGEN, L. MINTHON, A. NORDBERG & O. ALMKVIST. Effects of ApoE Genotype on Cognitive Performance in Memory Clinic Patients.

Objective: ApoE has been reported to be associated with Alzheimer development. The aim was to evaluate the effect of apolipoprotein E (apoE) genotype, sex and age on cognitive performance in memory clinic patients.

Participants and Methods: Seventy consecutive patients (31 men and 39 women) with Mild Cognitive Impairment were recruited from a memory clinic in Stockholm, Sweden. Mean \pm SD for age were 60.7 \pm 9.7. All patients were examined with 7 cognitive tests (11 variables) covering verbal abilities, visuospatial functions, immediate and episodic memory as well as cognitive speed and executive function. ApoE genotype were recorded as $\epsilon 4$ -allele carrier (26 pat.) or non-carrier (44 pat.).

Results: Groups based on apoE- $\epsilon 4$ presence, sex and age (2 groups, cut-off 60 yrs) were compared by a 3-way ANOVA with respect to the cognitive tests (MMSE, Similarities, Block Design (BD), Digit Span, RAVLT, RCFT and TMT). ApoE- $\epsilon 4$ carriers had lower performance on RCFT retention ($p < .05$) and higher on TMTb ($p < .05$). Men had scored lower on RAVLT total ($p < .05$) and higher on RCFT retention ($p < .05$). The two age groups did not differ on the cognitive variables. Interaction effects of sex * apoE were found for BD ($p < .05$), male $\epsilon 4$ carriers performed better than the other groups.

Conclusions: ApoE genotype and sex had significant effects on 4 of the 11 cognitive variables (RCFT retention (2 times), RAVLT total,

TMTb and BD) including one interaction effect. Age did not have any effect as the groups were divided. At random, for 77 combinations (7 * 11), 3.8 would turn out significant. However, the $\epsilon 4$ carrier impairment on RCFT retention seems logical as spatial memory as well as apoE is associated with AD. That men performed better on RCFT retention and men*apoE on BD (spatial components), and women on RAVLT (verbal modality component) might also be in line with expectation. The effects were small but reasonable.

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A.S. PINEDA & A.P. DEPRINCE. **Victimization History and Post-traumatic Stress Disorder: Learning and Memory Performance.**

Objective: The current study examined trauma-related learning and memory in the context of 1.) hippocampal function associated with prolonged stress exposure; 2.) psychiatric symptoms of posttraumatic stress disorder (PTSD).

Participants and Methods: Using paired-word associate learning and word stem completion tasks, explicit and implicit memory for neutral-neutral (N-N) and neutral-trauma (N-T) words was assessed in college participants exposed to no victimization (NV; $n = 63$), single victimization (SV; $n = 24$), and multiple victimization (MV; $n = 19$).

Results: A significant main effect of victimization for paired-associated recall, but not stem completion demonstrated worse memory performance as number of victimization increased. A significant PTSD x word type interaction in explicit memory showed that the PTSD high group recalled less N-N, but more N-T word pairs compared to the PTSD low group who showed the opposite pattern.

Conclusions: Poorer performance for explicit but not implicit memory was found as number of victimization increased, which may be a consequence of or a risk factor for MV. Trauma-related memory facilitation was found in individuals with greater severity of PTSD, which may interfere with the ability to respond to potential risk; increasing risk for MV. Increased risk for MV maybe a combination of hippocampal alterations acquired during the trauma, as well as trauma-related symptoms secondary to the trauma itself.

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R.H. RISS, R. CANNON & E. MÜLLER-ELLIOT. **Oscillatory Encoding and Retrieval Patterns following Traumatic Brain Injury: Evidence for Functional Cortical Reorganization.**

Objective: We utilized EEG three-dimensional source localization (sLORETA) and region of interest (ROI) techniques to examine whether auditory memory performance in traumatic brain injury (TBI) survivors is associated with functional reorganization of regional cerebral activation patterns in spatial and frequency domains.

Participants and Methods: Subjects were 8 memory-impaired TBI adults (mean age = 33.13; 3 females; 8 right handed; RAVLT memory scores > 1.5 standard deviation below the mean) and 8 normal-memory controls (mean age = 31.56; 4 females; 8 right handed). Electroencephalograph (EEG) was recorded during encoding and retrieval of four stories comprising the auditory memory subtest of the Rivermead Behavioral Memory Test. Phasic changes in band power, and three-dimensional current density maxima during paragraph learning and recall tasks, were compared between groups. Twenty-one ROI were selected for additional analysis.

Results: In comparison to controls, TBI subjects demonstrated a significant bias toward lower frequency oscillatory activity during encoding and retrieval intervals, with corresponding attenuation of the upper alpha band, reflecting generalized cortical slowing under task. Two broad differences in regional activation patterns differentiated the TBI and

control groups: 1) a shift from frontal to posterior task-activation in the TBI group relative to controls appeared to reflect increased reliance on automatic vs. strategic memory processes. 2) a relative activation shift from the language-dominant to the non-dominant hemisphere in the TBI group may reflect an injury-related difficulty in recruiting memory-specialized neural networks (dedifferentiation hypothesis) or adaptive use of a visualization memory strategy (compensation hypothesis).

Conclusions: Results provide tentative support for compensatory functional reorganization of memory processing following traumatic brain injury. ROI techniques hold promise for enhanced spatial resolution of three-dimensional EEG source generators.

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K. SEINO & S. ISHIZAKI. **Comparison of the conceptual structures of schizophrenic patients and those of healthy adults, using association experiments.**

Objective: The dimension of perception is considered to be basic from the first stage of human development; however, it is reported to be weak in the mental category structure of schizophrenic patients. The purpose of this study is to conduct a detailed examination of the conceptual structures of schizophrenic patients by applying techniques from the research on association concept dictionaries used for constructing a human memory model.

