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Abstracts Presented at the Twenty-Fifth Annual International Neuropsychological Society Mid-Year Conference

July 24–27, 2002
Stockholm, Sweden

THURSDAY MORNING, July 25, 2002

Poster Session 1/9:00 a.m.–5:00 p.m.

COGNITIVE FUNCTIONS, ASSESSMENT

C. SILVA, L. FAISCA, S. MENDONÇA, M. INGVAR, K.M. PETERSSON, & A. REIS. Awareness of Words as Phonological Entities in an Illiterate Population.

This study investigates lexical phonological processing in literate and illiterate subjects. *Goal:* To analyze if the acquisition of orthography/formal schooling influences the development of awareness of words as phonological forms independent of lexical semantics. *Methods:* A word length decision task was prepared. 15 pairs of words (W) and 15 pairs of pseudowords (PW) were randomly presented and subjects had to decide which item in a pair was phonologically the longest. For the W condition the relationship between word length and size of the denoted object varied along three sub-conditions: *Congruent* (5 pairs): the longer word denoted the larger object; *Incongruent* (5 pairs): the longer word denoted the smaller object; *Neutral* (5 pairs): only phonological length varied denoting objects of similar size. Manipulating W and PW allowed us to examine to what extent subjects focused on formal rather than semantic properties of the items. *Subjects:* Ten illiterate (67.2 yrs) and 12 literate (69.7 yrs; mean schooling 4.3) women. *Results:* Illiterates were significantly worse compared to literates both in W (p = .00007) and PW (p = .002) conditions. The mean number of correct decisions showed that for literates there were no differences between W (14.8) and PW (14.8) while illiterates showed a tendency for a difference (p = .05) between conditions (W = 11.1 *vs.* PW = 12.9). The analysis of the different W sub-conditions showed a significant effect only in the illiterate group (p = .0008) performing the least well in the incongruent condition. *Conclusion:* The present results indicate that performance on phonological word length comparisons is not completely independent from orthographic knowledge: illiterates performed least well in W condition suggesting semantic interference. In addition illiterates showed a sub-condition effect, i.e., the performance decreased with increasing semantic interference, indicating that they are more inclined to take semantic aspects into account than literate subjects when they make phonological length judgments.

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S. MENDONÇA, L. FAISCA, C. SILVA, M. INGVAR, A. REIS, & K.M. PETERSSON. The Role of Literacy in the Awareness of Words as Independent Lexical Units.

The concept of a word or word awareness has been discussed in the literature. However it is commonly assumed that native speakers know intuitively what a word is. The present study investigates the influence of formal schooling/orthographic knowledge on the awareness of words as independent lexical units within a sentence context. *Goal:* To analyze if sentence segmentation in literate and illiterate subjects show predictable differences and which cues (orthographic, phonological/prosodic or/and syntactic) are used for sentence segmentation. *Methods:* 24 simple sentences including lexical units (from 5 to 7 words) of different syntactic categories were presented auditorily. Subjects were asked to repeat each sentence and then count/identify the number of words in the sentence. Segmentation errors were classified in order to establish whether sentence segmentation was based on phonological/prosodic or syntactic cues. *Subjects:* Ten illiterate (67.2 yrs) and 10 literate (68.3 yrs; mean schooling 4.3) women. *Results:* The illiterate subjects performed at a mean of 20.5 (SD = 1.7) correctly repeated sentences and literate subjects performed at 23.3 (SD = 0.7) (p = .003). For sentence segmentation illiterates had a mean of 5.3 (SD = 5.7) correctly segmented sentences and literates a mean of 21.9 (SD = 1.8) (p = .0002). Concerning within group comparisons, we observed a dissociation between sentence repetition and segmentation just for the illiterate group (p = .005). For sentence segmentation, illiterates made mainly blending errors, as for example, associating the determiner and the prepositions with the nouns. *Conclusions:* The results indicate that awareness of words as independent lexical units in a sentence context for literate subjects may be improved by learning to read and write while for illiterate subjects the awareness of words may be determined by phonological/prosodic and syntactic cues.

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S.H. OFTE & K. HUGDAHL. Right–Left Discrimination: Effects of Educational Background.

The present study investigated right–left discrimination, with a paper-and-pen test with cartoon figures. The test consists of line drawings of a person with no, one, or both arms crossing the vertical body axis of the figure. The subjects' task is to mark with a pencil, as fast as possible, which is the right or left hand in the figure. The line drawings are either viewed from the back, from the front, or randomly alternating between the back and front views. The study consisted of 175 right-handed college students, 63 were psychology students, 54 were medical students, and 58 were law students. Undergraduate programs that are obligatory for medical study in Norway puts great demands on visuospatial abilities compared to psychology and law studies. Therefore, one could assume that inherited abilities for visuospatial processing have influenced their choice of education. Medical students have also experienced more training in processing of visuospatial tasks. Thus, it was predicted that medical students would perform

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better than psychology and law students at a right–left discrimination test. The main finding was that the medical students performed better than the psychology students for all figure orientation subtests and for all arm positions. In comparison with the law students, the medical students performed at the same level on the back view subtest, but they performed better on the front view subtest and on two out of three arm positions on the alternating view subtest. The findings are discussed in relation to experience in similar tasks and use of strategy.

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J. LEUTHARD, D. BÄCHTOLD, M. REGARD, & P. BRUGGER. Is "Left" Always Where the Thumb is Right?

A variety of reference frames may be used to define "left" and "right." Left-sided hemineglect, for instance, can affect items to the left of one's gaze, head or trunk orientation, or even the left side of the hand ("hand-centered" coordinates). We investigated the stability of hand-centered frames of reference as a function of hand posture and position (frontspace *vs.* backspace) in 32 healthy right-handed men. In a stimulus–response (S–R) compatibility task with centrally presented digits (1 to 11, without the number 6), subjects translated these numbers to hours on a clock face. Right-hand responses (second and fourth fingers) were required throughout. In the first run of frontspace testing, subjects responded with their second (index) finger to numbers "later than 6 o'clock" ("left" on both the subject's hand and on the imagined clockface) and the fourth (ring) finger to hours "earlier than 6 o'clock." In a second run, this finger-time assignment was reversed. In a backspace testing condition, subjects' responding hand was behind them. Reaction time analyses (correct decisions) indicated stable S–R compatibilities for frontspace testing (i.e., second-digit-advantage for responses "later than 6 o'clock" for palm-up and fourth-digit-advantage for palm-down conditions) and an S–R compatibility for the palm-down condition in backspace (similar to the one for palm-up in frontspace). No S–R compatibility emerged for palm-up testing in backspace, indicating that hand-centered conflicted with trunk-centered coordinates. These results are relevant to (1) theories of an analogue representation of space, (2) interactions between different body-part-centered frames of reference, and (3) the development of tests of representational neglect in backspace.

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C. MOHR, F. HÜBENER, & M. LASKA. Is There a Link Between Deviant Olfactory Perceptions and Olfactory Sensitivity?

There is a major controversy about the relationship between hallucinations and deviant sensory acuity in the specific modality in which the hallucinations occur. In healthy subjects, a "psychotic-like" feature, namely magical ideation, has been linked to deviant, "hallucination-like" olfactory experiences. We thus assessed magical ideation, deviant olfactory experiences and olfactory sensitivity for five different odorants in 21 (12 women) healthy subjects. It was found that (1) about half of the subjects ($n = 11$; 7 women) had, at least once, experienced deviant olfactory experiences; (2) the occurrence of deviant olfactory experiences was correlated with higher magical ideation scores, and (3) there was no firm relationship between olfactory acuity and either deviant olfactory experiences or magical ideation, respectively. These results show that (1) deviant olfactory experiences are not a prerogative of the psychiatric patient, (2) the positive relationship between magical ideation and deviant olfactory experiences supports the supposed link between "psychotic-like" features in healthy populations and real hallucinations of psychiatric patients, and (3) the absence of a relation between olfactory sensitivity and deviant olfactory experiences or magical ideation, respectively, suggests that their anatomical–functional correlates within temporolimbic regions may be different.

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C. MOHR, T. LANDIS, & G. THUT. Hand Clasping, Arm Folding, and Luria's Latent Left-Handedness.

Luria proposed that placing the left thumb on top while hand clasping (HC) or the left arm on top while arm folding (AF) might be a sign of "latent" left-handedness. This idea remained unconfirmed for each of the two postures, and untested for the postures in combination. We assessed in 445 healthy subjects (1) AF and HC and (2) hand preferences for conventional handedness items. Since handedness is not a single entity, we calculated whether posture combinations relate differently to hand preferences. The main finding was that the LL (AF: left-top, HC: left-top) combination is most strongly associated with the right-handed actions and the LR (AF: left-top, HC: right-top) combination the most with left-handed actions. Conventional right-handers ($n = 386$) did not differ between posture combinations and handedness items. We assume that these postures do not test for deviant hemispheric lateralization, at least on the motor level, in right-handers. We rather found that right-handers dominated in the LL group and left-handers in the LR group. Ambidextrous subjects were equally distributed in the posture combination groups. We suggest that the LL combination indicates those subjects with the strongest left hemispheric involvement in motor actions, whereas the LR combination, for which the HC preference deviates from the canonical pattern, indicates those subjects with a decreased hemispheric specialization. Thus, Luria's proposition that left-top preferences may select for "uncommon" hemispheric specialization was confirmed for those subjects (unselected for right-handedness) having the left arm but also the right thumb on top.

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C. MOHR, M. FATHI, & P. BRUGGER. A Single Dose of Levodopa Affects Whole-Body Movements in Healthy Men.

Animal research and clinical observations in neurological patients suggest that spatial attention is directed away from the hemisphere with the higher dopamine (DA) content. We designed a double blind levodopa/placebo study investigating in 40 healthy right-handed men the effects of DA on lateral deviations while walking blind-folded along a straight line (20 m). We assessed the side of the first deviation (>.20 m for both feet) and the number of deviations to either side. The results showed that the placebo group ($n = 21$) made (1) more deviations (sum of deviations to either side) and (2) more deviations to the right than the levodopa group. Moreover, for the first deviation, more subjects of the levodopa group either walked left or straight and more subjects of the placebo group walked to the right. These findings indicate that the baseline to deviate more to the right side of space in healthy subjects could be decreased under the influence of DA. The findings also suggest that a single dose of levodopa may affect the right hemisphere more than the left hemisphere. We conclude that dopaminergically innervated brain structures, most probably lateralized to the right hemisphere, are crucial mechanisms for spatially directed axial body movements.

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A. DUMBRAVA. Prospective Memory Disturbances in 2 Neuropsychological Populations.

A kind of long-term memory that psychologists have only recently begun to devote serious attention to is prospective memory. Very little is known about its disturbances in neuropsychological populations. Different prospective memory tasks have been administered to frontal lobe patients, neurotic patients and matched controls. Some different patterns of responses have been noticed in each group of patients as compared with their controls, with frontal lobe subjects being severely and diffusively altered and obsessive-compulsive subjects generally hyperfunctional with respect to prospective memory. Different aids (cues and reminders) are variably effective in increasing the prospective memory performances in patients as compared to controls. Explanations for these findings are advanced alongside with opening vistas on how to cope with prospective memory disturbances in everyday life.

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A. BILBAO, A. BILE, & I. BOMBÍN. Factors Influencing the Performance of Simulators of Memory Deficits.
Researchers studying malingering often use simulators to investigate new ways to discriminate people with true and feigned memory deficits. However, simulators are not the same as malingerers. There are two main differential factors that distinguish malingerers from simulators. First, motivational factors such as financial compensation or avoid going to prison. Secondly, familiarity with memory deficits, many malingerers have had some sort of memory deficit in the past, or have been able to study how people with memory deficits act and think. In this study we compare the performance of three groups of simulators of moderate–severe memory deficits under different conditions. Two variables were considered in order to design the experimental groups; familiarity with memory deficits and motivation to cooperate with the study. The low motivation-low familiarity group was composed of randomly sampled college students. The high motivation-low familiarity group was composed of college students who were told they had to perform like true patients in order to earn a $200 prize. The high motivation–high familiarity group was composed of family members of TBI patients with moderate to severe memory deficits. A control group composed of 15 patients with memory deficits due to different types of acquired brain injury was assessed in order to study the veracity of the simulators' performance. The results show that familiarity is a better predictor of good malingering than motivational factors. We also examine which tests are more efficient in discriminating malingerers from true patients.
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S. FORTALEZA & J.L.O. BUENO. Effects of Hippocampal Lesions on the Reversal Learning in Probabilistic Choice.
Fortaleza, Bueno, and Staddon showed that lesions in dentate gyrus of hippocampus did not affect the reversal performance of rats in probabilistic choice, when pre- and post-lesion data were compared. The purpose of the present experiment was to investigate the effects of the lesion on the acquisition of this same task. Thirty-two rats were rewarded with food for pressing bars in several forms of the "two-armed-bandit" situation. The animals were submitted to a probabilistic choice procedure in four conditions: L (only left responses rewarded), R (only right responses were rewarded), N (extinction) and F(forced-alternation). Before the training 12 animals were submitted to a neurotoxic lesion in dentate gyrus of hippocampus by intra-dentate injections of colchicine (lesioned), 12 rats were submitted to sham lesion (surgery control) and 12 rats were not submitted to any surgery (control). The lesioned animals showed a significant reduction of granule cells in the hippocampus compared with the control and surgery control rats. The alternation responses of the control animals during the condition F were affected by the preceding conditions. This interfering effect of the preceding conditions was not observed in the lesioned animals. The dentate gyrus granule cells lesions reduced the interference of the preceding events on the choice behavior in reversal learning tasks. These results give support to the dynamic theories of choice behavior.
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A. HERLITZ, C. LEWIN, M. LARSSON, & M. WÄNSETH. Sex Differences in Memory: A Meta-Analysis.
Sex differences in memory functions are often reported in the literature. In the present meta-analysis, we wanted to determine the impact of sex across different forms of memory (i.e., episodic memory, semantic memory, and primary memory), and whether potential sex differences varied as a function of age, tasks, and type of information to-be-remembered. Preliminary analyses showed reliable sex differences in episodic memory. These differences varied as a function of the information to be remembered, so that women excelled in episodic memory tasks tapping verbal abilities, whereas no sex differences were observed in tasks devoid of verbal information. Overall, age had a negligible effect on the obtained sex differences in episodic memory. The analyses of semantic memory indicated that sex differences appear as a function of type of task, such that women excel in tasks requiring rapid and fluid retrieval of semantic information, whereas men perform at a higher level than women in knowledge-based tasks. No sex differences were observed in tasks tapping primary memory. The implications of these findings will be discussed.
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R. MENESES, J. RIBEIRO, & A.R. GIOVAGNOLI. On the Role of Memory on Quality of Life Assessment.
Individuals with focal (mostly temporal and frontal) epilepsy often complain about memory deficits. Furthermore, many of these consider their memory deficits as the most disabling feature of their disease. In an attempt to better understand these complaints, a consecutive sample of 44 individuals with temporal and frontal lobe epilepsy was assessed on memory (performance and perception) and quality of life. The instruments used were: Logical Memory (I and II), Rey Complex Figure copy, Digit Span, Corsi Span; ESI-55 Cognitive Functioning Scale and SF-36 scales. No correlation was found between Cognitive Functioning and the memory tests used, nor between the item specifically covering memory and the memory tests. A statistically significant correlation was found between this item and the General Health, Vitality, and Mental Health Scales of the SF-36. A statistically significant correlation was also found between Cognitive Functioning and Vitality and Mental Health. Social Functioning has a statistically significant and negative correlation with Digit Span. These preliminary results stress the difference between memory performance and perception, which can have a significant effect on the willingness to search for and comply with cognitive rehabilitation programs. The relationship between Cognitive Functioning/memory perception and the perception of QOL dimensions with a significant mental component supports the potential benefits these individuals could obtain from psychotherapy, namely cognitive psychotherapy. The negative relationship between Social Functioning and Digit Span is puzzling and needs replication.
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E. PECK, S. MITCHELL, A. PECK, & L. PECK. Preliminary Results with the RMI from the WMS–III to Detect Malingering.
Concerns about an examinee's test taking motivation and its impact on the validity of neuropsychological test results has led to direct approaches to the assessment of test taking effort (e.g., Computerized Assessment Of Response Bias and Test Of Memory And Malingering). However, these tests can be described in advance to the examinee and their optimal test effort can be selectively applied to these measures. Therefore, indirect measures of test taking motivation which can be taken from routine neuropsychological tests administered, may prove to be of significant utility in describing the validity of neuropsychological test results. The current study provides a comparison of litigation versus nonlitigation patient groups on the Rarely Missed Index (RMI), which is calculated directly from errors on the Logical Memory Delayed Recognition (LMDR) subtest of the Wechsler Memory Scale–III. Eighty subjects were grouped on the basis of whether or not they were involved in litigation issues relating to their health problems. A comprehensive battery of neuropsychological tests was administered to each subject and included the Wechsler Memory Scale–III. The results of a frequency analysis of the LMDR revealed that each subgroup had only four specific items which were missed on ≤ 3 occasions and that three of these four items were consistent between the subject groups. Further statistical analyses will be presented. The data suggests that the use of an integrated measure of test taking motivation can be of value to the practicing clinician who is concerned about the possibility of less than optimal effort being expended by the examinee.
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P. MARUFF, M. KOLTA, A. COLLIE, M.G. FALLETI, & D.G. DARBY. The Detection of Feigned Cognitive Impairment Using a Computerized Test Battery.

Background: The identification of feigned cognitive impairment is important in neuropsychology. The sensitive indices are worse than chance performance, increased intra and inter subject variability, poor performance on easy tests and abnormal decreases in performance with increased task difficulty. We aimed to derive these same indices from performance on the CogState battery and develop a method to identify feigned cognitive impairment in individuals. *Methods:* 40 healthy adults performed the CogState test battery (www.cogstate.com) under four conditions. First, a baseline measurement was made. On the next day, they performed the same test battery with instructions to feign the fatigue associated with having been awake for 24 hr (anticipated fatigue). One week later, subjects were tested after having been kept awake for 24 hr (actual fatigue). One week later, subjects were retested with instructions to feign fatigue associated with having been awake for 24 hr (remembered fatigue). The next a final baseline measurement was taken. *Results:* There was no difference in the magnitude of impairment between anticipated and remembered fatigue although both yielded performance impairments greater than 4 standard deviations worse than actual fatigue. All indices derived were sensitive to feigned impairment. Discriminant function analysis classified correctly 89% of feigned impairment. *Conclusion:* The CogState test battery can generate indices that reliably detect feigned cognitive impairment.

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S.R. ROSS, R.A. KRUKOWSKI, S.H. PUTNAM, & K.A. ADAMS. The SRT and SSPT in the Detection of Probable Malingering in Head Injury.

Previous studies by Gfeller, Cradock, Trueblood, and Schmidt suggest that the Seashore Rhythm Test (SRT) holds promise as an indicator of invalid performance on neuropsychological tests. However, comparably less research has focused on the use of the Speech Sounds Perception Test (SSPT) in this regard. However, studies by Charter, Heaton et al. and Mittenberg et al. implicate the use of the SSPT in identifying probable malingering. This study examined the utility of the SRT and SSPT in the accurate detection of malingering in a clinical sample of persons referred for neuropsychological evaluation. Our sample of probable malingerers included 22 participants with questionable mild head injury who were seeking compensation for alleged dysfunction and performed at chance levels on the Recognition Memory Test (RMT). Twenty-four patients not involved in litigation and who suffered bona fide head injury were included for comparison. Receiver operating characteristic (ROC) analysis indicated that a cutoff score of eight errors on the SRT and 18 errors on the SSPT optimized classificatory accuracy. A cutoff score of 8 on the SRT resulted in a sensitivity of 82% and specificity of 63% [area under the curve (AUC) = .782]. This cutoff score provided an overall classificatory accuracy of 72%, maximizing sensitivity and specificity in this sample. The optimal cutoff score for the SSPT in this study was an error score of greater than 18 (AUC = .812). This score correctly classified 88% of head injury participants and 68% of probable malingerers.

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S.R. ROSS, R.A. KRUKOWSKI, S.H. PUTNAM, J.E. KURTZ, & K.A. ADAMS. Detecting Malingered Head Injury on the Personality Assessment Inventory (PAI).

Although a number of investigations have examined the usefulness of validity scales on the Personality Assessment Inventory (PAI), most have been analogue dissimulation studies. As a result, relatively little is known about the usefulness of PAI validity scales in clinical settings. Of particular interest to neuropsychologists is the detection of malingering in mild head injury (MHI). To this end, we examined the extent to which PAI validity indices were able to detect malingering in a clinical sample of persons referred for neuropsychological evaluation. Our sample of probable malingerers included 26 participants with questionable MHI who were seeking compensation for alleged dysfunction and performed at chance levels on the Recognition Memory Test. Fourteen patients not involved in litigation and who suffered varying degrees of head injury formed the comparison group. Significant differences were found for clinical scales of Somatic Complaints (*SOM*), Anxiety (*ANX*), Anxiety-Related Disorders (*ARD*), Depression (*DEP*), Paranoia (*PAR*), and Schizophrenia (*SCZ*) between groups, with probable malingerers obtaining higher scores. Elevations were also found for the Negative Impression Management (*NIM*) scale, the Malingering Index (*MAL*), and the Mean Clinical Elevation (*MCE*) Index in malingerers. When receiver operating characteristic (ROC) curve analysis was applied, all validity indices significantly predicted probable malingering. A cutoff score of 1 for *MAL* resulted in the highest classification rate with a sensitivity of 81% and specificity of 64% (overall classification of 75%; AUC = .79). When logistic regression was used to examine the incremental validity of PAI indices, *MAL* remained the best predictor.

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V. MATECHA, P. KULISTAK, & M. KUBICEK. Clinical Use of Luria's System in Practice.

Luria's system finds an intensive application in clinical practice. An example of it can be seen in its thirty-year history at the Faculty of Medicine of Charles University in Uradec Kralove, the Czech Republic. Although it has been adjusted to the existing conditions, the basic principles are the same. The study shows the examples of application of it in neurological practice. The system is suitable for clinical application as well as for scientific considerations, including the verification of hypotheses within a framework of neuron system. Its structures can be detected on a level of cortex, subcortex and medulla. Most brain disorders can be derived from it. This is a very basic system, which forms a base of cerebral activities. A similar explanation was proposed by Pribram and Vole. Global reaction of all three brain systems is obvious in many clinical situations. An example of a summary activities of the above mentioned systems can be seen in sexual activity in humans. The components of Luria's system respect the ontogenetic and phylogenetic development of the CNS, in which the rear parietal region dominates as it provides a base of a basic behavioral pattern. This pattern is valid since the generation of bacteria. Nowadays, this region is described as an area of submodal integration and cross-modal matching. System components communicate actually, and compare the information continuously on both horizontal and vertical levels.

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I. PAVÃO MARTINS, C. LOUREIRO, H. GAMEIRO, C. MIGUEL, V. MARTINS, & A. ALVES. Naming Public Faces: A Test for the Portuguese Population (Preliminary Results).

Introduction and objectives: The difficulty to retrieve proper names is a very frequent complaint, particularly among the elderly, that may result or not from cerebral organic pathology. However, there is no Portuguese test on this domain. The purpose of the present study is to develop such a test. *Method:* The authors selected 200 photographs of national and international celebrities. They belong to three socioprofessional categories (politic, spectacle, sport) with a maximum popularity on three distinct periods (the 50s, between the 60s and 70s, > 80s). *Results:* On the basis of results of a pilot study with 50 healthy individuals (30 females and 20 males) distributed in three groups according to education and two according to age, showed that the mean score obtained was significantly influenced by education: 72.6 (until 4th grade), 90.3 (between 5th and 9th grade) and 131.5 (after 10th grade) ($F = 14.34$ $p < .00$). Age, sex and locale of residence influenced the results but not significantly the 78 more frequently evocated faces were selected, and the final version of the test was built. The results of the standardization of the definitive test will also be presented.

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K.I. TAYLOR, D. BÄCHTOLD, A.U. MONSCH, E. MEIER, M. REGARD, & P. BRUGGER. A Simple Clinical Test to Identify and Quantify Types of Visual Neglect.

Patients with visual neglect suffer from a disturbance of spatial attention in which they are unaware or fail to respond to events or objects in one (typically the left) hemispace. This often subtle syndrome bears enormous clinical relevance, as exemplified by the often anosognosic neglect patient who attempts to cross a busy intersection. The most commonly employed assessment instrument for visual neglect requires patients to bisect several horizontally oriented lines of differing length and horizontal placement on a single sheet of paper (Line Bisection Task). However, patients may successfully perform on one line by orienting themselves to the other lines, thus decreasing the sensitivity of this test to the milder forms of compensated visual neglect. Moreover, this task does not reliably differentiate between the different types of visual neglect, which may present as body-centered (side of space relative to body midline, typically along the horizontal but also along the vertical plane), object-centered or size- (or depth-) dependent. We introduce a simple and short clinical test and computerized scoring programs constructed to identify and quantify these different types of visual neglect, especially those with a subtle presentation. The validity of the test was supported by the finding of a pseudoneglect, i.e., a nonpathologic form of right-sided inattention in 30 male participants. The test and scoring program will be further illustrated with several patient examples from the Neuropsychology Unit of the University Hospital Zürich.

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C. AEBI, A.U. MONSCH, M. BERRES, D. BRUBACHER, H.B. STÄHELIN, AND THE GERMAN–CERAD–NAB STUDY GROUP. Validation of the German CERAD–Neuropsychological Assessment Battery.

The German version of the CERAD Neuropsychological Assessment Battery (CERAD–NAB) serves as the minimal common assessment instrument for Memory Clinics in German-speaking Europe. Normative data ($N = 614$) including demographic (age–gender–education) adjustments are available. We aimed at investigating the German CERAD–NAB's clinical validity to identify early dementia patients. German CERAD–NAB data of 214 early (Mini-Mental State ≥ 18) dementia patients (150 Alzheimer's disease patients; 25 vascular dementia patients; 25 "mixed" patients (AD + VaD); 9 patients with frontotemporal lobar degeneration; 5 patients with Lewy-body dementia) from 17 memory clinics (2 Austria, 10 Germany, 5 Switzerland) were pooled with our normative sample. All patients has been diagnosed independently of CERAD–NAB results. Utilizing z scores 10 receiver operating characteristic curves were generated to establish each CERAD–NAB variable's optimal cut-off score, their sensitivity and specificity. A logistic regression analysis aimed to find a combination of variables that best discriminates between patients and controls. The optimal cut-off scores were between -1.5 (constructional praxis–copy) and -0.6 (intrusion errors). Degrees of diagnostic accuracy ranged between 86% (word list–delayed recall) and 62% (intrusions). The stepwise logistic regression selected Animal Fluency, Word List–Total, Word List–Delayed Recall, and Constructional Praxis–Delayed Recall and resulted in a sensitivity of 87%, and a specificity of 97%. The current validation study revealed good to excellent discriminatory power of the German CERAD–NAB. Thus, its use as a common minimal assessment instrument in German speaking memory clinics is warranted. Future research will need to establish the CERAD–NAB's capacity to distinguish between different dementia etiologies.

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A.E. ZEHNDER, S. BLÄSI, M. BERRES, H.B. STÄHELIN, R. SPIEGEL, & A.U. MONSCH. Cut-Off Scores for the Nurses' Observation Scale for Geriatric Patients (NOSGER).

The NOSGER is an assessment tool for in- and outpatients where the frequency of disturbances in every-day functioning of Alzheimer's disease (AD) patients are rated by a caregiver. The scale is constructed to reflect the following dimensions: Memory, IADL, Self-Care, Mood, Social Behavior, and Disturbing Behavior. We aimed (1) to study the influence of age, education and gender on the NOSGER in normal controls (NC) and (2) to determine optimal cut-off scores for each dimension. NOSGER data of 454 NC (385 men, 69 women; MMSE = 29 ± 1) and 516 AD patients (188 men, 328 women; MMSE = 21 ± 6) from the Memory Clinic of Basel, Switzerland were analyzed. Multiple regression analyses and Predicted Residual Sum of Squares (PRESS) statistics were performed to adjust for the influence of demographic variables which resulted in z scores for each NOSGER dimension. Receiver Operating Characteristic (ROC) curves were then generated to determine each dimension's optimal cut-off score. The dimension Self-Care was discarded from these analyses, because the variance in NC was too small. For the remaining five dimensions, optimal cut-off scores ranged between 0.62 and 1.53 (z scores). NC subjects were best distinguished from AD patients in the NOSGER-dimension Memory, followed by IADL, Social Behavior, Mood, and Disturbing Behavior (areas under the ROC curves: 0.92, 0.86, 0.84, 0.83, 0.65, respectively). The NOSGER revealed good to excellent discriminatory power in those dimensions affected in early stages of dementia. Thus, its use can be further recommended as a valid tool to gather information regarding everyday functioning from collateral resources.

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A. LUNDERVOLD & I.H. KHATEEB. Numerical Estimation of the BOLD Response in Event-Related fMRI.

Functional magnetic resonance imaging (fMRI) of the brain is typically based on blood oxygenation level dependent (BOLD) contrast mechanisms and produces images that reflect neuronal responses to sensory stimuli or cognitive tasks. Event-related fMRI (ER-fMRI) is a technique for detection of neurovascular responses to very brief, randomly intermixed, stimuli. Signal description in ER-fMRI can be defined as modelling and estimation of parameters like lag (time to maximum response intensity), dispersion (duration of response) and gain (response intensity/strength). Under simple assumptions about BOLD signal mechanisms, these parameters can have physiological interpretations in terms of processing delay, duration or asynchrony of neural firing, and number of firing neurons in the activated population(s). We have studied a signal description model which incorporates simple averaging of time locked single trials combined with non-linear least squares estimation of parameters in a Gaussian fit. Using data from a word vs. non-word discrimination task, where SPM99 was used to detect activated voxels, we found that the responses to non-word trials had a shorter rise time and a lower signal intensity than word trials. Moreover, the response duration for word trials were generally wider/longer than for nonword trials. We conclude that model-based estimation of heamodynamic response parameters in event-related experiments opens up for more detailed BOLD fMRI studies of information processing.

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S.L. BENGTSSON & F. ULLÉN. Independent Representations of Temporal Structure and Serial Order of Movements.

In motor program theory, the serial order and the relative timing of the individual acts comprising a movement sequence are invariant features of a generalized motor program. We investigated whether the central nervous system can also utilize independent representations of these two aspects. If so, one would expect that teaching naive subjects to execute a sequence ST, with serial order S and temporal structure T, will strongly facilitate the execution of S or T alone, and, inversely, that pre-training on S and T in isolation will facilitate execution of ST. We tested these predictions using a transfer design. The sequences consisted of rhythmical sequences of keystrokes on the numerical keyboard of a PC. The target sequence was presented at the beginning of the experiment and immediately following each unsuccessful reproduction by the subject. Learning was considered

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complete after 12 consecutive error-free reproductions. Subjects were divided into two groups. Group A learned (1) a sequence (ST) of nine keypresses (S) with a temporal structure of eight different intervals (T); (2) S with an even rhythm; and (3) T on a single key. Group B initially learned conditions 2 and 3, then 1. Learning of S and T was strongly facilitated in group A, as was learning of ST in group B. These observations strongly support that temporal structures and the serial orders of sequences can be handled separately. It appears likely that this gives larger flexibility in motor performance, as well as a more efficient learning of new sequential motor skills.

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J. CHIN, Y. KANG, K. RYU, D.W. SEO, & S.B. HONG. Clinical Validity of the Material-Specific Memory Model.

Previous studies reported that lesions of the left (dominant) temporal lobe result in impairments of verbal memory, whereas lesions of the right (nondominant) temporal lobe result in impairments of nonverbal memory. However, this material-specific memory model still remains controversial. The present study was conducted to examine the clinical validity of the material-specific memory model. Thirty left temporal lobe epilepsy patients (LTLE) and 18 right temporal lobe epilepsy patients (RTLE) participated in the study. All the patients had hippocampal atrophy or sclerosis ipsilateral to the epileptogenic area. All of them were right-handed and left-hemisphere language dominant. A comprehensive neuropsychological test battery was given to the patients. For the present study, the IQ scores for the Korean WAIS and memory scores for the Logical Memory Test and the Rey-Osterrieth Complex Figure Test were analyzed. There was no difference between LTLE and RTLE in IQ scores. Each group was divided into 4 subgroups: (1) Patients who showed the material-specific memory impairments; (2) Patients who showed the material-specific memory impairments, but in the opposite direction; (3) Patients who showed memory impairments in both verbal and visual memory; (4) Patients who did not show memory impairments at all. On the delayed recall, the percentages of these 4 groups in LTLE were 23.3%, 16.7%, 50.0%, and 10.0%, respectively. In the RTLE patients, they were 29.4%, 11.8%, 41.2%, and 17.6%. These results indicated that the material-specific memory model was valid in less than 30% of the TLE patients. Therefore, these results suggest that the clinical validity of modality-specific memory model is very doubtful.

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L. HUTTON, J.M. GRAY, W.A. BARKER, A. BAEZ. The Effects of Methylphenidate on Neuropsychological Test Performance, Subjective Feelings of Alertness and Functional Imaging: A Single-Case Study.

NV is a 42-year-old, previously very fit man with an approximate 8-year history of extreme fatigue, apathy, subjectively reduced alertness and myalgia, which began suddenly after exercise. Six years later, baseline serial neuropsychological testing revealed poor performance in a number of areas including verbal learning (Rey AVLT, total score over learning trials) and attentional control (Stroop). Baseline recording of subjective feelings of alertness, fatigue, pain and apathy, carried out on a hourly basis over a number of days, revealed persistent feelings of fatigue, apathy and reduced alertness. A SPECT scan revealed uneven cortical activity, with increased activity in the thalamus and underactivity in the cortex. An initial 5mg trial of the dopamine agonist methylphenidate produced improvement in verbal learning and attentional control and subjective improvement in concentration. He continued on methylphenidate for a number of months, recording his subjective feelings of alertness, fatigue, pain and apathy. With regard to subjective ratings, alertness alone improved. A repeat SPECT scan revealed an overall improvement in cortical uptake. The thalamus no longer showed high uptake, but there remained a slight reduction in medial temporal uptake. Repeat neuropsychological testing showed improvements over baseline on some measures, including verbal learning. However, attentional control did not maintain the improvement seen on the initial trial. Indeed accuracy seemed adversely affected.

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S. ÄYSTÖ. Neuropsychological and Cognitive Functions Differentially Associated with the WAIS and WISC Measured Intelligence in Mental Retardation.

In a representative sample of persons with mental retardation ($N = 258$; age 2–64 years) a battery of neuropsychological (NPS) and cognitive tasks was presented concurrently with the WISC–R and WAIS intelligence tasks. In terms of the alternative PASS theory of intelligence it was found in regression analyses that the successive processes were associated with the WAIS IQs, but attentional and simultaneous processes with the WISC–R IQs. All IQs in spite of the test were significantly (range 39–45%) predicted by simultaneous and successive processes; planning and attention had only 1% additional power. The NPS tasks that were regrouped as functional entities (such as praxias, agnosias, receptive, expressive, higher functions and basic academic skills) gave generally higher predictions for the WAIS (range 23–84%) than for the WISC–R IQs (range 22–58%). In the former case, praxias and agnosias were emphasized, whereas in the latter case the academic and expressive skills were prominent. All NPS entities predicted strongly the PASS tasks (range 37–83%). Planning and attention had both the strongest association with praxias whereas simultaneous and successive processes associated most strongly with academic skills. As a conclusion, in mental retardation the structure of intelligence as measured by the WISC–R and WAIS tests differs in terms of neuropsychological functions and PASS processes. The sample characteristics may explain some of the observed differences.

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G.M. HILL, J. LUMSDEN, D. BISHOPP, & R.C. SALMON. Psychometric Intelligence and Offending in Forensic Psychiatric Inpatients.

An extensive literature has drawn attention to high rates of cognitive disturbance and neurological abnormality in patients with a history of violent and aggressive behavior. Less has been reported about a significant number of offenders who show similar behavioral characteristics, but achieve good results on conventional psychometric tasks. This project considered a decade of admissions to a High Security Psychiatric Hospital, and compared two extreme groups defined by psychometric intelligence. Using the Wechsler Adult Intelligence Scale, the 10% of patients who obtained the highest estimated IQs were compared with the 10% who functioned least well. Comparisons included the history of behavioral disturbance and the nature of the index offence, together with psychiatric diagnosis and the Mental Health Act category at admission. Independent evidence of underlying cerebral dysfunction was also available for both groups from concurrent structural brain imaging and neurophysiological investigations. The high IQ group were found to be less vulnerable to cerebral dysfunction, but were more likely to exhibit complex offending behaviors associated with very high levels of violence.

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S. BLÄSI, A.E. ZEHNDER, M. BERRES, R. SPIEGEL, H.B. STÄHELIN, A. STUDER, & A.U. MONSCH. Natural Behavioral Changes in the Course of Alzheimer's Disease.

It is important to know the natural behavioral changes that occur in Alzheimer's disease (AD) in order to give optimal care to patients. The Nurses' Observation Scale for Geriatric Patients (NOSGER), a caregiver-based questionnaire to assess behavioral disturbances, consists of the following dimensions: Memory; Instrumental Activities of Daily Living (IADL); Self-Care; Mood; Social Behavior; Disturbing Behavior. We aimed to empirically determine (1) the chronological order of occurrence of behavioral changes as assessed by the NOSGER, and (2) each NOSGER dimension's natural course over time. Sixty-six AD patients (36 women; 30 men; age = 71 ± 8 years; education = 12 ± 3 years; baseline MMSE = 21 ± 6), with at least three consecutive data sets were recruited from the database of the Memory Clinic Basel, Switzerland. All data were converted to demographically adjusted z scores. Linear regression coefficients for each patient between MMSE scores and each NOSGER dimension served to