Participants and Methods: The association experiments were conducted on subjects including 19 outpatients that met the DSM-IV criteria for schizophrenia and 21 normal controls, in order to extract their conceptual structures. Two tasks, incorporating superordinate and subordinate concepts, were presented to the subjects, who were required to extract associated concepts from the stimulus words.

Results: The associative experiment results of the schizophrenics were compared with the results of the controls. The statistical differences were examined using the two-sided Mann-Whitney's U test. In the subordinate concept task, the number of associations and the relevance ratio of the normal controls were significantly high. On the other hand, the schizophrenics exhibited a large and significant tendency to make errors in association. Moreover, they obtained significantly high statistics with regard to their inverse association rate, which represents the probability of associating a stimulus in the opposite direction of a concept.

Conclusions: We found that compared to the controls, schizophrenics faced difficulties in associating subordinate concepts with their conceptual structures. This research enabled the evaluation of the higher and lower levels of the conceptual structures of schizophrenics, which reflect long-term memory, using association experiments. Future studies should examine the clinical symptoms of schizophrenic patients, in detail, using our methods.

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G. ST-DENIS & N. CAZA. **False recognition for critical lures and their homophones: Evidence for associative processes.**

Objective: The goal of this study was to test two alternative accounts of false memory in a group of young participants. According to fuzzy trace theory (Reyna & Brainerd, 1995), participants tend to falsely recognize non-presented critical lures (e.g., coral) given that they are semantically related to the studied words (e.g., reef, sea, etc.) and match the gist trace. Under associative activation theories (e.g., Underwood, 1965), all strong associates will tend to be falsely recognized, not only those matching gist for the studied words.

Participants and Methods: To test these hypotheses, we used a false recognition paradigm that included homophone lures (e.g., choral); the homophone lures differed from the critical lures (e.g., coral) on the basis of meaning and spelling, and therefore, did not match gist for the studied words. Words were presented verbally for study, and visually for recognition to a group of 16 young participants.

Results: The percentage of “yes” responses to studied words, critical lures, homophone lures, and neutral distracters was measured. Analyses were performed using pairwise t-tests. Results showed that both the critical and homophone lures were more falsely recognized than neutral distracters, belying the false memory effect.

Conclusions: These findings support the role of associative processes in false memory. This work was supported by CIHR and FRSQ grants for NC.

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D.E. TRAHAN & C.E. ROSS. Continuous Visual Memory Test: Sensitivity and Specificity in Patients with TBI, Stroke, and Alzheimer's Disease.

Objective: This study examines sensitivity, specificity, and total hit rates for the CVMT, a measure of visual recognition memory for complex ambiguous designs (Trahan & Larrabee, 1988), in normal adults and groups of patients known to have a high base rate of visual memory impairment.

Participants and Methods: The normal sample included 427 adults (164 male, 263 female) ranging in age from 18-91. The patient groups included 84 individuals with severe traumatic brain injury (TBI), 38 with right-hemisphere stroke (RCVA), and 17 with Alzheimer's Disease (AD). All were administered the CVMT along with other neuropsychological measures.

Results: Using revised norms (Trahan & Larrabee, 1997), specificity rates were 96% for CVMT Total Score and 92% for CVMT Delay. For adults over age 50 only, specificity rates were 99% for both the Total and Delay scores. For Total Score, sensitivity rates were 67% for TBI, 50% for RCVA, and 65% for AD. For the Delay score, sensitivity rates were 56%, 42%, and 47%, respectively. Combining all normal and patient groups, total hit rates were 87% for the Total Score and 82% for Delay. When patient groups were compared only with normal subjects over age 50, data for RCVA and AD revealed total hit rates of 88% for Total Score and 85% for Delay. ANOVAs revealed that all patient groups performed significantly below age-matched controls. TBI patients performed lowest on the Total Score.

Conclusions: Despite past questions about the CVMT's low specificity in older subjects, application of revised norms resulted in remarkably high specificity in all age groups. Sensitivity rates were moderate to high in all patient groups. Total hit rates exceeded 80% and were especially high for CVMT Total Score. These data support the clinical efficacy of the CVMT in patients known to have a high base rate of visual memory problems.

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D.E. TRAHAN, C.E. ROSS & S.L. TRAHAN. Expanded Paired Associate Test - Revised: Development of an Alternate Form.

Objective: The EPAT (Trahan & Larrabee, 1984) was a modification of the Paired Associate Learning Subtest from the original Wechsler Memory Scale. The EPAT added four additional hard word pairs, as well

as a delayed-recall task. This increased the test's sensitivity in higher performing adults and allowed for distinguishing between acquisition and retrieval deficits. This study assesses the comparability of the EPAT and the revised edition, the EPAT-R (Trahan, 2004), which uses original word pairs.

Participants and Methods: Participants included 66 adults (31 male, 35 female) ranging in age from 18-86 years ($M = 64.56$, $SD = 16.24$). Mean education was 12.41 years ($SD = 2.58$). All were referred for evaluation due to either known or suspected neurological conditions such as stroke, TBI, or dementia

or psychiatric disorders (primarily major depression). All were administered the EPAT and EPAT-R in counterbalanced order as part of the evaluation.

Results: Pearson correlations between forms were significant for both Acquisition ($r = 0.89$, $p < .001$) and Delayed-Recall Scores ($r = 0.84$, $P < .001$). EPAT-R Acquisition Scores were 1.95 points higher on the average ($t = 4.52$, $P < .01$).

EPAT-R Delayed Scores were only 0.48 points higher ($t = 2.43$, $p = .02$). Variances for the two forms were equivalent for both the Acquisition and Delayed Scores.

Conclusions: This study demonstrated high correlations between the EPAT and EPAT-R for both Acquisition and Delayed-Recall Scores. The EPAT-R Acquisition phase is slightly easier with mean scores being about 2 points higher. Delayed recall differences were less than one-half point. Minor adjustments in EPAT-R scores allow application of original norms with highly comparable results.

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S. VESTBERG, U. PASSANT & C. ELFGREN. Relationship Between Neuroticism and Cortisol in Patients with Memory Complaints.