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determine the course of behavioral changes. Based on these regression models, mean predicted NOSGER scores were calculated for each dimension relative to a MMSE reference score of $z = -3.0$. A higher mean of predicted scores in one dimension relative to another indicated an earlier occurrence of these disturbances. Linear courses were found for five NOSGER dimensions in the following chronological order of occurrence: (1) Memory; (2) IADL; (3) Social Behavior; (4) Mood; and (5) Self-Care. No linear model was found for the dimension Disturbing Behavior. An additional analysis in a subpopulation of 36 patients with at least four data sets showed no quadratic course for any of the six NOSGER dimensions.
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G. SMITH. Does Early Detection of Dementia Lead to Better Outcomes?
This study was undertaken to examine the hypothesis that early identification of dementia produces better outcomes. All persons from a large Alzheimer's Disease Patient Registry (ADPR) that had progressed to a clinical dementia rating scale (CDR) score ≥ 2 or its equivalent, were selected. This included 426 patients. These patients were then grouped according to dementia severity at initial evaluation yielding; 179 CDR −.5s, 145 CDR −1s and 102 CDR −2s. For those patients who had died, "percent of disease course under medical care," was calculated as the time from diagnosis to death divided by time from onset to death. Mean scores were 83% for CDR −.5s, 68% for CDR −1s and 54% for CDR −2s. Functional, residential and cognitive outcomes at the first evaluation where CDR was ≥ 2 were compared. Age at nursing home placement and age at death were also compared. There were no statistically significant differences in MMSE, or record of independent living scores at index evaluation. CDR −.5s were slightly more likely to be residing in institutional care. There were no differences in age at placement or in age at death across groups. Subsequent analyses stratified according to ADPR enrollment before or after choline agonists became widely available will be presented.
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R. ÁVILA, I. CARVALHO, A. ALVAREZ, & C. BOTTINO. Support for Caregivers of Alzheimer's Disease Patients.
Recent literature has emphasized the difficulties experienced by Alzheimer's disease (AD) patient's caregivers. The burden of caring is financially, emotionally and physically significant. It includes the effective loss of companionship and support of a life partner, social isolation, in addition to financial, legal and social problems. Support groups for caregivers aim to help them to better understand the disease and patient's behavior and teach them to handle patient's difficulties more competently. The group provides psychotherapeutic and social support to stabilize caregiver's well being, and prevent depression and anxiety caused by strain and burden of caregiving. The goal of this study is to provide an effectiveness assessment of a counseling and support group for AD patients' caregivers. After informed consent, 12 caregivers were assessed with MADRAS and HAM-ANXIETY and divided into two groups: therapeutic group (TG); control group (CG). After the initial evaluation, the TG was submitted to weekly sessions of counseling and support (CS) during 4 months. One psychiatrist and one psychologist managed the CS group. The respective patients of the TG were also attending cognitive rehabilitation group. Both groups were reassessed with the same instruments. Statistical analysis was conducted with nonparametric tests, comparing the effect size of each group. (TG *vs.* CG) HAM-A (−0.82 *vs.* −0.03), MADRAS (−0.55 *vs.* −0.47) (smaller score is better). No significant differences between the two groups were found, but the level of anxiety symptoms was lower among caregivers who received counseling and support treatment. This result showed that caregiver and patient support enhances quality of life.
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I. CARVALHO, R. ÁVILA, A. ALVAREZ, & C. BOTTINO. Effectiveness of Cognitive Rehabilitation in Alzheimer's Disease Patients.
Neuropsychological rehabilitation is an active process of change to enable people who have cognitive deficits caused by injury or disease to achieve an optimal level of physical health, psychological well being, living skills and social relationship. Clinical symptoms of Alzheimer's disease (AD) include a variety of progressive cognitive deficits, especially memory, causing a worsening in patient's quality of life. Researchers are considering the relevance of cognitive rehabilitation (CR) for people with dementia, even though there is no cure for AD yet. The goal of this study is to assess the effectiveness of CR in AD patients. In this study, 13 mild AD patients were included in a 2-month open trial with AChE-I (Rivastigmine 6–12 mg/day). Before being assigned to the CR training group, patients were assessed with MMSE, ADS-Cog, ADL, MADRS, HAM-Anxiety and a neuropsychological battery (NB). After these initial evaluations, 6 AD patients were submitted to 16 CR-group sessions (once a week) while 7 patients remained only with pharmacological therapy. After 16 weeks of CR, all 13 patients were reevaluated with the same instruments. Better results were found in CR group in the cognitive functions, daily living activities (ADL) and psychiatric symptoms, comparing to the AChE-I group. It did not reach statistical significance with the non-parametric tests. However, computing the effect size it was found a larger positive effect on the NR group compared to the AchE-I group. The results showed that neuropsychological interventions in conjunction with pharmacological therapy might optimize function in patients with AD.
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N.R. KARLSEN, S. JACOBSEN, Ø. SUNDSETH, A.M. FJELL, & K.B. WALHOVD. Predictors of Neuropsychological Deficits: Data from a Patient Sample.
Three hundred patients examined at the Department of Neuropsychology, Ullevaal University Hospital, Norway, were registered in a database. The probability of clinically concluded neuropsychological deficits varied with referral diagnosis ($p < .05$): Dementia (61%) and cerebrovascular conditions (46%) most often yielded neuropsychological deficits, while deficits were less likely found in psychiatric conditions (16%) and whiplash injuries (13%). Proportion of uncertain conclusions was also highest for these latter patient groups (42% and 50%, respectively), while dementias and cerebrovascular conditions seldom yielded uncertain conclusions (16% and 36%, respectively). One hundred twenty-five patients had had brain scans (primarily CT/CT and MRI). Probability of neuropsychological deficits was higher in the group with negative scanning results than in the group with findings on scans. This is probably due to higher proportion of referrals for neuropsychological examination in the event of positive findings—the threshold may be higher for referring patients with negative findings. A linear regression including age, scanning result, and 15 test results predicted 73% of the variance in conclusion (clear deficits, uncertain, and no deficits; $r = .86$, $p < .000$). When including only test results, the proportion of explained variance decreased to 57% ($r = .76$, $p < .000$). A model consisting of pegboard nondominant hand, TMT B, CVLT delayed recall and CVMT delayed recognition yielded 47% explained variance ($r = .69$, $p < .000$). Scans, TMT B and CVLT delayed recall yielded 44% explained variance ($r = .66$, $p < .000$). Thus, test results are highly predictive of the conclusions made by neuropsychologists at Ullevaal University Hospital.
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S. VESTBERG, U. PASSANT, L. GUSTAFSON, & C. ELFGREN. Is There a Predictive Value of Subjective Memory Impairment?
Forty-five patients, 35–73 years old (*M* age 59.3) with subjective memory impairment from an ongoing longitudinal study at our Memory Clinic were included. All have undergone a neuropsychological research test battery and a semi-structured clinical interview and psychiatric rating scales at baseline and at 1-year follow-up. Exclusion criteria: a former diagnosis of dementia/major depression/psychosis/post-traumatic stress syndrome/

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cerebrovascular disorder and alcohol/drug abuse. The results from the neuropsychological assessment were corrected for age, and education/occupation. The subjects were then classified into (A) Normal; (B) Mild Cognitive Impairment (MCI) type 1, subjects with an isolated memory impairment; (C) MCI type 2, memory impairment in combination with other slight cognitive deficits; and (D) Dementia. *Results:* Normal: 15 subjects, 35–68 years old (54.6). MCI type 1: 14 subjects, 51–71 years old (61.5). MCI type 2: 9 subjects, 53–69 years old (61.8). Dementia: 7 subjects, 37–73 years old (61.9). *At follow-up:* Normal: 17 subjects, MCI type 1:11 subjects, MCI type 2: 6 subjects, Dementia: 11 subjects. It should be noted that all 4 subjects that progressed to dementia were impaired in delayed cued recall at baseline. None of the MCI patients with reversible cognitive dysfunction were impaired in those tests. About half of the subjects classified as Normal or MCI type 2 at baseline reported stress, but not so in the other groups. Depression was present to almost the same degree in all groups.

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K. FUCHS & C. MANNING. Psychological Factors Impact Subjective Assessment of Memory in Women at Risk for AD.

Individuals with a parent with Alzheimer's disease (AD) are at increased risk for developing the disease themselves and are often concerned about their own memory abilities. This study assessed cognitive and emotional functioning in two groups: women with a parent with AD ($N = 30$) and women whose parents do not have dementia ($N = 15$). Women between the ages of 45 and 60 without AD were selected because in this age range they may have caregiving responsibilities for their parents. *Results:* The two groups were comparable in age ($M = 51.4$ years), education ($M = 15.7$ years), and estimated IQ (above average). There were no significant differences between the groups on the WMS–III General Memory Index, Beck Depression Inventory or State Trait Anxiety Index. The two groups differed in their level of concern about developing AD themselves ($p < .001$) and in the degree of caregiving responsibilities (Burden Interview, $p < .01$). Within the at-risk group, those who indicated experiencing mild to moderate memory problems ($N = 11$) obtained significantly higher scores on the BDI, STAI, and Burden Interview than those reporting few or no memory problems ($N = 19$). However, the two groups were comparable in performance on memory tests. *Conclusion:* It is likely that the subjective experience of memory dysfunction in women at increased risk for developing AD is related to symptoms of depression, anxiety and the stress of caregiving activities. This highlights the need for psychological and social support services for this group. (This work was supported in part by the Alzheimer's and Related Diseases Research Award Fund)

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A. ESTÉVEZ-GONZÁLEZ, C. GARCÍA-SÁNCHEZ, A. BOLTES, P. OTERMÍN, & J. KULISEVSKY. Incidental Memory in the Preclinical Phase of Alzheimer's Disease: A 3-Year Follow-Up Study.

Patients without dementia who are at increased risk for Alzheimer's disease, such as those who have subjective memory complaints, are often studied in order to identify markers of preclinical Alzheimer's disease. In this study, the authors provide preliminary data of 54 subjects, from a wider cohort of patients with subjective memory complaints. All subjects were given a comprehensive neuropsychological test battery, and then followed annually for 3 years to determine which individuals developed sufficient functional change that they met clinical criteria for Alzheimer's disease. Specifically, we attempted to determine the preclinical spatial–incidental memory in Alzheimer's disease comparing 15 subjects (9 M/6 F; *M* age 74.3 yrs; Mini-Mental State Examination (MMSE): 22.1; years of education: 8.2) who developed Alzheimer's disease with 39 subjects (12 M/27 F: *M* age 65.1 yrs; MMSE: 28.3; years of education: 8.1) who are nondemented 3 years after the first evaluation. The spatial–incidental task consisted of a designed 16-item paradigm adapted from Hasher & Zacks. Analysis of variance, with age as the covariate, showed that the Alzheimer's disease subjects performed significantly more poorly ($p < .002$) than their nondemented counterparts 3 years before diagnosis. We conclude that the performance on spatial–incidental memory tasks could be an early marker in the diagnosis of Alzheimer's disease and that spatial–incidental memory deficits are detectable in preclinical period of the Alzheimer's disease.

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S. LAATU, A. REVONSUO, R. PORTIN, P. HÄMÄLÄINEN, L. PIHKO, H. JÄYKKÄ, V. OJANEN, J.O. RINNE, U.K. RINNE, J. RUUTIAINEN, & S. TUISKU. Semantic Memory Deficits in AD, PD and MS.

The theoretical frameworks of semantic memory vary and the methods used to study this construct are heterogeneous. This has lead to contradictory findings in studies concerning neurological diseases such as AD, PD and MS and semantic memory deficits related to them. We used four linguistic tasks measuring understanding of concrete and abstract concepts, their attributes and hierarchical relationships. Fourteen AD patients, 12 PD patients, and 12 MS patients all with a mild cognitive decline were studied. Cueing was used if spontaneous productions lacked any essentials. The results showed impairments in all of the patient groups on all tasks. Cueing did not markedly improve the results. Different stages of the visual object recognition process were studied by using six two-choice reaction-time tasks, including object shape detection, object familiarity detection, semantic word and picture categorization, object name retrieval and a simple discrimination task for controlling visuomotor slowness. Ten AD patients, 14 PD patients, and 15 MS patients each with an incipient cognitive decline were studied. The results revealed impairments in several processing stages depending on the patient group. Semantic memory deficits emerged in every patient group. Physical and cognitive restrictions that could have influenced the results, were controlled as far as possible. Physically matched cognitively preserved patients and healthy subjects were used as controls. Semantic memory deficits were, thus, found by using both linguistic and visual methods in AD, PD, and MS indicating that impairments of semantic memory may be an important part of the cognitive decline related to the three diseases.

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R. CHOUDHRY & J. SAINT-CYR. Subjective Evaluation of Cognitive Event Knowledge in Parkinson's Disease.

Script event knowledge was investigated in patients with Parkinson's disease (PD), and in normal controls (NC), using five different kinds of activities that varied in degree of familiarity. The aim of the present study was to assess the role of the frontal–striatal system in evaluating the importance of script events that are part of goal-oriented planning activity. Twenty-two medically treated, early stage PD patients and controls, matched for age, education, and IQ, were asked to rate the importance of events in self-generated scripts. A standard battery of tests measuring: VIQ, verbal memory, confrontation memory, motor speed and dexterity, verbal fluency, verbal reasoning, depression and working memory was administered to all subjects. PD patients and NC groups differed on verbal reasoning, motor function, semantic fluency and on level of depression. There was no correlation between depression scores and ratings of importance for script events. Although, PD patients generated central events for the five activities normally, they ascribed lower ratings to peripheral and central script events, compared to NCs. PD patients were unimpaired in estimating the importance of central as well as peripheral events for the most familiar activity (morning routine) compared to NCs. Overall, for other less familiar scripts, PD patients gave lower ratings than NCs. The results may be attributed to differential functions of the basal ganglia and cortex.

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M. ALEGRET, F. VALLDEORIOLA, E. TOLOSA, P. VENDRELL, C. JUNQUÉ, J. MARTINEZ, & J. RUMIÀ. Neuropsychological Long-Term Effects of Pallidotomy in Parkinson's Disease.

The aim of the present study was to assess the long-term neuropsychological effects of unilateral posteroventral pallidotomy in Parkinson's disease (PD) in a 4-year follow-up. We studied 10 pallidotomized PD patients of an original cohort of 15 consecutive patients who underwent pallidotomy. The following neuropsychological tests were administered before (3 days) and after (3 months and 4 years) surgery: Rey's Auditory–Verbal Learning Test, Visual Associative Learning test from the WMS–R, Judgment of Line Orientation, Trail Making, phonetic verbal fluency, Stroop test, Beck's depression questionnaire and Maudsley Obsessive-Compulsive Inventory. All tests were administered during the effects of medication in the context of a levodopa challenge. We compared presurgical, and 3 months and 4 years postsurgical performances. Repeated measures ANOVA, performed to investigate overall changes, showed significant effects for two tests: phonetic verbal fluency ($F = 6.82$; $p = .006$) and Judgment of Line Orientation Test ($F = 9.66$; $p = .001$). *Post-hoc* analyses differentiated 3-month from 4-year changes. Three months after surgery, we found an improvement on the Judgment of Line Orientation Test, which returned to baseline 4 years after surgery. In the 3-month follow-up, we found a deterioration on phonetic verbal fluency. In the 4-year follow-up there was a partial recovering on phonetic verbal fluency, because the score in this test improved but did not statistically differ from presurgical nor 4-year postsurgical scores. Our results suggest that unilateral posteroventral pallidotomy could produce transient changes on prefrontal and visuospatial functions, but there is no evidence of any permanent neuropsychological effect.

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A. J. LUNDERVOLD, R. STARRFELT, D. AARSLAND, C. JANVIN, J.P. LARSEN, & K. HUGDAHL. Early Signs of Dementia in Parkinson's Disease.

Attentional dysfunction in Parkinson's disease (PD) has been extensively studied using the cue–target paradigm from Posner's model of attentional networks. In the present study this paradigm was presented to PD patients ($n = 74$) and control subjects ($n = 39$). The PD patients were assessed for dementia at the time of testing, and at a 4-year follow-up. We asked if the RT measures from the cue–target test could reveal early signs of dementia. The PD patients were sub-grouped according to MMSE. On the first MMSE rating, only the subgroup with scores <25 ($n = 5$) showed significantly slower RT than the other subgroups and the controls. However, all PD subgroups showed a RT pattern with smaller cognitive cost of invalid cues than the controls. In the follow-up study, 23 of the PD patients showed MMSE scores <25. Most of these patients had slower RTs and smaller cognitive cost than the median for the total PD-group on the paradigm performed 3 years earlier. The slow RT can be explained by an overall motor and mental slowness. In presenting an invalid cue, most normal subjects will expect the target to appear in the cued position, and thus show a cost in RT to the target. We suggest that the less cost of invalid cues observed in PD patients was due to a failure of generating such an internal strategy. These patients seemed to rely on external cues, and they were not distracted by the conflicting information in the invalid condition. This impairment may have implications for assessment of early cognitive impairments in PD.

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A.R. GIOVAGNOLI, A. BIZZI, A. BRAMBILLA, & O. BUGIANI. Visual Agnosia: Cognitive Dissociation and Neuroanatomical Relationship.

We present here the case of a 63-year-old woman who chronically showed visual difficulty without intellectual, executive, attentive, memory or language deficits. Neuropsychological evaluation revealed associative visual agnosia and impaired visual imagery, whereas auditory, tactile, and olfactory recognition were well retained. Semantic memory was altered on tests requiring mental visual representations, whereas it was preserved on verbal classification and on tactile, auditory, and olfactory naming. All this highlights the dissociation of visual recognition and imagery from the recognition and naming of nonvisual stimuli, suggesting that different sensorial channels may independently allow access to semantic memory. Magnetic resonance showed cortical atrophy in the left parieto–occipital cortex, while positron emission tomography showed significant hypometabolism, and spectroscopy showed reduced N-acetilaspartato concentration in the same zone. These findings support the idea that left parieto–occipital damage play an important role in visual gnosis and imagery impairment.

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E. STRAUSS, S. MacDONALD, M. HUNTER, & D. HULTSCH. Intra-Individual Variability in Older Adults: Cross-Domain Links.

In 1926, Henry Head proposed that "an inconsistent response is one of the most striking results produced by a lesion of the cerebral cortex." A number of investigators considered this phenomenon in subsequent years. However, researchers have only recently begun to explore systematically the possibility that inconsistent performance within a task on a single occasion, or for the same task administered on multiple occasions over a short interval, represents a behavioral marker of underlying CNS dysfunction. In the current study, intra-individual variability of physical status (gait, blood pressure, manual ability, cardiovascular fitness) and affect/beliefs (mood, perceived competence and control) as well as their relations with cognition (simple and choice reaction time, memory) were examined in three groups of older adults: 15 healthy elderly, 17 individuals with non-neurological health-related disturbance (arthritis) and 13 people with compromise (dementia). Arthritics were included to determine whether variability is primarily CNS-related or driven by other health-related phenomena. The findings suggest that greater inconsistency in physical performance is observed in groups characterized by CNS dysfunction. By contrast, fluctuations in affect appear to reflect other, more transient sources (e.g., pain). In general, increased inconsistency in non-cognitive domains is associated with poorer cognitive function. There are cross-domain links between inconsistency in physical functioning and fluctuations in cognitive performance, although the nature of the links depends largely upon the neurological status of the individuals. Considered together, the result indicate that measures of cognitive as well as physical variability are important behavioral markers of neurological integrity.

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J.N.S. ABREU, B.A.B.S. SANTIAGO, C.F. de ALMEIDA, C.L. RAMOS, C. MAGALHÃES, C.L.S.G de SOUZA, E.S. MEDEIROS, F.L. ALVES, I.F. BRANDÃO, M.F.P. de SOUZA, M.S.T.B de MENEZES, & S.L.S. BARRETO. Neuropsychological Profile of Aging in Salvador (Brazil) Using the B.E.C 96.

There are few neuropsychological tools in the Brazilian Portuguese language to investigate the effects of normal and pathological aging. Especially in the northeast area of the country, this kind of instrument needs to be constructed, validated and/or adapted to local culture. Generally, drawings or words used in tests should be analyzed to identify common neurological aging conditions. As a preliminary study for the construction of a new neuropsychological battery for aging adjusted to this culture, we investigated profile using B.E.C 96 as a initial model for our study. 21 normal subjects (*M* age: 73.95 years, *SD:* 6.34) from the community, were assessed in a unique trial, according to defined literature for the battery. All of the subjects were instructed to the general proposal, but without references to comparative profile with original data. We verified educational level with (8.06 years of education). The subjects completing all of the subtests and scores showed a mean score of 10.48 with *SD* 1.06. Only the problems subtest score was lower in subjects than the original French sample, probably due to subjects with low educational level (range: 2–16

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years, with 50% under 8 years). Despite the initial data, this study allowed us to see difficulties with non-everyday drawings (e.g., mushrooms) to evaluate naming and/or recall with or without intervals discussed in our research. Results suggest, and we propose that a further assessment be conducted and the use of certain tools be considered for a neuropsychological battery to be used with the aged that takes cultural factors into account.
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A. DERWINGER, A. STIGSDOTTER NEELY, & L. BÄCKMAN. Long-Term Effects of Memory Rehabilitation in Old Age.
Is memory rehabilitation effective over longer periods of time? What is most effective for the old person's rehabilitation; training with a classic mnemonic or practicing ones own strategies? In order to answer these questions a number-consonant mnemonic training program (50 Ss) was compared with a self-generated strategy program (27 Ss) and a control group (25 Ss). Participants were assessed before, immediately after, and eight months after training. The results show that the mnemonic group outperforms the two other groups immediately after training. But at follow-up the picture is different, the self-generated strategy group increases its performance significantly over time, while the mnemonic group show a reliable decrease, in the free recall numerical memory task. However, when cognitive support (i.e., verbal cues, repeated trials) was provided at testing the mnemonic group maintained their significantly higher level of performance from immediately after training compared to the self-generated strategy group. These data indicate that numerical memory training may generate long-term effects in older adults. However, the classic mnemonic appears to be too cognitively demanding when not practiced regularly or when tested without support, indicating that practicing one's own strategies might have advantages over learning a mnemonic in old age.
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Invited Lecture/9:15–10:00 a.m.

STEM CELLS AND BRAIN REPAIR: RECENT PROGRESS AND FUTURE PERSPECTIVES

Anders Björklund

Invited Lecture/10:30–11:15 a.m.

NEURAL PLASTICITY AND COGNITIVE DEVELOPMENT

Joan Stiles

Birch Lecture/11:30 a.m.–12:30 p.m.

CREATIVITY: FROM EINSTEIN TO AUTISM

Kenneth Heilman

THURSDAY AFTERNOON, JULY 25, 2002

Symposium 1/1:30–3:00 p.m.