Objective: Associations between neuroticism and the hypothalamic-pituitary-adrenocortical (HPA) axis activity have recently been shown (McCleery & Goodwin, 2001; Zobel et al., 2004; Wasserman et al., 2007). However, the direction of the correlations varies in different groups. The awakening cortisol response (ACR) is proposed to be a reliable measure of basal HPA axis function. Our aim was to investigate the relationship between neuroticism and ACR in patients with memory complaints.

Participants and Methods: 30 patients, 38 – 71 y (mdn age: 57), with memory complaints from an ongoing study at our Memory Clinic, have undergone neuropsychological and clinical assessments. Exclusion criteria: dementia/major depression/psychosis/post-traumatic stress syndrome/cerebrovascular disorder and drug abuse. 16 patients performed according to expectation on tests of episodic memory (subjective memory impairment, SMI), 14 had objective memory impairment (OMI). The Swedish version of the revised NEO Personality Inventory was used to assess neuroticism and its 6 traits (anxiety, angry hostility, depression, self-consciousness, impulsiveness and vulnerability). Salivary cortisol level was based on the mean level of 2 consecutive days, 30 min after awakening.

Results: The anxiety trait was significantly and negatively correlated with morning salivary cortisol level according to Spearman rank correlation test ($r_s: -.449$, $p = .013$) whereas the factor of neuroticism and the other traits were not. Further analysis revealed a significant and strong correlation between anxiety and cortisol level in the OMI-group ($r_s: -.676$, $p = .003$) but not in the SMI-group ($r_s: -.416$, $p = .109$). OMI and SMI did not differ significantly regarding gender distribution (chi square test), age, cortisol level, awakening time, and anxiety according to the Mann-Whitney test.

Conclusions: Elevated anxiety, a neurotic trait, was related with an attenuation of the cortisol awakening response in patients with memory complaints, mainly for those with objective memory impairment.

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Visuospatial Abilities

V.W. MARK, A.J. WOODS & L.C. HAMILTON. Visual Memory and Search Organization During Cancellation.

Objective: To evaluate whether cancellation without visual feedback for marking is related to standard visual memory testing. Cancellation without feedback leads to increased errors (Woods AJ et al, JINS 2004), which suggests that visual memory is important for error-free performance. However, it is unclear whether errors can be predicted by standard visual memory assessments.

Participants and Methods: Healthy adults (n=17) completed 4 cancellation tests on a touchscreen. On the first and last tests, targets were circled upon contact. On the other tests, target contacts were not visibly marked but were electronically recorded. Target omissions, marking perseverations, and measures of search organization (average path length between targets, path intersections/ target, and "best r" (Mark VW et al, Neurology 2004)) were recorded. Test variables within each condition (visible vs. invisible marking) were averaged. Participants also completed the Visual Reproduction and Spatial Span Tests of the WMS-III. Nonparametric statistics evaluated whether the memory tests predicted the changes in cancellation performance during testing without visual feedback.

Results: As expected, participants had significantly increased omissions and perseverated target contacts during invisible marking ($p=0.001$). Nonetheless, error differences from visible cancellation were not correlated with the visual memory tests ($p>0.12$). Despite increased errors on invisible cancellation, all search organization measures were unchanged from visible cancellation.

Conclusions: The increased errors during invisible cancellation suggest a limitation in visual working memory, but which nonetheless cannot be detected by standard visual memory tests. These findings tentatively suggest that cancellation without feedback strains a different form of visual memory. Nonetheless, cancellation without visual feedback does not significantly disrupt search organization in healthy adults, which suggests that search organization is resilient to stresses on visual working memory.

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T.D. PARSONS, J. PAIR, J. BRENNAN, T. SILVA & A.A. RIZZO. Sex differences in spatial cognition within a virtual environment: Virtual Reality Cognitive Performance Assessment Test (VRCPAT).

Objective: Sex differences in visuospatial performances may be related to the distinct functional anatomy of spatial cognition in females versus males. While standard neuropsychological (NP) measures have been found to have adequate predictive value, their ecological validity may diminish predictions about real world functioning. Virtual environments (VEs) are increasingly recognized as ecologically valid tools for NP. We assessed the construct validity of the Virtual Reality Cognitive Performance Assessment Test (VRCPAT); and used the VRCPAT to examine sex differences in the processing of spatial information.

Participants and Methods: A 15 minute VRCPAT battery and a 1.5 hour in-person neuropsychological assessment were conducted with 41 healthy normal subjects (17 females). Mean age of the female group was 25.2 ± 3.7 years; mean age of the male group was 23.7 ± 3.6 years. None had a history of neurological or psychiatric disorders or any sign of color blindness or visual field defects.

Results: VRCPAT correlated significantly with traditional neuropsychological Learning ($r = 0.69$, $p < 0.001$, 48% of variance) and Mem-

ory ($r = 0.67$, $p < 0.001$, 45% of variance) composites. No significant correlations existed between VRCPAT and non-memory composites. Additionally, VRCPAT results show that males outperformed females on spatial memory tasks involving the construction of spatial representations from verbal descriptions.

Conclusions: Findings suggest the VRCPAT measures a capacity consistent with traditional measures of learning and memory; and is inconsistent with potential confounds. Findings develop previous research showing sex differences in VE mediated spatial cognition, and show how VEs can influence the magnitude of the difference.

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U.S. SPRINGER, B. PARKER, H.H. FERNANDEZ, G.P. CRUCIAN, M.S. OKUN & D. BOWERS. Operating Characteristics of Mindstreams' Visual Spatial Perception Score in Parkinson's Disease.

Objective: Visuospatial disturbances are often observed in Parkinson's disease (PD). This study sought to elucidate the operating characteristics of the visuospatial component of a computerized assessment battery in a PD sample relative to two commonly used neuropsychological measures of spatial cognition, Judgment of Line Orientation (JOLO) and the Benton Face Recognition Test (FRT).

Participants and Methods: 52 PD patients who were candidates for deep brain stimulation underwent cognitive assessment with the Mindstreams computerized battery (Neurotrax, Inc.) and a traditional multi-domain neuropsychological evaluation within 7 days of each other. The Mindstreams visuospatial domain score (M-VS) is based on a multiple choice task involving spatial perspective taking. Error types and operating characteristics for M-VS were derived using JOLO and FRT as the comparison measures. Abnormal scores were based on Mindstreams' cutoff of 1 SD below the mean. Regression analyses identified significant predictors of M-VS scores.

Results: JOLO, FRT, and M-VS scores were all significantly correlated ($p's < .01$), with JOLO and M-VS being most strongly correlated ($r=.45$, $p<.001$). 23-35% of the PD patients exhibited "abnormal" scores based on JOLO and/or FRT, versus 12% for M-VS. While M-VS specificity ranged between 87-90%, sensitivity did not exceed 17% when JOLO, FRT, or a composite of the two were used as comparison measures. Altering the cutoff score did not substantially improve operating characteristics. In regression analyses, M-VS scores were predicted by Digits Backwards, WMS-III Logical Memory 1, and Beck Depression Inventory. FRT was predicted by WMS-III Faces I ($p < .01$) and JOLO was predicted by Trails B and Digits Backwards ($p's < .05$).

Conclusions: Mindstreams' visuospatial domain provides adequate specificity in PD but may be inappropriate for detecting the presence of visual perceptual dysfunction. Our data also suggest that M-VS (but not FRT or JOLO) is sensitive to immediate verbal memory and depressive symptoms in PD.

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Y. TANAKA, M.L. ALBERT, M. MIYAZAKI, K. FUJITA & S. YAMAMOTO. Dynamic Spatial Awareness in Unilateral Spatial Neglect.

Objective: At least two types of dynamic visual information resources come into play when an observer sees an object approaching: one for scale-change; another for optic-flow field. The goal of this study is to determine which, if any, dynamic visual resources might be preserved in patients with unilateral spatial neglect (USN).

Participants and Methods: 41 subjects have participated in this ongoing study: 20 with unilateral hemispheric lesions with (N=6) or without (N=14) USN and 21 age-matched participants with no cerebral lesions.

The subject sits on a chair in front of a sponge ball hanging from the ceiling. The sponge ball is released, swinging toward the subject's shoulder. The subject is asked to dodge the sponge ball before the sponge ball touches the subject's shoulder.) All testing is filmed for subsequent evaluation. Time in seconds ("dodging time") is measured from the moment the subject starts to dodge the sponge ball to the moment the ball passes the shoulder.

Results: Dodging time was compared among 5 groups: those with left USN, right USN, right hemispheric lesions with no USN, left hemispheric lesions with no USN, and non-brain-damaged controls. There was no significant difference for dodging time among the five groups.

Conclusions: Although preliminary, these results indicate that patients with USN are aware of (at least some) dynamic aspects of visual stimulation in the neglected field, thereby helping to explain why vestibular and optokinetic stimulation can counteract phenomena of neglect.

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Psychopathology: Schizophrenia

V. KAMATH & J.S. BEDWELL. A Disconnect between Self-report Questionnaire and Clinical Interview Assessment of Schizotypal Personality: Influence on Cognitive Endophenotype Expression.

Objective: Self-report questionnaires are an increasingly popular method of identifying and screening individuals with schizotypy. The aim of the current study was to compare self-reported symptoms of schizotypy to clinical interview assessment within the same population. We examined cognitive performance on two well-researched cognitive endophenotypes of schizophrenia.

Participants and Methods: Individuals with high ($N = 26$) and average ($N = 26$) scores on the Abbreviated Schizotypal Personality Questionnaire (SPQ-B; 62% female) were administered a structured clinical interview, a six-minute degraded-stimuli Continuous Performance Test (CPT), and the computer version of the Wisconsin Card Sorting Test (WCST).

Results: Psychometrically-defined SPQ-B group differences in performance indices of the CPT did not approach statistical significance. For the WCST, SPQ-B group differences were statistically significant for number of correct responses, but in the opposite direction expected – individuals reporting high schizotypy had more correct responses than controls. In contrast, a clinical interview dimension score of schizotypal personality showed a statistically significant positive correlation with the number of errors on the CPT task. In addition, the disorganized factor score from the clinical interview showed a negative correlation with number of categories on the WCST and a positive correlation with failure to maintain set – both in the direction expected.

Conclusions: Our findings suggest that schizotypal traits may be more adequately assessed through an interview by trained clinicians who use clinical judgment to determine the presence of phenotypic aspects of schizotypal personality disorder, rather than relying on self-report measures. Further, these results may explain the differential cognitive findings reported across studies in schizotypal personality populations.

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Paper Session 11

1:15–2:45 p.m.

ADHD/Learning Disabilities

K.E. WALDIE & I.J. KIRK. Reading the Wrong Way with the Right Hemisphere.

Objective: Reading requires the use of at least two anatomically distinct, but cohesive, processing systems: a posterior (temporo-parietal) circuit and a frontal (inferior frontal) circuit. In the case of developmental dyslexia, this left hemisphere system has been hypothesised to be functionally disrupted.

Participants and Methods: Here we present block-design data from two fMRI experiments. In the first (pilot) experiment, lexical decisions were performed by an adult with phonological dyslexia and a comparison group of non-impaired readers ($n=7$) using 3 Tesla fMRI (Brain Research Institute, Melbourne). In the second experiment we included a larger sample ($n=30$) and modified the tasks to include linguistic and non-linguistic stimuli (Centre for Advanced MRI, University of Auckland).

Results: In Experiment One, we found minimal left posterior activation during reading tasks in the adult with dyslexia. Maximal activity was observed in right inferior frontal areas. In Experiment Two, dyslexics did not differ from normal readers when responding to nonverbal material, but showed marked differences in brain activity with verbal tasks. As in Exp One, over-reliance on right hemisphere resources was observed during reading tasks in the participants with dyslexia, particularly with irregular words. Dyslexic subjects also showed significant activation in the cerebellum during a phonological task, a finding not predicted based on current neural theories of dyslexia.