IMAGING MEMORY FUNCTIONS IN HEALTHY AND DAMAGED BRAINS

Organizer and Chair: Lars Nyberg

L. NYBERG. Imaging Memory Functions in Healthy and Damaged Brains.
Functional neuroimaging with PET and fMRI has generated much knowledge about the neural correlates of various forms of learning and memory in humans. Functional neuroimaging techniques have also been extensively used to explore neural correlates of cognitive functions in patients with various forms of brain damage. The purpose of this symposium is to bring together data from PET and fMRI studies of memory functions in healthy and damaged brains. Tulving will review the current empirical and theoretical status of, and ideas about, the HERA (hemispheric encoding/retrieval asymmetry) model of the involvement of the frontal lobes in encoding and retrieval. Markowitsch will deal with memory changes that are caused by environmentally induced stress and trauma situations. Eustache will present studies of the permanent amnesic syndrome, transient global amnesia and Alzheimer's disease. Nyberg will present data on training-induced changes of the neural correlates of memory encoding and retrieval.
Correspondence: *Lars Nyberg, Department of Psychology, Ume University, S-901 87 Ume Sweden.*

E. TULVING. HERA (Hemispheric Encoding/Retrieval Asymmetry) Model 8 Years.
Functional neuroimaging studies have revealed an interesting regularity in the activation of the prefrontal cortical regions in episodic and semantic memory encoding and retrieval. This regularity has been referred to as the HERA (hemispheric encoding/retrieval asymmetry) model of the involvement of the frontal lobes in encoding and retrieval. According to HERA: (1) left prefrontal regions are differentially more involved than are right prefrontal regions in retrieval of information from semantic memory, (2) left prefrontal regions are more involved than are right prefrontal regions in the encoding of novel aspects of incoming information into episodic memory, and (3) right prefrontal regions are more involved than are left prefrontal regions in episodic memory retrieval. When this pattern of findings was first described in 1994 it was perplexing. Although neuropsychologists and other brain scientists have known and written a great deal about many forms of hemispheric laterality, nothing in the literature on memory, or on frontal lobes, had alerted memory researchers for the possibility of finding hemispheric asymmetry in semantic-memory and episodic-memory retrieval, and in episodic-memory encoding and retrieval. Not surprisingly, therefore, the issue of the involvement of the frontal lobes in long-term memory in general, and the HERA model in particular, have come under intense empirical and theoretical scrutiny. I will review the current empirical and theoretical status of and ideas about HERA in light of the more extensive and more specific evidence that has become available since 1994.
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H. J. MARKOWITSCH. Functional Imaging Correlates of Environmentally Induced Memory Changes.
Memory impairments are usually associated with focal brain damage. There are, however, numerous forms of memory deterioration up to complete and lasting amnesia as a consequence of psychic disorders, including stress and psychic trauma situations. Environmentally induced stress and trauma situations may lead to personality changes, depression, and phe-

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nomenon which we have termed *mnestic block syndrome*. The memory changes are usually limited to the patient's own biography. They may affect the ability to retrieve old memories—leading to retrograde amnesia, or they may impair the formation of new memories, leading to anterograde amnesia. We have studied patients with either form of amnesia both neuropsychologically and with functional imaging methods. In line with our findings in patients, who after right-hemispheric temporo-frontal damage were unable to retrieve their autobiography, and in line with functional imaging results in normal subjects, who showed predominantly right hemispheric activation in temporo–frontal regions when retrieving episodes of their past, we obtained a right temporo–frontal hypometabolism in patients with organic damage to this region and retrograde autobiographical amnesia, and in patients with psychogenic amnesia, restricted to their personal past. Furthermore, we studied with functional imaging techniques the cerebral activation pattern towards retrieving positive (happy) and negative (sad) episodes and towards retrieving fictitious *versus* true episodes. Finally, loci of reduced brain metabolism in patients with mnestic block syndrome will be discussed and evidence for recovery of brain metabolism after successful treatment of this syndrome will be presented. It is concluded that environmentally induced brain changes are due to the action of stress hormones leading to a block of information flow in the brain.

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F. EUSTACHE & B. DESGRANGES. Neuropsychology and Functional Neuroanatomy of Amnesia.

The study of patients suffering from amnesia has greatly contributed to novel neurocognitive models of memory. The notion of several memory systems subserved by distinct neuronal networks is largely based on the dissociations found in amnesic patients. The classic clinico–anatomical method and more recently the use of structural imaging have allowed the identification of the lesions responsible for amnesia. However, structural imaging is unable to reveal functional changes, such as the impairment that may occur in structures remote from but connected to the area of primary damage. Because positron emission tomography allows the study of physiological parameters such as resting glucose consumption, which are closely related to synaptic activity, it can identify dysfunction of the neural networks involved in amnesia in the absence of clear-cut structural lesions. With current image-processing software, it is now possible, in a group of patients as well as in a single case, to generate statistical maps revealing the cerebral regions with significant resting hypometabolism. Another approach involves obtaining, within a short time interval, both cognitive scores and resting metabolism. Correlations between these two sets of data across a group of patients can then be computed, to reveal the functional neuroanatomy of the cognitive deficit that characterizes a given disease or syndrome. These methods open new avenues in functional neuropsychology in subjects without focal lesions detectable by usual structural imaging techniques. We present several examples of studies along these lines that we have carried out in the permanent amnesic syndrome, transient global amnesia and Alzheimer's disease.

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L. NYBERG. Training-Induced Changes in Functional Brain Activity.

Functional neuroimaging with PET and fMRI has shown that the pattern of brain regions associated with cognitive task performance can be substantially modified by task-specific training. Such differences in the way the brain is activated during novel versus practiced task performance suggests that patients with impaired cognitive function following damage to regions involved during initial, but not practiced, task performance can increase their performance with adequate training. We have used fMRI to study the neural correlates of memory encoding and retrieval during novel and practiced use of a mnemonic technique (the LOCI method). The results show a change in activation from mainly left temporal activation before training to pronounced frontal activation after training. The possibility of using this form of training to help patients with left temporal lesions to learn to use this mnemonic technique for encoding and retrieval is currently under exploration.

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Paper Session 1/1:30–3:00 p.m.

TOXIC CONDITIONS

K. JONES, G. KINSELLA, & B. ONG. Attention and Neuropsychological Adaptation Following CO Poisoning.

The neuropsychological syndrome of CO poisoning has only recently attracted systematic research efforts that will help clinicians to identify serious cases of poisoning, and understand the nature of residual impairment. CO poisoning affects predominantly the subcortical structures, including the frontostriatal pathways that are important in contributing to attentional functioning. Based on Shallice's model of human attention, the supervisory attentional system (SAS) is the mechanism that balances past experience with current adaptive demands, by way of attentional switching and scheduling. The current study tested the hypothesis that CO poisoning would produce a deficit of the SAS, and that primitive and automated attentional orienting would be unaffected. Forty-one deliberate and 32 accidental cases of CO poisoning were assessed at 3 days and 1 month post poisoning, on tasks of attentional orienting, and tasks of the SAS. The results were compared to a group of 53 healthy community participants. A deficit of the SAS was documented in both deliberate and accidental survivors of CO poisoning. There was no deficit of attentional orienting. Indices of poisoning severity were entered into regression analysis in order to predict attentional disturbance. Alteration of consciousness (either lost consciousness, or a period of disorientation) was found to most reliably predict attentional disturbance. The framework for interpreting SAS dysfunction following CO poisoning is discussed. The impact of impaired SAS for post-poisoning psychological adaptation is also discussed. An argument is made for including neuropsychological assessment and follow-up review in the management of survivors of CO poisoning who experience alterations to consciousness.

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P. MARUFF, S. CAIRNEY, C. BURNS, B. CURRIE, A. COLLIE, & D.G. DARBY. Improved Cognitive Function Following Abstinence From Gasoline Inhalation.

Background: The deliberate inhalation of gasoline is prevalent in inner-urban or remote rural communities. Although acute toxic encephalopathy is well documented, the neurological and cognitive effects of chronic petrol sniffing and the effects of abstinence are unknown. *Method:* A structured neurological and neuropsychological examination was used to assess 33 individuals who had sniffed petrol for longer than 6 months before and after 20 months of abstinence from gasoline sniffing. Blood lead and blood hydrocarbon levels and information about petrol sniffing behavior were also obtained from each subject. *Results:* At baseline, there was impairment in gait as well as deficits in visual attention, visual recognition memory and visual paired associate learning. All of these impairments resolved with abstinence. Blood lead levels were also reduced but had not returned to normal limits. *Conclusion:* Subtle neurological and cognitive abnormalities occur in gasoline sniffers and the severity of these abnormalities is reduced with abstinence.

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M.D. RIS & K. DIETRICH. Late Effects of Lead on Neuropsychological Functioning: Outcome of the Cincinnati Lead Study.

In previous papers and publications we reported on various stages or aspects of the follow-up of a lead-exposed birth cohort. This study repre-

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sents the longest, continuing longitudinal investigation of the neurobehavioral effects of early lead exposure. Preliminary analyses of the incomplete sample have suggested a relationship between academic skills and lead exposure. In this paper, we present the neuropsychological functioning of this completed study of 195 adolescents as it relates to parameters of early environmental lead exposure. Factor analysis with varimax rotation of the neuropsychological battery yielded five factors: Memory, Achievement, Attention, Visuoconstruction, and Motor. Factor scores will be used in multivariate, covariate-adjusted analyses of dose–response relationships between lead exposure and adolescent neuropsychological outcome. These analyses will provide important information for structural equation modeling of neuropsychological mediators of lead effects on antisocial behaviors.
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J. UEKERMANN, I. DAUM, P. SCHLEBUSCH, & B. WIEBEL. The Influence of Depression on Executive Functioning in Alcoholism.
Studies on neuropsychological functions in alcoholism have reported changes with respect to executive functions and memory which are mainly related to cerebral changes in the dorsolateral prefrontal cortex. According to the heuristic model of addiction the executive dysfunctions are of critical practical importance since they are associated with a lack of cognitive flexibility, which is a precondition for establishing abstinence. The question must be raised; however, whether the observed cognitive deficits are at least partly influenced by depression, which as such can also lead to cognitive impairments that primarily depend on the functional integrity of the prefrontal cortex. Although depression is the most frequent psychiatric disorder in alcoholics, its impact on cognitive performance in alcoholic patients has not been studied in a controlled investigation yet. In the present investigation non-depressed alcoholic patients (NDA), depressed alcoholic patients (DA), patients with depression but without alcoholism (D) and healthy controls (HC) completed a range of neuropsychological tests. Group comparisons revealed impairments of alcoholic patients with respect to executive functions and memory. Deficits in logical deduction were only found in depressed alcoholic patients. In conclusion the present study shows that depression exacerbates executive deficits in alcoholism. This finding can be discussed in the context of the heuristic model of addiction. Thus careful assessment of affective variables should be an integral part of the treatment of alcoholism and antidepressive therapy could be a precondition to develop adaptive strategies for the establishment of abstinence.
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Paper Session 2/1:30–3:00 p.m.

NEUROPSYCHOLOGICAL PROBLEMS IN CHILDREN

P. ZESIGER, C. MAYOR DUBOIS, J. NIELSEN, & T. DEONNA. Handwriting Disorders in Children: Motor Programming or Execution Deficits?
Difficulties in learning to write is a sign associated with many neurological pediatric conditions such as developmental coordination disorders (DCD), learning disabilities (LD), traumatic brain injury (TBI), etc. The aim of this study was to test whether all children with handwriting difficulties exhibit the same type of impairment or whether different profiles can be found. For this purpose, 8-to-12-year-old children ($N = 41$) with mixed etiology (including DCD, LD, TBI, etc.) but without specific central motor disorders were asked to perform several handwriting and graphomotor tasks. According to parental reports, all children presented handwriting problems. The productions were recorded by means of a graphic tablet. A computer program was used to segment each word/pattern produced into strokes and to compute 7 variables per stroke: Duration, length, average and maximal velocities, movement fluency (number of inversions on the velocity profile), spatial and temporal regularities. Results were then compared to those of normally developing, age-matched children ($N = 60$) and transformed into z scores. A hierarchical cluster analysis performed on the z-score profiles reveals the existence of 3 main subgroups of children as well as several additional, atypical profiles. The 3 main sub-groups are respectively characterized by (1) selective difficulties affecting movement duration and fluency, (2) selective difficulties affecting spatial and temporal regularities, and (3) a combination of these two impairments. These results suggest that handwriting disorders in children can be attributed to deficits affecting different levels of processing, namely motor programming and motor execution.
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E. KANTOLA-SORSA, E. GAILY, M. ISOAHO, V. HIILESMAA, & M. KORKMAN. Effects of Maternal Epilepsy on Cognitive Development.
This study focuses on the effects of maternal epilepsy on the cognitive development of the offspring. All children born to mothers with epilepsy during 1989–1994 at Helsinki University Central Hospital Obstetrics Department were enrolled and a matched (SES, sex, parity) control group recruited from the same unit (total $N = 580$) for assessment at the age of 5–9 years. To the 300 subjects (165 in the exposed and 135 in the control group) who complied, WISC–R or WPPSI–R (six subtests) and a selection of subtests from NEPSY tapping attentional, auditory–verbal, visual, visuomotor, hand fine-motor and memory abilities were administered. Statistical analysis (ANOVA) demonstrated no difference in VIQ or PIQ between the groups but significant differences in several NEPSY subtests. Group differences in subtests of auditory attention and rapid naming were seen in the younger age groups only. Differences in motor and memory subtests persisted through all age groups. The main results replicate those of our earlier study with similar design with only one age group (5 years) but the age trend in the present findings has not been previously reported. The findings support those of previous research of a risk of cognitive dysfunction with maternal epilepsy. The age effect raises the question of a maturational lag in language processing as one possible outcome of epilepsy pregnancy. The effects of medication will also be considered.
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R. OGG, P. ZOU, H. WHITE, T. COOPER, J. O'GRADY, R. BUTLER, & R. MULHERN. Attention Deficits in Survivors of Childhood Cancer: An fMRI Study.
Curative treatment in childhood cancer has been achieved at some cost to neurocognitive functions, including attention deficits that undermine successful academic achievement. Pilot studies suggest that cognitive remediation therapy (CRT) may improve cognitive function in survivors of childhood cancer. We report initial results from functional magnetic resonance imaging (fMRI) in children screened for an ongoing, prospective trial of the efficacy of CRT in this population. Our hypothesis is that behavioral deficits in sustained attention are associated with altered patterns of neural activation during continuous performance task (CPT) testing. Subjects ($N = 7$ to date) were school-aged survivors of childhood leukemia or pediatric brain tumor, at least one year off treatment. Initial analysis of visual stimulation data suggests that the hemodynamic response to neural activity is intact in these patients, at least in the primary visual cortex. General patterns of neural activation during the CPT were comparable to patterns observed in healthy adult volunteers ($n = 31$). Behavioral performance on the CPT during fMRI was not significantly different from performance in the behavioral lab (e.g., mean difference in reaction time = 8.8 ms, $p = 0.6$). Experimental subjects and wait-list controls will be imaged again at completion of the CRT phase to explore the association between patterns of neural activation and response to be-

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havioral intervention. The use of fMRI to identify specific functional neural correlates of attention deficits among childhood cancer survivors may ultimately facilitate the development and evaluation of behavioral or pharmacological interventions based upon specific abnormalities of brain activation.
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R. BUTLER, M. KERR, & B. SZEWCZYK. Emotional Perception Deficits Following Cranial Irradiation for Childhood Cancer.
It is now generally accepted that cranial irradiation as a CNS prophylactic treatment for children with leukemia is associated with cognitive impairment. Additionally, accumulated evidence has implicated maximal deficits in nondominant hemisphere functions, as assessed by measures such as performance IQ, visual–motor integration, and nonverbal memory. It has also been independently established that affect perception is primarily a nondominant hemisphere function. We hypothesized that children who demonstrated maximal impairment in nondominant hemisphere functioning following cranial irradiation would also manifest deficits in the ability of identity affect, based on facial expression. Subjects were 55 children and adolescents who were off treatment for leukemia. All participants had received cranial irradiation. Participants were subdivided into two groups based on performance IQ. Upon inspection of the overall distribution, it appeared that using the criteria of a performance IQ ≤ 94 resulted in two well differentiated subgroups: Low performance IQ ($M = 78$, $SD = 13$) and high performance IQ ($M = 107$, $SD = 8$). The two groups significantly differed in the expected direction on a test of emotional facial identification, but not on a presumed less challenging task of discrimination. This difference cannot be ascribed to facial recognition abilities because the two groups were not significantly different on a test measuring this function. We conclude that there is preliminary evidence to suggest that individuals who experience significant neurocognitive decline following cranial irradiation may also have difficulty in accurately perceiving affect, based on facial expression.
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Symposium 2/3:30–5:00 p.m.

CONSCIOUSNESS

Organizer and Chair: Antti Revonsuo

A. REVONSUO. Symposium on Consciousness.
The scientific study of consciousness has become a new interdisciplinary field in which cognitive neuroscience and neuropsychology closely interact with philosophy and theory. The present symposium reviews some of the central issues and research problems in this field. Antti Revonsuo first introduces the current state of the scientific study of consciousness and its main research problems as well as the role of neuropsychology in it. Second, Maria Wilenius-Emet describes an increasingly popular experimental approach to consciousness, the attempt in cognitive neuroscience to discover the neural correlates of consciousness in the brain. She presents data from recent EEG and MEG experiments on visual awareness. The last two presentations concern modern scientific approaches to dreaming and hypnosis as altered states of consciousness. Katja Valli presents a novel theory of the biological function of dreaming and reviews her research which aims at testing the theory. Sakari Kallio reviews the phenomenon of hypnosis from a theoretical perspective and reports a case study of his own. He suggests that hypnosis might be a useful tool in neuropsychological rehabilitation. The symposium as a whole thus presents an overview of how the psychological and the biological sciences are currently in close interaction when trying to elucidate the nature of consciousness, a problem which used to be a domain of purely philosophical speculation.
Correspondence: *Antti Revonsuo, Department of Philosophy, Center for Cognitive Neuroscience, University of Turku, Turku, FIN-20014, Finland.*

A. REVONSUO. Neuropsychology and the Science of Consciousness.
This presentation serves as an introduction to the *Symposium on Consciousness*. The history, the current research problems, and the future prospects of the science of consciousness are briefly reviewed and related to neuropsychology which has played an important role in the emergence of the whole field. The scientific study of consciousness emerged as a new and rapidly growing field of multidisciplinary research during the 1990s. The philosophical core of this field is the classical mind/body or brain/consciousness problem: the problem of understanding how the subjective psychological reality of consciousness is related to the objective biological reality in the brain. Such fundamental theoretical problems are inherent in neuropsychology and cognitive neuroscience, for those disciplines attempt to bridge the gap from biological phenomena in the brain to the realm of subjective mental and conscious phenomena. Therefore, one of the central questions in current consciousness research is, can the new data from neuropsychological dissociations between conscious and nonconscious processes (e.g., blindsight) or the growing body of brain imaging data about the neural correlates of consciousness elucidate (or even solve) the fundamental philosophical problems related to the scientific explanation of consciousness?
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M. WILENIUS-EMET & A. REVONSUO. Neural Correlates of Consciousness.
One of the major and most challenging unsolved problems of modern science is the explanation of consciousness. The connection between the subjective world, consciousness, and the neuronal activity of the brain is still largely unknown although various approaches to solve this problem have been undertaken. Subjective experience at any moment is, nevertheless, assumed to be associated with a corresponding pattern of neuronal activity. Due to the variety of aspects of consciousness, consciousness can be approached in many different ways, e.g., by studying visual awareness. Learning more about the underlying mechanisms of visual awareness might be helpful in the understanding of other aspects of consciousness as well given the assumption that the different aspects of consciousness employ a basic common mechanism or perhaps a few such mechanisms. The methods for brain and consciousness research have improved remarkably within the past decades. Cognitive neuroscience has furthermore linked consciousness studies and the natural sciences together and thereby allowed combined psychophysical and neurophysiological studies. The present paper reviews three studies on the electrophysiological correlates of visual awareness (as revealed by EEG or MEG). The correlations between neural activity and conscious perception that the present studies have revealed will be presented and discussed.
Correspondence: *Maria Wilenius-Emet, Center for Cognitive Neuroscience, University of Turku, Turku 20014, Finland.*

K. VALLI & A. REVONSUO. The Dreaming Brain—What Is It Doing, and Why?
Dreaming is the most common and most often occurring altered state of consciousness. There are at least three questions about dreaming of interest to neuropsychology: (1) What are the neural mechanisms involved in dream production? (2) What are the effects of localized brain injury on dreaming? (3) What is the biological function of dreaming? This presentation focuses mostly on the third question. During sleep the dreaming brain creates a virtual reality-like simulation of the world and this simulation seems so real to us that while asleep we take it for granted. Why does our brain bother to construct such an accurate simulation of the world

while we are completely unaware of the environment surrounding us? The question about the biological function of dreaming is the question of whether dreaming increased the inclusive fitness of ancestral humans in the original ancestral environment. The *threat simulation theory of dreaming* states that dream consciousness is essentially a mechanism for simulating threatening events. Threat perception and threat avoidance responses and strategies are rehearsed during dreaming in order to be better prepared for future encounters. Such a threat simulation system that forced our ancestors to face various threats in different combinations every night was valuable for ancestral humans, increasing the probability of successful reproduction. Furthermore, this ancient biological defence mechanism seems to be still working in us, as evidenced by, e.g., nightmares and post-traumatic dreams. Empirical data from our studies designed to test the threat simulation theory will be presented.