Conclusions: Dyslexic adults appear to show right hemisphere activity in response to linguistic stimuli, most likely as a compensatory reaction to left hemisphere dysfunction. Implications of these findings for early screening and remediation will be discussed.

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K.C. BROCKI, L.B. THORELL, L. NYBERG & G. BOHLIN. Are early effects of inhibitory control on later ADHD symptoms mediated by maturation in working memory?: A longitudinal study.

Objective: The maturation of working memory (WM) has been proposed to depend on increases in inhibitory control (IC) resources. Although, IC and WM are thought to play an important part in the neuropsychology of Attention Deficit Hyperactivity Disorder (ADHD), little is known with regard to these processes and their interrelation from a developmental perspective in ADHD. In this longitudinal study, we examine whether observed early effects of IC on later ADHD symptoms, is mediated by maturational effects in WM functioning.

Participants and Methods: Seventy-two preschoolers, 1/3 who had been identified as being at risk for developing ADHD, completed neuropsychological tasks designed to measure inhibitory control and working memory. Behavioral symptoms were measured through parental and teacher ratings of the DSM-IV criteria for ADHD.

Results: Results revealed that different types of IC are good predictors of both Hyperactivity and Inattention symptoms as measured 2 years later. In contrast, WM functioning only predicted longitudinal symptoms of Inattention. A hierarchical regression model showed that early effects of IC on symptoms of Inattention is not mediated by maturational effects in WM.

Conclusions: The findings underscore the importance of identifying early neuropsychological risk factors that can predict later ADHD symptoms as studied longitudinally over extended periods of time. This study shows that early IC may qualify as one of the strongest neuropsychological risk factor for later ADHD symptoms.

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M. NIKOLAS, J. NIGG & K. FRIDERICI. Moderating Effects of Dopamine Transporter Genotype on the Relationship Between Executive Function and ADHD Symptoms in Adolescence.

Objective: Youth with attention-deficit hyperactivity disorder (ADHD) have weaknesses in executive functioning (EF) (Willcutt et al., 2005). Dopaminergic neurons mediate transmission in fronto-striatal circuitry underlying many EF-related operations. The dopamine-transporter gene (DAT1) has been implicated in ADHD and EF performance (Bellgrove et al., 2005; Faraone et al., 2005). The current study examined DAT1 genotype, EF, and ADHD symptoms in adolescents.

Participants and Methods: 187 adolescents (59.6% males) ages 13-17 completed a multi-informant assessment, including parent and teacher ratings of symptoms, DNA swab, and measures of EF, including response inhibition (Stop Task), set-shifting (Trailmaking Task), interference control (Stroop Task), and working memory (Wisconsin Card Sorting Task). The DAT1 intron 9 polymorphism was genotyped; adolescents were classified into two groups (A/A; N=109) and (A/G,G/G; N=78).

Results: Measures of EF were used to validate an EF composite ($\chi^2[4]=2.33, p>.05, RMSEA<.001$). Moderated regression analyses were conducted with DAT1 genotype, the EF composite, and their interaction as predictors of ADHD symptoms. After controlling for age, gender, IQ, and covariance among ADHD symptom domains, EF ($\beta=.19, p=.002$) and DAT1 x EF ($\beta=.12, p=.04$) significantly predicted inattentive symptoms (parent+teacher ratings). Simple slopes revealed a significant relationship between EF and inattentive symptoms for those with the G allele ($\beta=.31, p=.001$); but not for the A allele homozygotes ($\beta=.07, p=.37$). All measures were nonsignificant predictors of hyperactive symptoms ($p>.10$).

Conclusions: DAT1 genotype significantly moderated the relationship between EF performance and parent+teacher ratings of inattentive symptoms. Results may have important implications for heterogeneity in EF performance in adolescents with ADHD and for EF as endophenotypes for ADHD.

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M. SEIDENBERG, J. JONES, R. SETH, K. DABBS, C. ALLEN, A. MCMILLAN & B. HERMANN. Attention Deficit Hyperactivity Disorder in New Onset Pediatric Epilepsy.

Objective: Recent studies suggest that Attention Deficit Hyperactivity Disorder (ADHD) is a common co-morbid condition in childhood epilepsy, but little is known regarding the nature, frequency and timing of associated neurobehavioral/cognitive complications or the underlying etiology of ADHD in epilepsy. This investigation examined: 1) the rate of ADHD and its subtypes, 2) the association of ADHD with abnormalities in academic, neuropsychological, behavioral, and psychiatric status, and 3) the etiology of ADHD in pediatric epilepsy.

Participants and Methods: 75 children (age 8-18) with new/recent onset idiopathic epilepsy and 62 healthy controls underwent structured ADHD (K-SADS) to identify the presence and type of DSM-IV defined ADHD, neuropsychological assessment, quantitative MR volumetrics

Results: ADHD is significantly more prevalent in new onset epilepsy than healthy controls (30% vs. 6%), characterized predominantly by the inattentive variant, with onset antedating the diagnosis of epilepsy

in the majority of children. ADHD in childhood epilepsy is associated with significantly increased rates of school based remedial services, academic underachievement, neuropsychological impairment with prominent deficits in executive function and a wide range of parent-reported dysexecutive behaviors. ADHD in pediatric epilepsy is not associated with demographic or clinical epilepsy characteristics nor a wide range of potential risk factors during gestation and birth. Quantitative MRI demonstrates that ADHD in epilepsy is associated with significantly increased gray matter in distributed regions of the frontal lobe and significantly smaller brainstem volume.

Conclusions: ADHD is a prevalent comorbidity of new onset idiopathic epilepsy associated with a diversity of salient educational, cognitive, behavioral and social complications that antedate epilepsy onset in a significant proportion of cases, and appear related to neurodevelopmental abnormalities in brain structure.

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Symposium 14

1:15–2:45 p.m.

Neuropsychological Practices in Several Asian Countries

Chair: Daryl Fujii

Discussant: Tony Wong

K. KUMAR. Neuropsychology in India.

Objective: India, with about 1 billion people, is projected to be the most populated country in the world. Being a rapidly developing economy with expanding industrialization and urbanization, it also has a fair share of medical, neurological and psychiatric disorders. Thus neuropsychologists are required to provide assessment and rehabilitation services to cater to this vast need. Indian neuropsychologists face unique challenges as there are about 18 official languages and several dialects, and illiteracy is common in rural areas.

Neuropsychology as a formal discipline is relatively new, originating in 1976. The Neuropsychological Battery (Mukundan 1979), India's first test battery based on Luria's model, was developed at the Department of Clinical Psychology, at the National Institute of Mental Health and Neuro Sciences (NIMHANS) Bangalore. With the advances in neuropsychology and cognitive neuroscience, newer batteries such as the NIMHANS Neuropsychology Battery (Rao, Gopukumar and Subbarkishna, 2004) were developed and standardized on a large sample with different age and education levels.

In the recent years several other centers around the country have been providing neuropsychological services and NIMHANS has been a major training centre for neuropsychological assessment and rehabilitation for various professionals including clinical psychologists, neurologists and psychiatrists. This presentation will discuss the brief history of neuropsychology in India, assessment, rehabilitation programmes and research practices in India.

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A. ISOMURA & M. MIMURA. Neuropsychology in Japan.

Objective: Clinical neuropsychology in Japan is regarded as a multi-disciplinary field in which diverse professionals use neuropsychological tests in their practice. There is no standardized professional training nor authorized license for “neuropsychology” which is not a distinct profession. Historically, neuropsychology was initially practiced by neurologists, neuropsychiatrists and speech therapists. Only recently, has interest in neuropsychology grown among clinical psychologists. Given, the lack of formal training and licensing, clinical skills for practicing neuropsychology is extremely varied. Another problem in Japan is that relatively few Western neuropsychological tests have been standardized with the Japanese population. In fact, a number of tests are frequently used in clinical practice without standardization. We will further discuss current issues of clinical neuropsychology in Japan.

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J. CHEY. Neuropsychology in a Rapidly Aging Country.

Objective: South Korea has experienced a dramatic economic growth and social change in the past half decade. One significant result of this change is the rapid aging of its population. In fact the time it would take South Korea to transform from an aging to an aged society is only 20 years, compared to 116 years of France, which makes South Korea the fastest aging country in the world. Accordingly, neuropsychology in Korea began its official clinical operation in the dementia population in 1994, when the nation’s first Neuropsychology Laboratory was instituted at Samsung Seoul Hospital. The Korean version of the Dementia Rating Scale (K-DRS; Chey, 1998; Mattis, 1988) was one of the first published neuropsychological tool in Korea. Since then, there has been a boom for neuropsychology in the past decade and many neuropsychological tools have been developed for the Korean population, many of which were restandardization of the tools developed in North America.

The Neuropsychology Research Meeting has been launched within the Korean Psychological Association’s Clinical Division in 1998. It has held quarterly workshops to educate clinical psychologists and graduate students in clinical psychology. Currently less than a half dozen major universities have clinical neuropsychology faculties and laboratories in the department of psychology, while many more neuropsychological laboratories have opened in the hospitals and medical schools. The challenges of Korean neuropsychologists and the future directions of neuropsychology in Korea will be discussed.

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M. LOPA-RAMOS & L. LEDESMA. Neuropsychology in the Philippines.

Objective: The Philippines is a small, developing country in Southeast Asia with a population of 90 million of Malay, Chinese, Spanish, American and Arab descent. It is a predominantly Roman Catholic country with a high literacy rate founded on a bilingual (Filipino-English) educational tradition. The country’s history can be divided into five distinct phases: the pre-Spanish period, Spanish rule (1521-1898), American occupation (1898-1946), the post-World War II independence era (1946-1986), and the re-establishment of democracy after 21 years of Martial Law and dictatorship (1986-present). Currently, the few neu-

ropsychologists in the country have all been trained abroad. However, in response to the need for more neuropsychologists, the University of the Philippines has developed a neuropsychology track at the graduate psychology level. Neuropsychology is practiced in hospital-based neurodevelopmental centers and centers for adults with memory and other neurocognitive and neurobehavioral problems. Most of the standardized tests used in assessment are Western instruments but informal measures in Filipino are also utilized. There have been a few attempts at developing indigenous instruments as well (e.g., De-Westernized Dementia Screening Scale). Research is an underdeveloped area in the country. A review of literature indicates topics ranging from epilepsy, language delay, bilingual reading, autism, Attention-Deficit/Hyperactivity Disorder, and dementia. Despite limited resources, neuropsychology in the Philippines continues to grow as its contribution in helping those with neurological-based disorders is becoming more recognized.

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S. COLLINSON & D. YEO. Neuropsychology in Singapore: Current and Emergent Challenges.

Objective: Singapore is a prosperous and vibrant multicultural society consisting of a mixture of majority Chinese, indigenous Malay, Indian and Arab communities. There also exist significant Eurasian, European and Peranakan (known also as ‘Straits Chinese’) communities. The leading causes of morbidity and mortality in Singapore are the major non-communicable diseases such as cancer, coronary heart diseases, strokes, diabetes, hypertension and injuries, with the recent emergence of dementia as a growing public health concern. In 2006, cancer, cardiovascular diseases and stroke together accounted for approximately 60% of the total causes of death. Despite high quality medical services, the active promotion of preventive medicine and the presence of established psychology departments in several local universities, the development of clinical psychology and neuropsychology in Singapore has lagged behind that of comparable economies in the western world. In recent years, there has been significant development of clinical neuropsychology research, test development and training in several locations in Singapore. The many local languages, dialects and cultures impose unique challenges for neuropsychologists in Singapore but as the country seeks to establish itself as regional leader in the clinical neurosciences, these challenges are taking on growing significance.

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K. RATANADILOK. Neuropsychology in Thailand.