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S. KALLIO & A. REVONSUO. Hypnosis as an Adjuvant in Neuropsychological Rehabilitation.

Hypnosis is defined as social interaction in which one person responds to suggestions given by another person (the hypnotist) for changes in the content of consciousness involving subjective changes in perception, memory, and the voluntary control of action. There is no general agreement on the theoretical framework within which these behavioral and subjective experiential changes should be explained, and also individuals respond differently to hypnosis. In clinical settings, hypnosis has been used as a psychological treatment for a variety of illnesses. However, more research needs to be done in order to find the areas where hypnotic interventions can most effectively be used. While hypnotic suggestions are not capable of curing physical disease, they can be used to enhance relaxation and alleviate pain and other physical discomforts making a positive contribution also to the overall quality of care. In this paper the basic phenomena included in hypnosis are presented along with a case description of a 25-year-old patient with severe brain damage resulting from a car accident. Hypnosis was used during the neuropsychological rehabilitation of this young man in different phases during the process.

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Paper Session 3/3:30–5:00 p.m.

MEMORY AND AMNESIA

J. CHEY, D. NA, W. TAE, J. YOO, & S. HONG. Volume Reduction in Hippocampus and Frontal Lobe of Nondemented Elderly Individuals With Low Cognitive Performance.

Dementia evaluation of elderly individuals with minimal schooling is difficult, since it is not easy to determine whether poor neuropsychological test performance is due to lack of education or dementia, especially dementia of the Alzheimer's type (DAT). To elucidate the underlying structural change of low cognitive functioning in elderly individuals with few years of education, this study examined the relationship between low cognitive functioning and volume reduction in brain regions vulnerable to Alzheimer's disease in a nondemented elderly population. Individuals with low cognitive performance ($n = 14$) were matched on age and education with those with normal cognitive performance ($n = 14$). The two groups were compared on the MR-based volumetric measures in the hippocampus, the entorhinal cortex, the amygdala, the frontal lobe, and the cerebrum. Normalized hippocampus ($p < .01$) and frontal lobe ($p < .01$) volumes were significantly reduced in individuals with low cognitive performance. Hippocampal volume was associated with delayed word-list recall ($p < .001$), delayed figure reproduction ($p < .001$), delayed recall of story ($p < .001$), as well as age ($p < .001$). Low cognitive performance in elderly individuals with only a few years of education was associated with atrophy in brain regions vulnerable to Alzheimer's disease.

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J.B. RICH, S. KARANTZOULIS, & N.W. PARK. New Fact Learning in Amnesia: The Method of Vanishing Cues *Versus* Study Only.

This study examined the effects of two training procedures on the acquisition of new factual information in 4 amnesic patients (M age = 50.3; educ = 14.0) and 6 healthy individuals (M age = 54.0; educ = 11.8). Forty three-word sentences (e.g., dentist played ukulele) were presented during training—20 in a *study only* condition and 20 using the *method of vanishing cues*—followed by cued recall (e.g., dentist played ???) of half the presented items. This study-then-test procedure continued in weekly sessions to a criterion of 40% recall success. Retention was assessed a week later using the same retrieval cues as during training. The following week, implicit memory was assessed by word-fragment completion (e.g., uk_____), and generalization was assessed using synonyms as retrieval cues (e.g., orthodontist strummed ???). Patients required significantly more trials to reach criterion ($M = 4.5$) than did controls ($M = 1.6$, $F = 5.8$, $p < .05$). There was no effect of training method on cued recall in either group. Across participants, there was a trend for better word-fragment completion performance for items presented with vanishing cues compared to study only, as expected. For controls but not patients, study-only training produced marginally more generalization than did training with vanishing cues. However, the amnesics did show generalization for items that were previously tested (as compared to those that were presented during training but not tested; $F = 25.0$, $p = .015$). This same pattern was only marginally significant among the controls, $p = .089$. Ongoing investigations in our laboratory will determine whether these findings are maintained in a large sample.

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A. JAVURKOVA, P. MARUSIC, & J. ZARUBOVA. Brain Plasticity of Memory Functions in Temporal Lobe Epilepsy Patients.

Depending on the side of the epileptogenic area there are different patterns of memory impairment in temporal lobe epilepsy (TLE) patients. Patients with refractory TLE undergo routine evaluation when epilepsy surgery is considered. The localization and lateralization of epileptogenic area is based on concordance of clinical, electrophysiological and imaging data. Functional neuroimaging (PET or ictal SPECT) plays an important role when structural imaging (MRI) is concluded nonlesional. In TLE patients neuropsychological tests are used for lateralization of verbal–nonverbal deficits in memory function (WMS–III, RAVLT, ROFT, RMT, intracarotid amobarbital/metohexital procedure). We present original cases with evidence of interhemispheric reorganization of the brain mechanisms responsible for basic memory functions, i.e., verbal and nonverbal recall and recognition. This shift of function is probably caused by focal damage of the distinct brain structures early in the childhood and subsequent brain plasticity.

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M.P.H. HENDRIKS, T. MEIJERINK, A.P. ALDENKAMP, & H. VAN DER VLUGT. Memory Impairment as a Consequence of Epilepsy-Related Factors.

We performed a multicenter study on memory functioning in 252 patients with epilepsy who subjectively complained about their memory. All patients were given a full battery of neuropsychological tests including general intellectual functioning, language functions, attention and concentration, visual constructive abilities, and obviously memory functions. The purpose of the study was to examine the relationship between memory impairments and epilepsy related factors, such as etiology, localization of seizure onset, age at seizure onset, duration of seizures, seizure frequency, and anti-epileptic medication. MANOVA with the total of 252 patients revealed no main effects. However, when patients with an extra temporal lobe seizure onset ($N = 61$) are excluded we find highly significant main effects of the factors lateralization and etiology. Patients with a left temporal lobe seizure onset ($F = 5.045$) and a symptomatic epilepsy ($F = 1,611$), score significantly lower on tests for verbal memory. Furthermore,

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those patients with a low seizure frequency (F = 3.263), and a short duration of epilepsy (F = 1,899) score significantly better on most the indices of the WMS–R. Finally, we found a main effect of medication (F = 1.437) caused by better performances of patients with monotherapy on the retention of Logical Memory, Visual Reproduction and the long-term reproduction of verbal associations. It may be concluded that within the majority of patients memory functioning is not specifically related to epilepsy factors. However, within a subgroup of patients with a seizure onset in the temporal lobes, memory impairments are strongly related to lateralization, etiology, and also to a longer duration, higher seizure frequency and a treatment with polytherapy.

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Paper Session 4/3:30–5:00 p.m.

ELECTROPHYSIOLOGY AND fMRI

H. TORGERSEN, B. OERBECK, K. SUNDET, & I. REINVANG. Cognitive ERPs in Young Adults With ADHD With and Without Methylphenidate.

The ADHD literature reports that methylphenidate normalizes the P3 component with larger amplitude and shorter latency and also larger amplitude in the N1 mulhern component. Event-related potentials, neuropsychological and behavioral functioning were assessed in 9 young adults (*M* age 21 years) with ADHD with and without their prescribed methylphenidate dosages. Mean total IQ (WASI) was 104 (*SD* 13). Mean *T* score on the attention problem subscale of Achenbach Young Adult Self Report was 63 (*SD* 7), confirming a moderate degree of clinical problems. Cognitive ERPs were recorded to auditory standard and target events in an oddball paradigm. Subjects responded with button press to stimulus categories defined by pitch differences. Neuropsychological tests tapping attention and mental flexibility showed no significant differences off medication (OffM) versus on medication (OnM). Barkley ADHD self-report questionnaire showed significantly worse perceived functioning OffM than OnM. Behavioral results showed significantly less hits and more misses OffM to the first standard after a target than OnM, indicating difficulties in mental flexibility OffM. Interactions were found between medication and electrode localization. The subjects differentiated significantly OnM versus OffM on the anterior components, while the posterior components were more clustered, indicating a predominantly prefrontal effect of methylphenidate in ADHD. There was a trend towards increased amplitude OnM for the N1 component. For the P3 component there was a trend towards the expected shorter latency OnM. Case inspection of the P3 latency showed that seven of the nine subjects had shorter latency OnM, one was unchanged, and one had longer latency OnM.

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K.B. WALHOVD & A.M. FJELL. Neuropsychological "Frontal" Tests in Relation to P3a Across the Adult Lifespan.

This study is an attempt to validate the P3a event-related potential (ERP) waveform, conceptualized as a frontal component, by means of relating it to neuropsychological 'frontal' tests in comparison with more general tests in a well-functioning sample. Forty-five healthy participants evenly distributed across the ages 20–93 took part in a visual three stimuli ERP task modeled on a paradigm reported by Comerchero and Polich to elicit P3a in a young homogeneous sample. A battery of neuropsychological tests was also administered: WASI, digit span and digit symbol from the WAIS–R, Corsi blocks, a version of the Knox blocks, the COWAT, Stroop, TMT A and B, CTT 1 and 2 and Grooved Pegboard. The results of the present study yield strong support for a tight coupling between neuropsychological measures and P3a. Overall, the relationship is stronger for P3a than for P3b. However, this is not particularly pronounced for 'frontal' tests exclusively. Rather, one must conclude that P3a generally exhibits neuropsychological validity, especially with regard to amplitude parameters. However, none of the components exhibit discriminant validity with regard to 'frontal' tests specifically. The theoretical and empirical basis of P3a is discussed in relation to variations in age and neuropsychological functioning.

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S.V. MÜLLER & T.F. MÜNTE. Error Monitoring and Doubt: A Study With Event-Related Potentials.

A central characteristic of humans is that they have to be able to operate under circumstances where less than optimal information is available. How, then, are actions monitored, if their quality and adequacy is in doubt? This was investigated with a pair-association learning tasks. Each phase begins with the learning phase: for each of 18 pictures, the subject is told whether it requires a left-hand or a right-hand response. Followed by the test phase: The pictures were presented several times in random order. The subject's task was to press the appropriate button as fast as possible. A deadline procedure was used to ensure fast responses. One second after the onset of the picture feedback was provided. In most cases, the feedback is appropriate (like in a 100% mapping condition). In 20% of the cases, instead of positive or negative feedback, a feedback indexing "unclear," leaving the subject in doubt whether or not the response had been adequate. While presenting this pair-association-feedback task event-related potentials (ERPs) were recorded. Error related negativity (ERN) was analyzed for presenting the picture depending on the following feedback, the responses of the subjects (correct *vs.* incorrect) and for the feedback (affirmative, negative, doubt). This allows us to characterize the role of the ERN in action monitoring in doubt. The evaluation of the data shows a significant difference to the ERN activity in the different feedback conditions. Of special interest was the significant difference between neural activity to negative and "doubt" feedback.

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H.-C. NUERK, B. GEPPERT, R. SCHNITKER, S. WEIS, A. THRON, & K. WILLMES. When Multiplication Knowledge Aids Magnitude Judgments: An efMRI Study.

Number bisection (deciding whether the middle number in a triplet is the numerical middle) has recently been used in neuropsychological case studies in addition to number comparison to assess quantitative as opposed to verbal arithmetic capabilities in number processing. While number comparison has often been used with normal participants, factors determining difficulty in the number bisection task have—to our knowledge—not been investigated systematically yet. We examined four factors in a combined RT and event-related fMRI study: multiplicativity (whether or not the three numbers are part of a multiplication table), range (distance between smallest and largest number) for bisectable number triplets as well as distance of the middle number to the numerical middle and bisection possibility for non-bisectable triplets. We obtained large effects for all four factors in RT and accuracy data in normal participants (n = 17). In a regression analysis, we additionally observed inhibitory effects of decade crossing and of 10 inclusion (whether or not one of the three numbers was a decade number). In the fMRI study, we found larger frontal and parietal activation in most of those conditions which were more difficult with regard to RT or accuracy. Most activated areas are part of the number processing networks suggested by the anatomo–functional model of Dehaene and Cohen. We discuss the opportunities and caveats imposed by these results for the use of the number bisection task as an assessment tool in case studies. Finally, the consequences of these results for number processing models are discussed.

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FRIDAY MORNING, JULY 26, 2002

Poster Session 2/9:00 a.m.–4:30 p.m.

NEUROLOGICAL AND PSYCHIATRIC CONDITIONS

W. BEATTY & R. AUPPERLE. RBANS Analysis of Memory in Multiple Sclerosis and Parkinson's Disease.
Patients with Parkinson's disease (PD) or multiple sclerosis (MS), even if they are not demented, often exhibit deficits in the free recall of lists of unrelated words. Recognition memory, by contrast, is less severely impaired and may not be impaired at all. For these patients, recall of organized material (stories) is frequently better than of unrelated words. Such findings support the hypothesis that the memory problems of patients with "subcortical" diseases arise mainly from retrieval failure. However, the difficulty of equating recall and recognition tests for difficulty and sensitivity precludes a firm conclusion. To re-examine the nature of memory impairment in MS and PD we administered the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) to 23 patients with PD and 50 patients with MS. All patients scored ≥27 on the MMSE, the lower limit for healthy controls. The RBANS has excellent norms for subjects from 20–89 years of age, allowing valid comparisons between tests and subjects after individual test scores are transformed to *Z* scores. For MS patients, recall of stories was significantly better than of lists of unrelated words and recognition memory for lists was significantly better than list recall. PD patients showed neither of these effects, but both patients groups showed evidence of cognitive slowing (poorer performance on semantic fluency than on naming). These results emphasize the heterogeneity of memory disturbances of patients with primarily subcortical diseases.
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D. NEMETH, B. MEYER, B. ROMANO, N. JABER, M. SCHEXNAYDER, K. WALTERS, & K. VOGELPOHL. The Use of Anger and Stress Management to Reduce Depression in MS Patients.
Patients with multiple sclerosis (MS) are more likely to be depressed than normal control participants or patients with other neurological illnesses which points to the importance of identifying effective depression treatments for this population. Nemeth and colleagues presented a single case study of an MS patient for whom anger and stress management appeared effective in reducing depression. Arnett and colleagues reported that depressed MS patients have difficulty with speeded attentional functioning, working memory, and the executive task of planning. Arnett and others hypothesized that left frontal hypoactivation might explain both depression and neuropsychological performance deficits among depressed MS patients. We hypothesized that anger and stress management techniques would reduce depression and simultaneously improve neuropsychological test performance among MS patients. The Chicago Multiscale Depression Inventory (CMDI), an instrument developed specifically for use with medical/neurological rather than psychiatric patients, was chosen for pre and post intervention assessment. Participants are members of three different MS support groups. The treatment is administered in three waves, such that treatment for Group 1 begins 2 months prior to Group 2, which in turn begins 2 months prior to Group 3. The Intervention, which was previously used in the single case study, includes an orientation lecture, modification of anger-eliciting automatic thoughts (cognitive restructuring), and relaxation training (deep breathing, quieting reflex training, and stress management tapes). Techniques of the intervention and results (depression and neuropsychological test performance) will be presented in this paper.
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K.I. TAYLOR, C. SCHOPPER, & M. REGARD. Münchausen in the Neurological Clinic: A Case Report.
The Münchausen syndrome is a chronic factitious disorder characterized by self-mutilation, feigning of medical symptoms and patients' journeying from hospital to hospital to satisfy their need to assume the sick role. Recognition of the estimated 0.3% of all neurology clinic admission who suffer from the Münchausen syndrome carries considerable socioeconomic and medical (diagnosis, treatment, management) consequences. We report the case of patient A.B. who was referred to our Neuropsychology Unit because of various cognitive and somatic complaints which A.B. had meticulously recorded in a databank according to diseased organ, symptom, chronology and medical visit and intervention. The neuropsychological examination was bland and we explicitly recommended that no further medical examinations be carried out with the notable exception of a psychiatric assessment. This case illustrates the typical features of the Münchausen syndrome and the necessity for its early and accurate identification. Differential diagnoses of the Münchausen syndrome, i.e., malingering and dissociative and somatoform disorders, are discussed.
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K.I. TAYLOR, P. BRUGGER, R. SCHIESS, & U. SCHWARZ. Persistent Multimodal Peduncular Hallucinations in a Patient With MS.
Lesions of the rostral brainstem or its projection sites in the pulvinar or medial thalamic nuclei may result in "peduncular hallucinations." These predominantly visual but often multimodal hallucinations occur during normal states of consciousness and typically consist of lively, colorful and nonthreatening persons or animals. They take place in the evening or dark, span both visual fields, last for several seconds or minutes, and are associated with sleep disturbances. We report the case of a 24-year-old female admitted to our clinic with an acute episode of MS. She described two events of synchronized visual and auditory hallucinations, the first lasting continuously during five days, and the second during 24 h. MRI revealed an isolated MS plaque in the periaqueductal segment of the mesencephalon; the retino–geniculo–cortical tracts were intact. The pathogenesis of this rare yet remarkable perceptual disorder can be conceptualized as a release mechanism, i.e., pathological modulation of the intact retino–geniculo–striatal visual system by morphologically or functionally impaired subcortical structures. This mechanism, including the aspect of multimodal synchronization, will be discussed in detail.
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A. SEINELÄ, P. HÄMÄLÄINEN, & J. RUUTIAINEN. Executive Functions in Multiple Sclerosis.
Executive functions were studied in 30 patients with multiple sclerosis (MS) and 15 normal control subjects. MS patients were classified into two subgroups according to their cognitive status; 15 of them were cognitively deteriorated (the MS-D group) and 15 cognitively preserved (the MS-P group). The cognitive level of the subjects was evaluated by the Mild Deterioration Battery (MDB). The study groups were matched in terms of age, gender, education, and depression. The patient groups were also matched for disease duration and physical disability. Modified Wisconsin Card Sorting Test (MWCST), Questions Game (a test of problem solving) and tests of fluency (word, category, design) were used to evaluate execution functions. Predictably, the MS-D group had deficient functions; they used ineffective strategies and made perseverative errors. Interestingly, mild problems in some of the tests were observed also in the MS-P group; they seemed to have a tendency to use the same kind of ineffective strategies as the MS-D group. To conclude, deficits in executive functions are associated with cognitive decline in MS. But furthermore, mild problems in executive functions can be observed even in patients with otherwise

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preserved cognitive abilities. Executive functions seem to be especially vulnerable in MS, thus indicating a dysfunction in the frontal lobe areas.
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S. HYMAN, K. NORTH, A. SHORES, D. GILL & A. STEINBERG. Natural History of Cognitive Deficits and Brain Lesions in Neurofibromatosis 1.

One of the most common complications of neurofibromatosis type 1 (NF1) are neuropsychological deficits. Current research suggests a relationship between brain lesions evident on MRI (T2 hyperintensities) and poor neuropsychological functioning. Research has shown that the majority of brain abnormalities disappear as the child develops into adulthood. Preliminary cross sectional data suggests that there also may be improvements in general intellectual functioning. This study examined the natural history of cognitive deficits and MRI T2 hyperintensities in patients with NF1 using a longitudinal design. Thirty-two patients with NF1 underwent an 8-year follow-up neuropsychological assessment and MRI. The association between changes in brain abnormalities and subsequent changes in cognitive functioning was then determined. Although the majority of brain abnormalities in the patients with NF1 either disappeared or were reduced in intensity, neuropsychological abilities did not show any significant improvement over time. No association was found on an individual level between changes in brain abnormalities and changes in neuropsychological abilities.
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J. LOUKKOLA, M. LAINE, H. AINIALA, J. PELTOLA, R. METSÄNOJA, A. AUVINEN, & A. HIETAHARJU. Cognitive Impairment in SLE: A Population-Based Neuropsychological Study.

Background: Systemic lupus erythematosus (SLE) is an autoimmune disease which may lead to several neurological and psychiatric symptoms. Several studies have recognized cognitive impairment in SLE patients but there is considerable disagreement as regards its prevalence and quality. *Objective:* In order to clarify further the prevalence and nature of cognitive impairment in SLE and NPSLE, we conducted the first neuropsychological study on a population-based sample. *Methods:* Cross-sectional, population-based neuropsychological study of 46 SLE patients and 46 matched controls. All patients and controls completed a 3–4 h neuropsychological test battery permitting evaluation in 8 areas of cognitive function and a clinical neurological examination. On the basis of the neurological examination, the SLE patients were divided into neuropsychiatric (NPSLE+; $n = 15$) and nonneuropsychiatric (NPSLE−; $n = 31$) cases. *Results:* In our population-based neuropsychological study of SLE, the subgroup of NPSLE+ patients performed significantly worse than the controls in three cognitive domains: complex attention, memory and psychomotor speed. Moreover, the NPSLE+ group performed significantly worse than the NPSLE− group in two cognitive domains, namely complex attention and psychomotor speed. It is remarkable that at group level, the NPSLE− patients' neuropsychological performance did not differ from that of the controls. *Conclusions:* This population-based study revealed neuropsychological deficits which are frequent among patients with neuropsychiatric SLE, but not among SLE patients without CNS involvement. These impairments involve memory, complex attention and psychomotor speed. The pattern of impairment suggests rather nonspecific CNS involvement, which is consistent with neurological manifestations of the disease.
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B. MONTAGNE, E. FRIGERIO, M. BURT, J. GRAY, E. DE HAAN, & D. PERRETT. Recognition of Facial Expressions in a Bipolar Patient.

Bipolar depression is a clinical condition involving major depression and one or more manic episodes. It is known that patients suffering from a mood disorder may show deficits in the perception of facial expressions of emotion. The aim of this research was to find out whether this deficit is state-dependent or persists during fluctuating mood states. Accuracy and sensitivity of the perception of facial expressions were measured with animated facial stimuli (morphs). Each trail started with a neutral face that slowly transformed into a full-blown emotion as posed by an actor. Accuracy was defined as the number of correctly recognized full-blown expressions. Sensitivity was measured by asking the subjects to indicate the earliest point in the transition at which they recognized the emotion. Depressed and manic states were evaluated with two self-rating scales, the BDI and the Altman. We report here the data of 1 bipolar patient, who showed a very clear shift between the depressed (BDI score: 0 *vs.* 13) and the manic state (Altman score: 25 *vs.* 0). The data indicated that this bipolar patient showed a single dissociation on the accuracy measures and a double dissociation on the sensitivity measures in the perception of happy and sad facial expressions depending on whether she was in a manic or depressed state. This suggests that expression recognition is state-dependent in bipolar disorder.
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E. AAKER, A. J. LUNDERVOLD, Å. HAMMAR, K.I. STORDAL, & A. LUND. Verbal Memory Function in Recurrent Unipolar Depression.

Several studies indicated that major unipolar depression is associated with changes in verbal memory functioning. The findings are, however, divergent, both with respect to quantitative and qualitative aspects of these changes. The influence of the stage of depression on verbal memory function and the performance of patients after remission are reported in a few follow-up studies only. In the present study 50 patients with recurrent major unipolar depressive disorder as determined by the Structured Clinical Interview for DSM–IV were included. All patients obtained a minimum of 18 points on the Hamilton and Montgomery Åsberg Depression Rating Scales. Fifty age-sex-education- and IQ-matched healthy controls were included as a control group. Their cognitive function was assessed by a neuropsychological test battery, including the California Verbal Learning Test (CVLT), in order to assess verbal memory function. Depressed patients were characterized by normal encoding, but as a group they showed a mild deficit in retrieval of the previously learned material. The aim of the present ongoing study is to evaluate changes in verbal episodic memory functioning over time in these patients. At present, 15 patients and 9 control subjects have been reexamined 2–3 years after the first testing. Preliminary results indicate that impairment of verbal retrieval has been stable over time. Follow-up results from a larger group of patients and controls will be presented and discussed at the meeting.
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J. ALLEN, L. KASE, & D. BRAMLEY. Neuropsychological Correlates of Self-Reported Depressive Symptomology in Young Adults.

Investigations of the relationship between self-reported symptomology and cognitive deficits have largely focused on elderly individuals undergoing examination for potential organic disorders. While geriatric patients generally display some level of cognitive decline as a function of depressive status, current research with younger adults has not consistently yielded similar findings. The intent of the present study was to better clarify the relationship between subjective depressive symptomology and performance on attentional and memory tasks in a sample of young adults. The study included 60 participants (41 women: 10 men) between the ages of 18 and 31, with a mean age of 19.72 years. Following informed consent, participants were administered the Beck Depression Inventory (BDI) as well as a battery of learning and memory measures (California Verbal Learning Test, Rey-Osterrieth Complex Figure, Controlled Oral Word Association, and selected subtests from the WAIS–III). After controlling for overall intellectual functioning levels, analyses utilized both dichotomous (e.g., depression *vs.* no depression) as well as categorical (e.g., mild, moderate, severe) of reported depressive symptomology. Results indicate

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that both visual and verbal long-term delay scores on both the Rey-Osterrieth ($p < .025$) and California Verbal Learning Test ($p < .03$). While the Working Memory Index of the WAIS–III did not display significant differences between depressed and non-depressed groups, the Letter–Number Sequencing Subtest was independently sensitive to affective status ($p < .05$). Clinical implications will be discussed.

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J. ALLEN, D. SALISBURY, & J. WILLIAMS. Neuropsychological Predictors of Vocational Outcome After Traumatic Brain Injury.

Although the nature and severity of neuropsychological impairment has been associated with the level of vocational outcome, there has been no definitive agreement as to which predictors are most predictive of employment after head injury. The current study attempts to identify the executive control variables that show the greatest promise in informing rehabilitation efforts and treatment planning. The present sample includes 55 participants (40 males, 15 females) between the ages of 21 and 61 who participated in the vocational reentry program located in the Midwestern US. Statistical analyses suggest that scores on the Tactual Performance Test of the Halstead-Reitan Neuropsychological Battery are significantly related to the vocational outcome indicators of long-term job status ($r = .49$, $p < .010$) and wage ($r = .37$, $p < .05$). Additionally, variables that demonstrate a relationship to wage during employment include the Perceptual Organization Index ($r = .44$, $p < .01$) and the Processing Speed Index ($r = .43$, $p < .01$) of the Wechsler Adult Intelligence Scale, Third Edition. Additional regression analyses and canonical correlations will incorporate demographic and trauma severity variables in an attempt to clarify predictive relationships as they relate to treatment planning and case management. Results will be discussed in terms of the clinical and economic ramifications of vocational retraining efforts and resource allocation.

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M. MATSUI, T. SUMIYOSHI, K. KATO, S. SUMIYOSHI, Y. KIKURA, & M. KURACHI. Impairment of Story Memory Organization in Patients With Schizophrenia.

Memory impairment is one of the most consistent findings among the neuropsychological deficits reported in patients with schizophrenia. The purpose of this study was to examine the organization of story memory in patients with schizophrenia. Participants were 35 patients (20 men and 15 women, *M* age 28.1 years) who fulfilled the ICD-10 diagnostic criteria for research on schizophrenia and 24 healthy comparison subjects (16 men and 8 women, *M* age 28.1 years). All participants were administered the Wechsler Memory Scale–Revised (WMS–R). The organization structure of memory was evaluated with the Logical Memory stories of the WMS–R based on an established method. This analysis allowed independent scoring of thematic sequencing and content distortion, the latter consisting of confabulations, confusion, inclusion, and perseverations. Psychopathology in patients was assessed by experienced clinical psychiatrists using the Scale for the Assessment of Positive Symptoms (SAPS) and the Scale for the Assessment of Negative Symptoms (SANS). As expected, schizophrenic patients performed worse than controls on the score of thematic sequencing [$t(57) = 4.67$, $p < .001$]. Additionally, there were significant negative correlation between positive symptom and thematic sequencing ($r = -.46$, $p < .05$) and positive correlation between avolition and thematic sequencing ($r = .5$, $p < .01$). These findings suggest memory organization of story is impaired in patients with schizophrenia and the memory organization deficits are related to the diversity of symptoms including the disorganized thought and behavior.

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T. FISHER, S.G. SHAMAY-TSOORY, R. TOMER, & J. AHARON-PERETZ. Executive Functions in Adult ADHD: Comparison With Focal Brain Lesions.

Attention deficit hyperactivity disorder (ADHD) represents one of the most pervasive behaviour disorder of children, and the symptoms continue into adulthood in 60–70% of those diagnosed in childhood. Neuropsychological studies have generally pointed to difficulties in executive functions, which was interpreted as reflecting frontostriatal network abnormalities as the likely cause of ADHD. However, there are no reports in the literature, which directly compare the performance of either children or adults with ADHD, to the performance of patients with known frontal lesions. The present study therefore compared the performance of 28 adult patients with ADHD on several measures of executive functions, to the performance of patients with focal frontal ($n = 33$) or posterior ($n = 13$) brain damage and 17 age- and education-matched healthy controls. Compared to normal controls, ADHD subjects were significantly impaired in all measures of cognitive flexibility (WCST, Trails Making Test, Verbal and Design Fluency), but did not differ from either group with focal brain lesion. However, this deficit characterized only the subjects with ADHD–Inattentive type, whereas those with ADHD–Hyperactivity performed as well as the healthy controls. These findings suggest that the cognitive profile observed in ADHD–Inattentive type is different from the pattern of performance characteristic of ADHD–Hyperactivity. The similarity observed between subjects with ADHD–Inattentive type and patients with either frontal or posterior localized brain lesion is, contrary to expectation, based on the "frontal model" of ADHD, which implies that subjects with ADHD will display a specific pattern of deficits, similar only to patients with frontal lesions.

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M. YAMANAKA & M. REGARD. Neuropsychological Correlates of Asymmetric "Conversion" Symptoms.

Although many models have been proposed to explain so-called conversion symptoms (hysterical symptoms), there is no neuropsychological study available testing the cerebral dysfunctional hypotheses. We present the results of a prospective neuropsychological study with 6 patients (2 f, 4 m, 2 non-right-handers, 5 with left and 1 with right-sided symptoms, 5 with sensomotor and 1 with purely sensory symptoms) and the retrospective analysis of 49 case histories with conversion symptoms admitted to a neurological clinic. The assessment focused on functional hemispheric asymmetry, callosal transfer and the structured interview of neurological signs associated with mild cerebral dysfunction. We found evidence of mild neuropsychological dysfunctions in 5 out of 6 cases. Four had nonverbal and 2 had verbal short term memory dysfunction, 5 performed better in figural than verbal fluency and in 2 language dominance was atypical. These results indicate asymmetric cerebral dysfunction in frontotemporal areas. None had diminished callosal transfer. Three patients with left-sided symptoms had right temporal dysfunction. In all cases, history revealed evidence of mostly early acquired brain injury. We conjecture that conversion symptoms are in fact aggravated residuals of neurological symptoms and conclude that even mild cerebral affections heighten the risk to develop "conversion" symptoms.

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J. VASTERLING, L. DUKE, H. TOMLIN, K. BRAILEY, & E. KAPLAN. Global–Local Visual Processing in PTSD.

A growing literature on hemispheric specialization of emotion has suggested hemispheric asymmetries in anxiety. Although cognitive deficits have been documented in posttraumatic stress disorder (PTSD), the degree to which these deficits reflect relative right or left hemisphere dysfunction has received little attention. The purpose of this study was to assess hemispheric-specific dysfunction in PTSD on a behavioral task. Twenty-eight PTSD-diagnosed and 14 psychopathology-free male Vietnam veterans were administered a computerized global local visual task modeled after Fileteo et al. Eight stimuli used in 128 trails were created by

hierarchical combination of the numerals, "1" and "2" (targets), and "3" and "4" (distractors). Subjects were asked to respond by button press as quickly as possible if they observed targets at either the global or local level. Smaller reaction times (RTs) to local targets suggest greater attentional bias to local features and relative activation of the left hemisphere; smaller RTs to global targets suggest greater attention to global features and relative activation of the right hemisphere. Results revealed that the two groups failed to differ in mean RTs to local or global targets. However, RTs to local targets were positively correlated with higher levels of anxiety ($r = .34$, $p = .03$) and stressor severity, as measured by combat exposure ($r = .42$, $p = .008$), suggesting lower levels of left hemisphere activation in high anxious, high exposure subjects. These results provide partial support for the hypothesis that anxiety may be associated with hypoactivation of the left hemisphere.

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D. RODRIQUEZ-SALGADO, M. RODRIQUEZ-ALVAREZ, & E. VÁZQUEZ-JUSTO. Characteristics of Neuropsychologically Impaired Asymptomatic HIV-Seropositives.

Since only a portion of asymptomatic HIV-seropositives show neuropsychological impairment, it is important to ascertain their specific characteristics. It would help to determine factors increasing the risk of developing neuropsychological impairment in early HIV infection. In this way, the objective of this study was to evaluate sociodemographic and clinical characteristics of asymptomatic drug users with neuropsychological impairment. Study population ($n = 54$) included two groups of asymptomatic seropositive drug users: abstinent asymptomatic seropositives, and methadone-maintained asymptomatic seropositives. Our previous data showed that methadone patients are at more risk than recovered drug users to develop neuropsychological impairment, so we took it into account. All subjects were classified as neuropsychological impaired or not impaired with regard to their performance in a comprehensive neuropsychological battery. Sociodemographic and clinical differences between impaired and not impaired seropositives were analyzed in the two groups. Data analysis and obtained results allow us to conclude that in asymptomatic drug users a low educational level is associated with neuropsychological impairment, independent of current drug use; however factors such as less cognitive reserve and worse HIV clinical parameters are associated with neuropsychological impairment only in the case of methadone-maintained seropositives. These data suggest that characteristics of neuropsychologically impaired asymptomatic seropositive drug users are different depending on if they are recovered or not. Methadone asymptomatics show more factors associated to neuropsychological impairment development.

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E.L. RYAN & S. MORGELLO Neuropsychological Deficits Among HIV Neuropathologic Groups.

We examined the neuropsychological profiles of HIV-infected adults ($N = 21$) grouped by neuropathologic diagnosis. Data was obtained from the Manhattan HIV Brain Bank, a repository of nervous system tissue also with antemortem neuropsychological evaluations. Retrospective analysis of autopsy data from 21 seropositives yielded three neuropathologic groups: infectious disease ($N = 5$), hepatic process ($N = 8$), or normal ($N = 8$). We examined group differences in the neuropsychologic domains of psychomotor speed, working memory, verbal memory, and executive functioning. There were no significant differences in the summary scores for these domains. On individual tests the hepatic encephalopathic group was slower on Trails B ($p < .05$) and there was a trend towards slower performance on Trails A ($p < .07$). Worse performance on verbal memory, motor functioning, and working memory tasks were also observed however, differences were not significant. This pilot data suggests seropositive individuals with coinfection may have more compromised neuropsychological functioning. We plan to examine histologic differences between the groups and will present these findings as well neuropsychiatric data at conference time.

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E. LOJEK & R.A. BORNSTEIN. Quality of Life in HIV+ Men With Different Neuropsychological Performance.

Although there is increasing evidence that HIV-related neuropsychological (NP) dysfunction significantly affects day-to-day functioning, the relationship between specific patterns of NP performance and different dimensions of quality of life has not been systematically studied. Two hundred seven HIV+ participants and 77 HIV− controls completed assessment on a comprehensive NP battery and The Sickness Impact Profile (SIP) as a measure of everyday functioning. Cluster analysis was used to divide HIV+ subjects regarding specific patterns of their NP functioning. Five profiles of NP were obtained: (1) no cognitive deficits, (2) learning and memory dysfunction, (3) slowness of psychomotor processes, (4) impairment of abstract thinking, (5) concurrence of various neuropsychological dysfunction. The most severe NP changes were marked in HIV+ subjects characterized by the profiles Number 1, 3 and 5. The research confirmed the connection between neuropsychological functions and the quality of life of people infected with HIV. The most serious problems with managing in everyday life were observed in HIV+ clusters with intense cognitive dysfunction. HIV-positive men who were not neuropsychologically different from HIV-seronegative men also did not display any dysfunction in their everyday lives. The weakening of cognitive abilities reduces the efficiency mostly at one's job, but it also involves difficulties with concentration in everyday life, poorer efficiency in psychosocial functioning, sleeping problems and weariness. The factors that significantly influence future quality of everyday life in HIV-infected people were as follows: the level of overall neuropsychological impairment, speed of information processing, spatial abilities and categorical thinking.

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T. FERNANDES, L. FARRAJOTA, & I. PAVÃO MARTINS. The Case of N.B.B.—A Peculiar Case of Anomic Aphasia.

Background: Many anomic patients present semantic and/or phonological errors in oral production, which can be explained as deficits at semantic and/or lexical storages. *Case report:* N.B.B., a man 56 years old has an anomic aphasia as a result of a left corticosubcortical temporal lesion due to a viral encephalitis. *Neuropsychological assessment:* N.B.B. has fluent speech with anomic pauses and circumlocutions, with normal articulation and prosody. On the Lisbon Aphasia Battery, N.B.B. presented a poor performance on naming by visual confrontation task, although he correctly identified all the objects by name. Repetition of words and nonwords was normal. Performance on the Token Test was below normal range. Remarkably, on Snodgrass and Vanderwart Naming Test, N.B.B. produced a high proportion of semantic errors (which were rarely observed on his spontaneous speech or other language tasks). Errors were produced in all semantic categories tested (e.g., animals, objects, clothes, tools). *Conclusion:* The case of N.B.B. demonstrates the potential contribute of William Levelt's model of speech production for the comprehension of N.B.B. performance pattern on language tasks. We suggest that the semantic errors produced by N.B.B. seem to demonstrate that the deficit is at the lemma stratum, or at word form stratum or even on the connections of both levels of lexical access.

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M.M. SITSKOORN, M.E. SALDEN, J. NUYEN, A. JENNEKENS, O. ZILCH, & P.F. VOS. Cognitive Effects of Daily Hemodialysis as Compared to Standard 3 Times Weekly Dialysis.