Objective: Neuropsychology is an emerging, but problematic discipline in Thailand. On one hand, as awareness of neurological disorder among the Thai people increases, there is an increased demand for neuropsychological services. Unfortunately, there is a lack of knowledge and appropriate training of professionals which can be harmful to the patients and also to the field itself. This paper will present a current picture of neuropsychology in Thailand by using results from data that will be collected from psychologists around the country. This study, the first of its kind to be conducted in Thailand, will survey psychologists on their practice, the types of neuropsychological assessments they use, the nature of their patients, their training experiences in neuropsychology, and their research and areas of interests in relation to neuropsychology.

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Symposium 15

1:15–2:45 p.m.

N. CHE DIN. Neuropsychology in Malaysia.

Objective: Malaysia is a multiethnic country in South East Asia, surrounded by Thailand, Indonesia, and Singapore. The population of Malaysia in 2007 is estimated to reach 26 million people with the Malays as the major ethnic group (52%), followed by 30% Chinese and 18% of other races. The Malaysian economy is an enviable position compared to other developing countries. The Malaysian standard of living is one of the highest in Asia. The rate of economic growth is one of the fastest in the Third World. The development of neuropsychology field in Malaysia started in 1994 with the advent of the first Masters in Clinical Psychology program in the country. Neuropsychology was taught as one of subjects in the Masters Program. Neuropsychological services are provided by a clinical psychologist as part of the medical, neurological, psychiatric, pediatrics and psychogeriatric management in the hospital and university outpatient clinics. Malaysia has yet to develop the postgraduate program in neuropsychology. The current services are mainly in neuropsychological assessment for head injury, stroke, epilepsy, and geriatric patients. All neuropsychological tests administered were adapted from the West and tests interpretations are based on the Western norms. The awareness and understanding of the Malaysian government and community concerning the role of clinical psychology in general and neuropsychology in particular, are one of the steps to be undertaken in the near future as well as the development of postgraduate training programs in the academic sector.

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D. FUJII, T. WONG, K. KUMAR, J. CHEY, M. LOPA-RAMOS, A. ISOMURA, K. RATANADILOK, S. COLLINSON & N. CHE DIN. Neuropsychological Practices in Several Asian Countries.

Symposium Description: Neuropsychology is a discipline that is practiced around the world as neurological disorders such as traumatic injury, dementia, and HIV know no borders. Thus all neuropsychologists share the same challenge of determining cognitive changes in persons with known or suspected neurological disorders, by estimating premorbid abilities, comparing this to current estimated cognitive skills, predicting functional abilities, and making recommendations for treatment. This symposium describes neuropsychology as it is practiced in several Asian countries including India, Japan, Korea, Malaysia, Philippines, Singapore, and Thailand. Asia is a family of countries that share proximity and different degrees of underlying cultural values and religious beliefs. Despite similarities, these countries are simultaneously highly diverse in their geography, climate, history, population, educational systems, economies, primary health problems, access to resources, as well as neuropsychological development.

The purpose of this symposium is three-fold. First, we describe the practice and research of neuropsychology in several Asian countries. Salient issues include how practice and research is affected by economic and academic development of the country, as well as the predominant medical problems in the region. A second goal is to provide insights into how to better service our Asian-Americans clients. Third, knowledge of Asian neuropsychology may generate ideas for research and test development within our own country.

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Chemobrain: Cognitive Impairment Associated with Cancer Treatment

Chair: Bart Brigidi

B.D. BRIGIDI, B.D. BRIGIDI, A.J. SAYKIN, D.D. CORREA, F.W. UNVERZACT & P. BROUWERS. Chemobrain: Cognitive Impairment Associated with Cancer Treatment.

Symposium Description: Cognitive functioning is a major determinant of quality of life for individuals with cancer. Neuropsychologists contribute to better QoL for cancer survivors by providing assessment of and recommendations to deal with changes in cognition associated with both the disease and treatment. The current symposium aims to further clarify which treatments for which cancers are associated with which cognitive deficits; the duration of cognitive deficits; and the neural substrates and etiologic mechanisms that underlie the observed changes in cognitive functioning. In the current symposium, Dr. Bart Brigidi will be discussing neuropsychological, fMRI, and self-report QoL data pooled from ongoing clinical trials involving the administration of bevacizumab, a novel antiangiogenic chemotherapy, to adults with recurrent high grade glioma. Dr. Andrew Saykin will present voxel-based morphometry and diffusion tensor imaging data which show gray and white matter changes after chemotherapy for breast cancer. Dr. Denise Correa will present results of retrospective and prospective studies of primary CNS lymphoma patients who have undergone combined treatment with chemotherapy and whole brain radiation. Dr. Frederick Unverzagt will present data on telephone-based neuropsychological assessment with women with breast cancer. Lastly, as the discussant, Dr. Pim Brouwers will provide summary comments and insights for studying cognitive effects of cancer treatments in a genomic era.

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B.D. BRIGIDI, R.H. RAYNOR, L. HUGHES, L. FORNNARINO, H.S. FRIEDMAN, J.E. HERNDON, A. DESJARDINS, D.A. REARDON, D. BIGNER & J. VREDENBURGH. Assessment of Neurocognitive Impairment and Quality of Life in High Grade Glioma (HGG) Patients Treated with Bevacizumab (Avastin®).

Objective: There are no published studies on the effects of bevacizumab (Avastin®), a systemic antiangiogenic chemotherapy agent, on neurocognitive functioning and quality of life (QoL) in patients with HGG.

Participants and Methods: Neurocognitive/QoL data were pooled for subjects from clinical trials at The Preston Robert Tisch Brain Tumor Center at Duke (PRT-BTC) involving administration of bevacizumab (Avastin®) to patients with recurrent HGG. A brief neuropsychological battery was administered at baseline and after each of two six week cycles of chemotherapy. A subset of patients completed fMRI conducted during performance of a verbal working memory task at baseline and post-treatment.

Results: Differences on neurocognitive and fMRI measures at baseline compared to post-treatment will be presented as well as the association between neurocognitive functioning and QoL.

Conclusions: Use of neurocognitive testing is increasingly becoming part of standard care in treatment of HGG. Effects of treatment on fronto-executive abilities are discussed. Difficulties with conducting serial neurocognitive assessments with a HGG population and the potential added value of including fMRI neurocognitive paradigms will also be discussed. Correspondence: *Bart D. Brigidi, PhD, Surgery, Duke University Medical Center, The Preston Robert Tisch Brain Tumor Center at Duke, DUMC Box 3624, Durham, NC 27710. E-mail: brigi002@mc.duke.edu*

A.J. SAYKIN, B.C. MCDONALD, T.A. AHLES, J.D. WEST, S.K. CONROY, L.A. CHESNUT, S.A. HORRIGAN, C.L. KRUCK & K. ARFANAKIS. Chemotherapy-associated changes in brain structure on voxel-based morphometry and diffusion tensor MRI: Preliminary results from a prospective study of breast cancer patients.

Objective: A growing body of research has reported cognitive changes after cancer chemotherapy yet the neural substrate remains unclear. We used voxel-based morphometry (VBM) and diffusion tensor imaging (DTI) to examine gray and white matter (GM, WM) changes after chemotherapy for breast cancer. These techniques allow unbiased assessment of structural changes on a voxel-by-voxel basis across the whole brain.

Participants and Methods: Participants included healthy controls (HC) and two groups of breast cancer patients. The CTx+ group received systemic chemotherapy in addition to surgery, local radiation, and/or hormone therapy; the CTx- group did not receive chemotherapy. Groups were matched for age, gender (all women), and education. High resolution T1-weighted MRI volumes and DTI were acquired as part of a comprehensive protocol at baseline (BL; after surgery but before radiation and/or chemotherapy) and one month (1M) following the completion of chemotherapy, or yoked intervals for the CTx- and HC groups.

Results: At 1M relative to BL the CTx+ group showed significantly decreased GM density in bilateral frontal and temporal regions on VBM and increased trace diffusivity on DTI in distributed central WM regions bilaterally. These changes were not seen in the HC or CTx- groups.

Conclusions: These findings suggest decreases in cerebral GM density and WM integrity detectable shortly after systemic chemotherapy and represent, to our knowledge, the first prospective data demonstrating structural alterations on brain MRI related to breast cancer treatment. Longer term follow-up data from this cohort should clarify whether these alterations are transient or persist over time as well their relation to functional outcomes.

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D.D. CORREA, M. ROCCO-DONOVAN, R. DOLGOFF-KASPAR, L.M. DEANGELIS & L.E. ABREY. Neuropsychological Assessment in Primary Central Nervous System Lymphoma (PCNSL) Patients Treated with Chemotherapy and Whole Brain Radiotherapy.

Objective: The standard treatment for primary CNS lymphoma (PCNSL) involves high-dose chemotherapy alone or combined with whole brain radiotherapy (WBRT). This regimen can prolong survival but is often associated with delayed neurotoxicity. We report the results of an ongoing prospective neuropsychological study of PCNSL patients treated with induction chemotherapy followed by reduced-dose WBRT.

Participants and Methods: Twelve patients (mean age = 59 ± 8.2) had neuropsychological evaluations (1) at diagnosis, (2) after induction chemotherapy and prior to reduced-dose WBRT (23.4 Gy), and (3) six and (4) twelve months after completion of WBRT. Nine patients completed an additional cognitive evaluation (5) eighteen months post-treatment.

Results: At diagnosis, patients had moderate impairments in Executive Functions, Verbal Memory, and Motor Speed. There was a significant improvement in Executive Functions ($p < 0.01$) following induction chemotherapy, and scores remained relatively stable at follow-up. There were no significant changes in Verbal Memory and Motor Speed up to twelve months post-WBRT, but there was a mild decline in these domains among the nine patients who completed the eighteen-month follow-up. Five patients had an increase in white matter abnormalities on MRI over the follow-up period.

Conclusions: Executive Functions improved following induction chemotherapy, likely due to decreased tumor involvement and possibly to discontinuation of corticosteroids and anticonvulsants. Longitudinal neuropsychological assessment suggested no significant cognitive decline up to eighteen months post-chemotherapy and reduced-dose WBRT in this group of PCNSL patients. These preliminary findings are discussed in the context of cognitive outcome studies of PCNSL patients treated with single and combined modality therapy.

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F.W. UNVERZAGT, P.O. MONAHAN, L.R. MOSER, Q. ZHAO, J.S. CARPENTER, G.W. SLEDGE & V.L. CHAMPION. The Indiana University Telephone-Based Assessment of Neuropsychological Status (IU-TBANS): A new method for large scale neuropsychological assessment.

Objective: Sensitive measures of neuropsychological function were adapted to a telephone administration format for use in a large survey of quality of life in breast cancer survivors (BCS).

Participants and Methods: Healthy controls (HC) and BCS were recruited from the community and administered the same neuropsychological test battery on two occasions separated by 1 week. Subjects were randomly assigned to conditions, stratified by diagnosis: In-person at Time-1 and In-person at Time-2 [P-P]; Telephone at Time-1 and Telephone at Time-2 [T-T]; T-P; and P-T. Four cognitive (Rey AVLT, Controlled Oral Word Association, Digit Span, Symbol Digit) and two self-report measures (Squire Memory Self-Report Scale, Center for Epidemiological Studies Depression Scale) were used. 106 subjects were randomized (54 HC and 52 BCS).

Results: Test-retest reliabilities (intraclass correlations) did not differ significantly by condition across the cognitive or self-report measures and ranged from moderate to near perfect (r 's .43 - .93, p 's $< .05$). Mean scores at Time-1, practice effects (Time-1 to Time-2), and standard errors of measurement were comparable between In-person and Telephone administration formats.

Conclusions: Results suggest that memory, attention, information processing speed, verbal fluency, and self-report of mood and memory can be measured reliably and precisely over the telephone.

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