Background: Chronic renal failure leads to cognitive impairment. Although hemodialysis might have beneficial effects on cognitive function-

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ing. deficits in mental processing and concentration seem to persist. Daily hemodialysis (DHD) reduces peripheral vascular resistance as compared to standard 3 times weekly dialysis (SHD). This might be the result of decreased sympathetic activity. Decreased sympathetic activity may lead to better cerebral tissue perfusion, which in turn might benefit cognitive functioning. Aim of the present study was to investigate the effects of DHD on cognitive functioning. It is hypothesized the DHD patients will show an improvement in cognitive functioning as compared to SHD patients. *Method and analyses:* DHD patients ($N = 10$) were administered a comprehensive testbattery (1) before, (2) after 6 months on DHD, (3) after reinstitution of SHD. SHD patients ($N = 9$) were also evaluated 3 times. All test scores were rescaled to z scores and reduced into four functional domain scores: information processing, memory, executive functioning, and attention. Repeated measures analyses with one between-subjects factor (group) and one within-subjects factor (domain score) were used to examine the domain scores over time for the experimental and control groups. *Results:* Analyses revealed a nonsignificant *Group* × *Domain Score* interaction for each of the four functional domains. *Conclusion:* The trend over time of scores on the functional domains was the same for both groups. Our findings do not support the hypothesis of an improvement in cognitive functioning in DHD patients as compared to SHD patients.
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R. PORTIN, H. HELENIUS, M. NURMI, H. BACKMAN, L.-M. PARVINEN, L. LEMPAINEN, & E. SALMINEN. Effects of Androgen Deprivation Therapy on Cognition in Prostate Cancer.
The objective of the study was to evaluate short-term effects of androgen deprivation therapy on cognitive performances in patients with prostate cancer (PC, *M* age 66 years). Twenty-five patients received antiandrogen therapy (HT), starting prior to radical radiotherapy (RT) and continuing up to 12 months after RT, while 24 patients only received RT. The criteria for adjuvant hormonal treatment were grade >2, Gleason >5, PSA>20. Cognitive testing was performed at baseline and 6 months after therapy. Fifty-two healthy men were studied at baseline as a control group. Verbal, visuomotor and memory tests, and Beck depression scale were administered. Attentional performances were examined using CogniSpeed© software. At baseline, the HT group performed at a lower level than controls and the RT group in word list learning ($p = .033$), copying figures ($p < .001$), and in a vigilance task ($p < .001$). Further, the HT group performed more poorly than controls in Digit Span ($p = .008$), Digit Symbol ($p = .009$), word fluency ($p = .016$), and in a reaction time task of attention and working memory (for speed, $p = .033$; for errors, $p = .015$). At 6-month follow-up, there were no differences in cognitive performances between the treatment groups, when the effects of age, education and disease-related factors were controlled for. However, there was a slight tendency of improvement in the HT group in some cognitive measures. Thus, androgen deprivation or curative radiotherapy were not likely to disturb cognitive functioning. Cognitive deficits found were associated with disease severity rather than with treatment-related factors.
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K. PEACE, J. FREEMAN, D. PEREZ, & G. TRIPP. Long-Term Effects of Adjuvant Chemotherapy on Cognitive Functioning.
Research by the present authors has shown that while undergoing adjuvant chemotherapy, patients with breast or bowel cancer suffer impaired performance on tests of working memory, attention, speed of information processing and verbal fluency compared to both healthy and cancer controls. These impairments were not due to the effects of anxiety or depression. The current study has used a prospective design to determine the long-term effects of adjuvant chemotherapy by assessing the same chemotherapy patients and cancer control patients 6 months after chemotherapy finished (or at a comparable interval following initial assessment in the case of the controls). Preliminary data from this follow-up study will be presented to demonstrate the long-term effects of adjuvant chemotherapy on cognitive functioning.
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C. ANDERSON-HANLEY, M. SHERMAN, R. RIGGS, & B. COMPAS. Cognitive Effects of Systemic Treatments for Cancer: A Meta-Analysis.
A meta-analysis was conducting using the data from 24 independent samples examining the possible cognitive effects of systemic treatment for cancer. Effect sizes ($n = 144$) were extracted across seven cognitive domains: attention, information processing, verbal memory, visuo-spatial memory, visuo-spatial skill, executive function, and psychomotor skill. *Results:* Varied results have been reported in the medical and psychological literatures using 3 primary means of evaluating impact: (1) post-treatment performance *vs.* normative data; (2) post-treatment performance *vs.* controls; and (3) pre- *vs.* post-treatment performance. Despite variability in method of evaluation, there are some notable consistencies. Fifteen out of the 21 comparisons were significant (across 7 cognitive domains and 3 methods of evaluation). All 21 averaged effect sizes suggested decrements in functioning regardless of domain or type of comparison (e.g., with self, control or norms). Significant effect sizes were found for all three modes of evaluation for information processing (wt'd $d = -.46$ to $-.69$) and executive functioning (wt'd $d = -.38$ to $-.94$). *Conclusions:* Despite variability in method of analyzing effects of cancer treatments, this study suggests some consistent effects (information processing and executive functioning decrements). Additional factors may be contributing and warrant further research (e.g., site of cancer, type/duration of treatment, etc.). It is premature to conclude that systemic treatments will uniformly produce cognitive decline. It is clear that more well-controlled research is needed to clarify for whom, when, and under what conditions cognitive changes will most likely accompany systemic treatments so that patients and their providers can make informed choices.
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K. DIETRICH & M.D. RIS. Early Exposure to Lead and Juvenile Delinquency.
Cross-sectional studies have reported an association between lead levels in bone and delinquent behavior in later childhood and adolescence. The adolescent follow-up of the Cincinnati Lead Study (CLS) is the first prospective longitudinal study of lead and child development to address this question with comprehensive assessments of toxicant exposure and other developmental cofactors. A birth cohort of 195 urban, inner-city adolescents recruited between 1979 and 1985 were examined. Prenatal exposure was significantly associated with covariate-adjusted increase in frequency of parent-report delinquent and antisocial behaviors. Both prenatal and postnatal exposure was significantly associated with increased self-report delinquent and antisocial behaviors, as well as marijuana use. This study thus confirms earlier clinical observations and recent retrospective studies linking lead exposure to antisocial behavior in children and adolescents. As such, lead seems to play a measurable role in the epigenesis of behavior problems independent of other social and biomedical cofactors. We have recently embarked on a study of antisocial and criminal behaviors in this cohort, now in early adulthood, and this methodology will be reviewed.
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P. RAPELI, R. KIVISAARI, H. KALSKA, S. KÄHKÖNEN, V. PUSKARI, & T. AUTTI. Cognitive Functions in Previous Amphetamine Addicts.
Specific cognitive deficits are postulated to raise vulnerability to drug addiction. Cognitive deficits may also interfere with transition from addiction to abstinence. However, few studies have been made about cognitive functions of previously drug-addicted persons. In this ongoing study

cognitive functions of previous amphetamine addicts as well as age, sex and premorbid IQ matched controls are studied. The duration of abstinence in a previously addicted group is at least 2 years. The cognitive measures include attention, memory, intelligence and executive function tests. The cognitive measures are combined with magneto-encephalographic, evoked potential and brain volumetric measures. A thorough addiction history as well as psychiatric evaluation of lifetime psychiatric comorbidity is available. Preliminary results of cognitive measures show difference between groups only in delayed logical memory where ex-amphetamine addicts recall fewer items. Brain images show differences between the groups in vermis of cerebellum and possibly in prefrontal cortex. More detailed results will be presented in the poster session. The results will be discussed according to the hypotheses of premorbid deficits cognitive deficits and cognitive compensation. The implications of the results to the research of neural plasticity will also be discussed.
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A.R. GIOVAGNOLI, F. VILLANI, R. MENESES, A. BRAMBILLA, & O. BUGIANI. Graphic Initiative and Frontal Lobe Function.
Initiative is often impaired in subjects with frontal lobe damage, as reflected by a reduced ability to start verbal expressions and movements. Although the creation of original designs depends on initiative, this performance might also reflect constructive praxis, visual perception, and executive abilities, which are distributed throughout the cerebral cortex. This study evaluated graphic initiative in patients with focal brain dysfunction aiming (1) to compare frontal lobe patients with temporal lobe patients and healthy subjects, (2) to explore the relation of graphic initiative to visual-constructive and executive abilities (as expressed by Rey's complex figure copying, card sorting, and word fluency). Thirty-two patients with left ($n = 17$) or right frontal lobe epilepsy (FLE; $n = 15$), 74 patients with left ($n = 42$) or right temporal lobe epilepsy (TLE; $n = 32$), and 38 healthy controls underwent a graphic test constituted by a free and a fixed condition. For each condition the number of correct nonperseverative designs was calculated. ANOVA showed significant between-group differences in the number of correct designs ($p < .0001$), and *post-hoc t* statistics revealed that FLE patients were impaired compared to TLE patients and controls. Correlation, regression, and factor analyses did not show any association of graphic initiative scores with sorting or visual–constructive scores. The results of this study support the view that frontal lobe dysfunction associated with partial epilepsy play a role in nonverbal initiative impairment. Furthermore, the dissociation of design creation from other neuropsychological performance suggests that a graphic task may provide a sensitive index of initiative.
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B.B. MATHIESEN. Personality Disorder and Prefrontal Brain Injury.
Brain injured patients may suffer from "organic personality syndrome" or a change of personality, as it has been described in DSM–III–R and DSM–IV. It has also been suggested that a subgroup of borderline personality disorders (BPD—equivalent to the diagnosis of "unstable personality disorder" in DSM–III) has an organic etiology, and these patients suffer from executive dysfunctions. The aim of the present study was to assess individuals with personality change as the primary symptom after brain injury, testing the hypothesis of a relationship between prefrontal brain injury and (organic) personality disorder. The Karolinska Psychodynamic Profile (KAPP) was applied as an adjunct to the neuropsychological assessment of both basal cognitive and advanced executive functions. Participants were 13 individuals with prefrontal brain injuries due to head trauma, subarachnoid hemorrhage, or abscess. Comparing the brain injury group to 65 normals (brain healthy ulcerative colitis patients) KAPP results supported the hypothesis: disturbance of prefrontal functional systems caused by brain injury may disturb the integrative functions and affect regulation of the self. This was manifested in object relations, in social interaction and interpersonal relations. It is necessary to underline that neither neuropsychological nor personality related assessment may stand alone, as there were large individual differences: some patients only had personality related difficulties, some only had cognitive or executive dysfunctions, and some suffered from both. Furthermore, the specific differences between the symptoms and personality structure of brain injured patients and those with personality disorders of developmental etiology is yet to be scrutinized.
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J.-F. CANTIN, C. BÉLAND, N. BÉLANGER, M.-E. BOUCHARD, M. FORTIER, & M. PÉPIN. Persistent Symptoms Following Mild Head Injury: Expectation as Etiology.
The causes of persistent postconcussive syndrome (PCS) and the factors that maintain it remain controversial. Although the initial cause of PCS may be physiological, psychological factors appear to play a role in its maintenance. Past research has suggested that expectations may form the potential basis for a psychological process that contributes to the persistence of the postconcussion symptoms. Mild head injury (MHI) may activate commonly held expectations about the symptoms of head trauma. Expectations would produce selective attention to these symptoms following injury. Because many postconcussion symptoms occur normally as a result of everyday stress, a cyclical symptom–expectation–stress–reactivity reinforcement pattern results and may serve to maintain PCS symptoms. The purpose of this study is to examine the role of the expectations in the symptom report of patients with persistent PCS and without persistent PCS following MHI. Sixty participants will complete the Rivermead Postconcussion Symptoms Questionnaire (RPSQ) under two or three conditions. Normal controls will report current symptoms and symptoms expected 1 week and 6 months following a hypothetical MHI. The group of head injured participants with persistent PCS and the group of participants without persistent PCS will report current symptoms and retrospective symptoms (prior to the injury). We expect that the control group will endorse more symptoms one week after the simulating MHI than 6 months later. We also expect that the group of participants with persistent PCS will endorse fewer retrospective symptoms than the participants without persistent symptoms.
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J.-F. CANTIN & M. PÉPIN. Predictors of Persistent Postconcussive Syndrome After Mild Traumatic Brain Injury.
The origins of persistent postconcussive symptoms following mild traumatic brain injury (TBI) are still controversial. The present study aims to investigate outcome in adults with mild TBI at 1 week and 3 months postinjury and to identify factors associated with persisting problems. This study also aims to avoid some of the confounding issues from earlier studies by using two comparison groups. Fifty participants will be evaluated during the first week following mild TBI. From these participants, two groups will be formed: a group of participants with persistent postconcussive symptoms and a group of participants without persistent postconcussive symptoms. In order to avoid potential bias, two control group ($N = 25$) will also be evaluated: a group of participants with minor injuries not involving the head and a group of healthy participants. At 1 week post injury, the participants will complete the Rivermead postconcussion symptoms questionnaire and the Holmes-Rahe Survey of Recent Experiences to measure symptoms associated with the injury and concurrent life stressors respectively. Neuropsychological measure of attention, speed of information processing, and working memory will include the Stroop Color, and Word Test, the Consonant Trigrams Test, the Trail Making A and B and the WAIS–III Substitution subtest. At 3 months post injury all these measures will be repeated. The Rivermead head-injury follow-up questionnaire will also be administered to investigate the impact of the injury upon the outcomes. We expect that a combination of emotional, neuropsychological, and organic factors may significantly aid the prediction of persistent postconcussive syndrome.
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M.-S. HUA, P.-K. YIP, Y.-L. CHANG, AND C.-Y. WANG. Delusional Misidentification and Posttraumatic Brain Injury.

Misidentifications of place and time have been recognized as a cardinal feature of organic mental syndromes. Likewise, a misidentification of persons, such as the Capgras and the Fregoli syndrome has also been thought to be as a result of neurological diseases though it has traditionally been related to psychiatric illness. In the literature, most of the researchers attributed misidentification problems to memory, visuoperceptual, or executive dysfunction. In the present study, we examined the neuropsychological function of a female adult patient with traumatic brain injury, and she has persistently manifested misidentification problems without duplication symptoms. Meanwhile, we further made an attempt to explore the possible underlying neuropsychological mechanisms of misidentification problems. The results revealed multiple cognitive deficits, including anterograde and retrograde amnesia, executive dysfunction, a significant deterioration of verbal-conceptual intellectual functioning, and defects of visuoperception and manual dexterity. Misidentifications of time, place, person, and event, as well as remarkably psychopathological manifestations including irritability, jocularity, childishness, a loss of patience, and confabulation were evident. The patient, however, denied any cognitive, emotional, personality, and misidentification problems. On the follow-up, cognitive deficits, with the exception of visuospatial perception, was persistent compared with the initial examining results, and so were misidentification and psychopathological manifestations. On the basis of these findings, we thus suggest that temporal sequencing, and awareness deficits might contribute to the patient's delusional misidentification.

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R.F. KAPLAN, M.C. STEVENS, S. TARTAR, & M. LISS. A Case of Capgras Syndrome With Normal Face Perception.

Capgras syndrome (CS) is a disorder in which the patient incorrectly identifies a person, usually a family member, as an imposter. CS has been associated with impaired visual perception, particularly face recognition. We describe a case of a 77-year-old man with no prior psychiatric history, who believed his wife of 51 years to be an imposter. The misidentification occurred 6 months after a mild head injury (small laceration above the left eye, no LOC, no PTA, GCS = 15). He was noted to have cognitive decline prior to the injury. Afterwards, his wife described him as more passive, with slowed thinking, less motivation, increased memory loss, but without misidentification tendencies. Five months later, he was diagnosed with myasthenia gravis. The symptoms improved with Prednisone (60 mg) and Mestinon. He then suddenly developed the belief that other women were impersonating his wife. He did not misidentify other family members. An MRI revealed multifocal deep white matter disease, especially in the parietal and frontal lobes, but no focal abnormalities. Neuropsychological testing (Repeatable Battery for the Assessment of Neuropsychological Status), showed impaired functioning (<5th percentile) in Attention, Immediate Memory, Delayed Memory and Language, with a low average (14th percentile) Visuospatial/Constructional performance. Performances on Benton's face and form recognition tests were likewise within normal limits. These data suggest that CS can result from a combination of brain insults with different etiologies in the presence of normal visual perception.

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T. ANDERSON & H. GODFREY. Traumatic Brain Injury and Fractionation of Working Memory Executive Abilities.

Baddeley's model of working memory includes a "central executive" that works to facilitate interaction between the various working memory subsystems. Poorly co-ordinated social and cognitive performance commonly observed following a traumatic brain injury suggests a "central executive" deficit may play a role in this behavior. Researchers applying traditional tests of executive ability to social and cognitive outcome following injury have observed modest correlations. The strength of this relationship may be due to the poorly defined nature of the "central executive" and its subsequent assessment. Baddeley recently proposed fractionating the "central executive" into various sub-functions such as co-ordination, purposeful ongoing generation, and inhibition of information. Consequently tests designed to assess Baddeley's proposed separable functions were generated and have been utilized successfully with predominately homogeneous samples of brain injured individuals. Provisional results from an ongoing study of 42 traumatically brain-injured adults and 21 matched controls that completed a two session interview and test battery are presented. The sessions collate information about disability level, social integration, and employability following an injury. The presence of language deficits and dysexecutive behavior is assessed in session and qualified by a nominated close friend or relative of the participant. Cognitive functioning is assessed using traditional tests of intelligence and executive ability as well newer, more specialized, working memory tests. Comments on the predictive potential of a fractionated approach to executive ability with more a heterogeneous traumatically brain-injured sample conclude.

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H. WESTERBERG, H. FORSSBERG, & T. KLINGBERG. Working Memory Training After Brain Injury: Effects on Brain Activation and Cognition.

Working memory (WM) is the ability to hold and manipulate information for short periods of time. WM is closely associated with attention. Injuries affect the central nervous system (CNS) in different ways, almost always causing deficits in attention. Since the ability to pay attention enhances the result of all other rehabilitation, it is a critical issue. We hypothesized that attention could be enhanced with a method of intense and adaptive WM training. We developed a computerized training program which targets different modalities of WM. Here we present the results of WM training for a single male subject (aged 29 years) who suffered severe prefrontal brain injury (Glascow Coma Scale <7) 12 months before commencing training. The injury affected the right caudate nucleus and the surrounding white matter tracts. Compared to a placebo group (n = 7), statistically significant training effects were found for example on Corsi block tapping, Stroop and Raven tests, all of which are known to rely on the prefrontal cortex. To compare brain activity pre- and post training we used functional magnetic resonance imaging (fMRI) during performance of a visuospatial WM task. The analysis of this data showed that training resulted in an increased prefrontal activity of the injured hemisphere.

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A. COLLIE, D.G. DARBY, M.G. FALLETI, M. KOLTA & P. MARUFF. Head Injury, Alcohol, Fatigue and Performance Impairment.

Background: Mild cognitive impairments occur following concussion, however the measures used to communicate the magnitude of these impairments are arbitrary and generally meaningless to individuals without knowledge of psychological testing. We compared directly the magnitude of the cognitive impairment following concussion with that occurring in alcohol and fatigue affected individuals. *Methods:* A brief (15 min) computerized test battery assessing multiple cognitive domains (CogState™) was administered to 15 sportspeople 2 days post head injury, 40 matched control subjects with Blood Alcohol Concentrations (BACs) of 0.05% and 0.10%, and to the same control subjects over 24 hr of sustained wakefulness. The magnitude of cognitive impairments were determined by comparing post-concussion, alcohol or fatigue results to baseline data recorded at earlier assessments. *Results:* Psychomotor impairments following concussion were of equivalent magnitude to those detected in individuals with

a BAC of 0.05% and after 22 hr of sustained wakefulness. However, fatigue and alcohol affected individuals displayed a more global pattern of performance impairment than head injured individuals. *Conclusions:* Cognitive deficits following head injury are of equivalent magnitude to those occurring at a BAC equivalent to the legal Australian driving limit. The severity of cognitive impairment in the days following head injury are easily communicated using BAC or hours of sustained wakefulness as a reference point.

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P. KULISTAK, V. MATECHA, K. KUPKA, & M. KUBICEK. Long-Term Development of rCBF (SPECT) in Cerebellum Lesion: Single-Case Study.

The case study shows longitudinal investigation (7 years) of a young man (24 years old), who suffered from bleeding into the right cerebellum hemisphere. Haematoma was removed together with a major part of vermis. The mans subsequent defect be seen in ipsilateral motoric impairment. As a result of crossed cerebellum–cerebral diaschisis deficiency cognitive functions occurred as well, in which a substantial role of the right cerebellum is assumed. In the course of intensive motoric and cognitive rehabilitation, the patient was controlled by neuropsychologist and SPECT. On the contrary to literary indicated definitive improvement of rCBF conditions in brain except irreversible changes in neurons at the position of original lesion—in this case some symptoms of "CBF restructuring" within entire brain were occurring during the 7-year follow-up. This process is explained as evidence of various types of diaschises, resulting from a loss of exciting (or inhibiting) afferents, and effecting the tissue, a structure of which was not damaged. Our longitudinal control of a single case shows a complex phenomena in continuous restructuring of brain metabolism, which runs simultaneously with continuous improvement of the cognitive functions or even after normalization of them. The above described phenomena can be also associated with an important adapting plasticity of brain initiated by a lesion; an occurrence of it, course and result have not been fully explained so far.

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G. NYS, G. HUMPHREYS, & M. RIDDOCH. Neuropsychological Evidence From 'Anti-Extinction.'

Many patients manifest extinction following a unilateral brain lesion. In the current study, we report the phenomenon of 'anti-extinction,' which is the opposite of extinction. Anti-extinction occurs when a patient is unable to discriminate a contralesional stimulus presented in isolation but is able to report the same stimulus when an ipsilesional item appears simultaneously. This phenomenon is not compatible with recent attentional competition theories. In order to provide an explanation for the 'anti-extinction' effect, we conducted 3 experiments on G.K. a patient with bilateral parietal lesions following two consecutive strokes who shows this phenomenon. In the first experiment, we examined how G.K.'s identification performance varied as a function of the exposure duration of the stimuli. We found anti-extinction with brief exposures (less than 300 ms) of stimuli defined by onsets, which turned to extinction as the stimulus duration increased (more than 600 ms). We did not find this effect with offset stimuli. In the second experiment, we demonstrated that the anti-extinction effect is not due to spreading attention or to increased arousal, but rather to temporal grouping of onsets of stimuli (i.e., in both hemifields). Experiment 3 assessed whether G.K. was aware when stimuli onset together, and showed a dissociation between perceptual identification and G.K.'s conscious judgements of temporal order (he showed a strong effect of 'prior entry' of the right stimulus). We suggest that an explanation in terms of unconscious transient (short lasting) binding between stimuli with synchronous onsets might explain 'anti-extinction.'

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M. PREISS, V. BENES, J. KLOSE, & J. KOBLIHOVA. Cognitive Deficits and Personality in Patients After Subarachnoid Hemorrhage.

Recently the rapid advancement of endovascular techniques can be seen. Endovascular approach is becoming routine and aneurysmal treatment is slowly shifted from the hands of neurosurgeons to the hands of interventional radiologists. Until recently, there is not a single article focused on psychological consequences of AN coiling. Neuropsychological and personality testing of patients who had undergone operation for subarachnoid hemorrhage (SAH) due to aneurysm was performed in prospective, nonrandomized study, 1 month and 1 year after operation. Type of operation (clipping and coiling) and other neurological variables (Hunt and Hess Grade, Fischer Grade, Timing of intervention, AN localization, periinterventional complications, neurological picture and others) were compared with neuropsychological and personality variables and quality of life. WAIS–III, Trial Making Test, FAS (verbal fluency test), Beck Depression Inventory, Cloninger's Temperament and Character Inventory, SQALA (quality of life), Czech version of Auditory Verbal Learning Test, Subjective Memory Scale and NEO–FFI were used. The results and differences between psychological consequences of clipping and coiling are discussed.

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T.F. BERGQUIST, J.A. TESTA, M. OAK, & J.F. MALEC. Differences in Incidence of Memory Intrusion Errors in Patients With ACoA Aneurysm *Versus* TBI.

Intrusion errors on memory tests reflect an inability to inhibit already processed and irrelevant information. Such errors are thought to reflect a combination of memory deficits and executive dysfunction. These types of memory errors occur following traumatic brain injuries (TBI), dementing conditions such as Alzheimer's disease, and strokes. Patients with anterior communicating artery (ACoA) aneurysms exhibit problems with amnesia, confabulation, intrusions, and proactive interference along with personality changes. In patients with ACoA aneurysms, neuropsychological studies indicate specific problems with delayed memory and tests of executive function. The incidence of memory deficits with TBI varies according to the location and type of injury. While memory deficits in both diffuse TBI and ACoA are fairly common, we hypothesized that intrusion errors would likely be more common in the ACoA population. To directly examine this possibility, 33 patients (21 with TBI and 12 with ACoA, matched for age and education) referred to a post-acute brain injury rehabilitation program for evaluation were included in this study. Patients with missing data were excluded. All individuals underwent a comprehensive neuropsychological assessment. Performances on measures of overall cognitive function do not differ between the two groups. The groups differ in VSLT error score ($p = .04$) and with a trend towards significance in AVLT error score ($p = .07$), while overall memory test performance are comparable between groups. These findings support the hypothesis that the memory deficits following ACoA aneurysms differ qualitatively from those in diffuse TBI, and are consistent with greater executive dysfunction.

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G. STEIGER-BAECHLER, A.U. MONSCH, & H.B. STÄHELIN. Mild Cognitive Impairment Due to Vascular Lesions (Vascular-MCI): A Pilot Study.

A high percentage of MCI patients will convert to Alzheimer's disease, others do not decline at all, or may develop another form of dementia. Vascular dementia might also be antedated by symptoms which do not yet fulfill diagnostic criteria of dementia. The current pilot study aimed at elucidating a characteristic memory impairment profile in patients with MCI due to vascular lesions (Vascular-MCI). Eight MCI patients (4 f, 4 m; age = 74.3 ± 4.2, range = 67–79; education = 14.9 ± 4.3) evidenced significant cortical and/or subcortical infarctions on MRI and were diag-

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nosed as Vascular-MCI. Thirty-seven patients (8 f, 29 m; age 70.5 ± 7.3, range = 57–82; education = 14.4 ± 3.1) showed no vascular lesions and were diagnosed as Degenerative-MCI. Diagnosis for MCI was established with the NYU-Paragraph Recall Test and a stage of 0.5 on the Clinical Dementia Rating. For comparison purposes 30 early Alzheimer's disease patients (18 f, 12 m; age = 78.2 ± 6.1, range = 57–88; education = 11.8 ± 2.8; MMSE = 25.5 ± 2.1) were included. All patients were administered a German version of the California Verbal Learning Test (CVLT). We analyzed CVLT recall measures and recognition discriminability using demographically adjusted Z scores. Vascular-MCI and Degenerative-MCI performances were statistically not different on the recall measures, however, Vascular-MCI patients performed significantly worse than Degenerative-MCI patients on recognition discriminability ($p < .05$). Although AD patients performed worse on all CVLT measures, the pattern of performance of Degenerative-MCI and AD patients was strikingly similar and differed from the pattern found in Vascular-MCI. In our pilot study we found different CVLT profiles between Degenerative-MCI and Vascular-MCI patients. As of today it seems that Vascular-MCI is characterized by a more severe storage deficit in comparison to Degenerative-MCI.

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C. LAFOSSE, M. TROCH, L. VERCRUYSSE, & E. VANDENBUSSCHE. Pusher Syndrome: Evidence for a Disturbed Postural Body Scheme.

Introduction: Some stroke patients show a striking group of symptoms characterized by a postural imbalance due to a typical "pushing away" of the body towards the contralesional (often hemiplegic) side of space. We investigated whether patients with a pusher syndrome will demonstrate a specific altered postural body scheme. *Method:* Based on the six conventional subtests of the Behavioral Inattention Test and based on the Pusher Scale, 53 subjects were classified in five groups: 10 normal subjects, 12 patients without neglect, 12 patients with a mild neglect, 10 patients with a severe neglect, and 9 right brain damaged patients with a severe neglect and contraversive pushing. All subjects have a normal weight bearing in sit and can hold normal balance. In all subjects, we systematically investigated four coordinates of the body-centered representation of space: the subjective postural vertical, the subjective straight ahead, and the location and lateral limits of stability of the center of gravity using posturography. *Results:* We noticed an increased severity of spatial hemineglect, seen in the pusher syndrome, resulting in a decreased sensitivity to the gravitational verticality with a directional bias in the misperception of the origin of the spatial body axis. *Discussion:* Our results suggest that the patients with the pusher syndrome tried to realign their body's center of gravity with their pathologically perceived postural vertical. This indicates that the underlying cause of the pusher syndrome is an altered perception of the postural body scheme in gravitational space.

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J. FONSECA & A. CASTRO-CALDAS. The Knowledge of Reading and Writing Rules Influences Aphasia Outcome.

Background: Learning to read and to write in childhood influences cognitive processing and particularly language. The main different features between illiterate and literate subjects, reported in the literature, concern (1) concrete versus abstract thought; (2) phonemic difficulties in word repetition or in literal fluency; (3) perception/interpretation of photos, images and drawings. There are a great number of studies, reported in the literature, about the influence of several variables in the aphasia recovery. Education has not been considered of crucial importance or even forgotten. *Objectives:* The purpose of this study is to know if illiteracy may be a significant variable to the aphasia outcome. *Method:* We compared two groups of aphasic subjects: 24 illiterate and 42 literate. All the subjects were evaluated in the 1st month and 6th post stroke. Outcomes were compared. *Results:* The study didn't show significant differences among the two groups concerning the recovery of the language capacities. Nevertheless the correlation of the different language skills showed an important difference between the two groups. *Conclusions:* Language is processed in a modular way and learning to write and to read allows a larger plasticity of the cognitive strategies.

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A. BERG, H. PALOMÄKI, & M. KASTE. Depression Among Caregivers of Stroke Survivors: Stroke Related Factors.

Purpose: We aimed to determine if there are stroke related factors that associate and predict depression among caregivers of stroke survivors. *Methods:* We studied 100 patients in Helsinki University Central Hospital after their first ischemic stroke. The group consisted of 68 men and 32 women, aged 27–70 years. Thirty-eight of the patients had right hemisphere infarct, 42 a left hemisphere infarct, and 20 had infarct in the brainstem region. Stroke severity was measured with Scandinavian Stroke Scale (SSS) and depression with Beck Depression Inventory (BDI). Caregivers of the patients fulfilled their own BDI. Both patients and caregivers were studied at acute phase, at 6 months, and at 18 months. *Results:* 30–33% of the caregivers scored 10 points or more at each time. Stroke severity correlated with caregiver depression at acute phase (Spearman $r = -0.27, p < .01$), at 6 months and at 18 months ($r = -0.23, p < .05$). Caregiver depression was not associated with lesion location. Patient age tended to correlate with caregiver depression at 18 months, but it did not reach significance ($r = .20, p < .08$). Caregiver depression associated with patient depression at 18 months ($r = 0.31$, $p < .01$). *Conclusion:* The mood problems of caregivers are frequent and they should be taken into account in the rehabilitation of stroke survivors. Stroke severity is an important determinant of caregiver depression. The associates of caregiver depression are discussed.

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Invited Lecture/9:00–9:45 a.m.

EPISODIC MEMORY, YESTERDAY AND TODAY

Endel Tulving

Invited Lecture/10:00–10:45 a.m.

HOW DOES THE BRAIN REPRESENT TIME?

Stephen Rao

Invited Lecture/11:15 a.m.–12:00 p.m.

THE COMPETITION OF CORTICAL SPACE: TRAINING INDUCED PLASTICITY AND MUSIC

Christo Pantev

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FRIDAY AFTERNOON, JULY 26, 2002

Symposium 3/1:00–2:30 p.m.

NEUROIMAGING OF LANGUAGE AND MUSIC

K. HUGDAHL. Neuroimaging of Language and Music Processing.
Despite all research devoted to how the human brain processes language and music stimuli, there are still several unanswered questions. For example, how do the two hemispheres process speech and music stimuli? What are the basic features of impairment in dyslexia? How does the illiterate brain process semantic input? The present symposium has as one of its aims to present recent neuroimaging (fMRI, PET, ERP, MEG) studies of brain activation in language and music processing, with a special focus on contributions from the Nordic countries. Researchers from the Nordic countries have made significant contributions to both theoretical and methodological developments in functional neuroimaging. This symposium presents five papers on language and music processing. The topics included in the symposium relate to the effects of attention on speech perception, the effects of different dialectical pronunciations of the same speech segment on ERP amplitudes, the effects of illiteracy on brain activation to language stimuli, the use of MEG to record brain activation in dyslexic subjects to auditory stimuli, and how the brain processes music stimuli. The symposium covers all of the major neuroimaging methods and techniques, including fMRI, PET, MEG, and ERP.
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K. HUGDAHL, T. THOMSEN, & L.M. RIMOL. The Effect of Attention on Speech Perception—The "Cocktail Party Phenomenon."
Focusing of attention to a specific speech source plays an important role in everyday speech perception. In the psychological literature this is known as "the cocktail party phenomenon." However, little is known of the neuronal substrates of focused attention in speech perception in particular. Using an event-related fMRI protocol, 3- and 4-letter words and nonwords were randomly presented to the subjects during three different instructional conditions. One condition was passive listening without any specific instructions of focusing of attention. A second condition was attention focused on the words, and a third condition was attention focused on the non-words. Functional MRI was performed with a 1.5 T Siemens Vision Plus scanner. The subjects were 13 healthy adults. During passive listening, there were significant activations bilaterally in the superior temporal gyrus (BA22/42, $Z > 7.59$) and in the right medial temporal gyrus (BA 20/21 and 47, $Z > 5.00$), with a left-sided advantage. The activation on the left side was also more focused to the planum temporale area. Attention focused on either the words or the non-words produced in addition unique significant activations bilaterally in the inferior frontal gyrus (BA 47, $Z > 5.83$), and posteriorly in the medial temporal gyrus (BA 37, $Z > 5.12$). There were no significant differences for activations observed to the words compared to the non-words, neither during passive listening nor during focused attention. It is concluded that attention plays a modulatory role in neuronal activation to speech sounds, producing specific activations that may facilitate speech perception.
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H. NORDBY & I. MOEN. Mismatch Negativity (MMN) to Consonant Sounds Specific to Norwegian Dialects.
MMN is an event-related potential (ERP) component that reflects automatic and pre-attentive processing in audition. MMN is elicited by changes in various auditory stimulus parameters and occurs reliably to changes in speech sounds. The present study investigated cortical ERPs to consonant sounds that were either common or specific to Norwegian dialects by comparing two groups that were either native or foreign to the consonant sounds. The stimuli were spoken consonant vowel syllables, /ta/ and /Ta/, with durations of 173 ms and 164 ms, respectively. The acoustic difference between the syllables is mainly manifested as a slightly longer closing phase during articulation of /t/ than of /T/ which accounts for the difference in duration between the syllables. The syllable common to the dialect groups, /ta/ was presented frequently (.9 probability) while the dialect specific syllable /Ta/ was the infrequent stimulus (.1 probability). The stimuli were presented in a randomized sequence during an ignore condition (finding mismatches between pictures). The infrequent stimulus elicited in both groups a negative wave (Nw) with frontal maximum in the 200–250 ms latency range. The Nw, indicative of MMN, was more pronounced in the native group than in the other especially at right frontal leads (F4). The results indicate that speech sounds are more easily processed if they are part of one's original dialect. This finding also points to the plasticity of the MMN system in that early acoustical exposure tends to tune the sensitivity of the system differentially.
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K.M. PETERSSON, A. REIS, & M. INGVAR. Cognitive Processing in Literate and Illiterate Subjects: Some Recent Behavioral and Functional Neuroimaging Data.
The study of illiterate subjects that for social reasons did not have the opportunity to go to school and receive formal education represents one possibility to study the influence of cultural factors, in particular formal schooling, on cognition and the functional organization of the human brain. This so-called naturally occurring illiteracy may also serve as a model for studying the influence of alphabetic orthography on auditory-spoken language. We will review some recent behavioral and functional neuroimaging data indicating that formal schooling modulates the cognitive system and provides support for the hypothesis that the functional architecture of the brain is influenced by literacy. We indicate that formal schooling has effects in several cognitive domains, more specifically we indicate that both language related and visually related functions are influenced by literacy. We will also point to the importance of using ecologically relevant tasks when comparing the performance of literate and illiterate subjects. In summary, it appears that formal schooling has a significant influence on the functional organization of the human brain.
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H. RENVALL. MEG Studies of Auditory Temporal Processing in Dyslexia.
Dyslexic subjects show, besides reading-related skills, a variety of mild sensory and motor deficits. Recent studies in our laboratory have shown that dyslexic adults are slow in processing of binaural sounds that follow each other in rapid succession in an auditory illusion task as well as sounds of two different frequencies in a pitch streaming task. One possibility is that dyslexic subjects would have a prolonged sensory "input chunk" within which subsequent stimuli may interfere. The prolonged input chunks could distort processing of rapid stimulus sequences and the proper development of cortical representations needed for reading acquisition. With magnetoencephalography (MEG), cortical activity can be tracked with millisecond temporal accuracy. We have applied MEG to study auditory cortical processing of tone pairs, noise/square-wave sequences mimicking speech sounds and frequency deviants in Finnish dyslexic adults. Our results demonstrate deficient processing of tones and acoustic changes presented in rapid succession within tens to hundreds of milliseconds in dyslexic adults. The observed differences could be related

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to insufficient triggering of automatic auditory attention, resulting from a general deficiency of magnocellular system. In line with the hypothesis of weakened attention triggering, frequency deviants in an otherwise monotonous stimulus sequence elicited smaller mismatch responses in dyslexic than normal-reading subjects. We propose that limitations in both modality-specific and more global attentional capacities could lead to prolongation of sensory input chunks and thus improper cortical representations in dyslexic readers.

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M. TERVANIEMI. About Neurocognition of Musical Sounds and Musical Expertise.

When compared with neurolinguistics, the research on neurocognition of music is at its very early stages. However, thanks to relatively rapid theoretical as well as methodological development in both cognitive neuroscience and music psychology, some observations about brain functions regarding musical sound processing are available to us today. In the present talk, evidence acquired by the means of brain recordings during auditory stimulation will be reviewed. The majority of these studies aimed at revealing the impact of the automatically initiated processes of the auditory cortex in representing sounds, that is, the neural processes activated despite the attentional focus of the subject. Consequently, those studies were conducted in the mismatch negativity (MMN) paradigm in which the subject concentrates on a task unrelated to the auditory stimulation during the brain recordings. The elicitation of the MMN component in the event-related potentials indexes whether or not the neural representations differ between the incoming *versus* neurally represented sounds. The MMN data on musical sounds indicate that, first of all, rather complex musically relevant sounds and sound successions can be neurally encoded even when the subjects ignore the sounds and concentrate on a parallel task in another modality. Second, these data imply that several subskills of musical expertise are evident already at the pre-attentional level of sound processing. Third, this processing differs between musical and phonetic sounds. In sum, the data indicate that conscious attention towards the musical sounds is not necessary for initiating their neural memory-based processing.

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Paper Session 5/1:00–2:30 p.m.

NEUROLOGICAL DISORDERS

W. BEATTY & R. AUPPERLE. Cognitive Impairment in Multiple Sclerosis: Gender Differences.

Some studies have reported higher mortality and more rapid progression of disability in male than in female patients with MS, but these gender differences have not always been found. In cognitive studies, gender is rarely considered, probably because of the small number of males in the samples. To compare cognitive performance of men and women with MS, we recruited and tested consecutive patients who met established diagnostic criteria for MS (25 M, 25 F) at the Veterans Hospital and other area clinics. Refusal rates averaged about 15% for both sexes. Patients received the Repeatable Battery for the Assessment of Neuropsychological Status, the Screening Examination for Cognitive Impairment and the Neuropsychological Screening Battery for Multiple Sclerosis. There were no sex differences in age, education or disease duration, but males were more disabled than females. ANCOVA controlling for disability revealed that males were more impaired than females on most measures of verbal and non-verbal learning and memory, and on semantic but not letter fluency. There were no gender differences on measures of information processing speed (SDMT, PASAT) verbal abstraction, attention, naming or problem-solving. The present findings are in good agreement with our earlier studies. These studies which involved 188 patients also showed greater impairment by males on verbal and nonverbal memory tests, but not on other measures. The origin of this gender difference is unknown, but clinicians may wish to note the special vulnerability of male patients to memory disturbance.

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M.T. SCHULTHEIS, E. GARAY, S.R. MILLIS, & J. DeLUCA. Cognitive Impairment and MS: Relationship With Driving Accidents and Violations.

Evidence for the negative impact of impaired cognitive functioning on driving-related skills has been demonstrated previously among persons with multiple sclerosis (MS). Despite this, studies examining "real-life" driving behavior among this clinical population are rare. One method used in prior driving research with other populations that can provide an objective and ecologically valid measure of driving behavior, is the evaluation of driving records. The purpose of the current study was to compare the incidence of motor vehicle accidents and violations among drivers with MS, when cognitive impairment is present. An archival evaluation of Department of Motor Vehicles (DMV) records for 27 community-dwelling drivers with documented MS [14 MS without cognitive impairment, (MS−); 13 MS with cognitive impairment, (MS+)] and 17 healthy control (HC) subjects, matched on age, sex and driving experience was conducted. Comparison of the incidence of motor vehicle accidents and violations for the past 5 years for the three groups were analyzed. The results indicate that MS+ subjects demonstrated a higher incidence of motor vehicle accidents when compared to HC and MS− subjects. No significant difference in the incidence of motor vehicle violations was observed between the groups. These findings suggest that the presence of cognitive impairment in drivers with MS can result in an increased risk of motor vehicle accident involvement. The clinical relevance and application of these findings are discussed.

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M. VAN ZANDVOORT, J. VAN DER GROND, E. DE HAAN, & J. KAPPELLE. Cognitive Deficits and Changes in Neuronal Metabolism After a Lacunar Infarct.

Chronic, mild neuropsychological impairments have been associated with the occurrence of a single supratentorial lacunar infarct in the white matter. The origin of the cognitive disturbances is yet unknown. In the current study proton magnetic resonance spectroscopy (HMRS) is used to elucidate the hypothesized relation between a lacunar infarct, metabolic alterations, and neuropsychological function. Patients with a lacunar infarct ($n = 26$) are compared with patients with a mild myocardial infarct ($n = 12$) and healthy controls ($n = 12$) on a purpose-designed neuropsychological examination, and on the N-acetyl-aspartate/creatine, choline/creatine and lactaat/creatine ratios. The volume of interest of the MRI/MRS examination was located in normal-appearing white matter of the centrum semiovale at a distance from the infarct. On neuropsychological examination lacunar patients performed worse than both patients with a myocardial infarct ($p < .0001$) and healthy controls ($p < .0001$). The N-acetyl-aspartate/creatine was decreased in patients with a lacunar infarct compared to the other two groups. This decrease in neuronal metabolism was significantly related to the level of cognitive functioning ($p < .01$ for the ipsilateral hemisphere and $p < .05$ for the contralateral hemisphere). We conclude that a single symptomatic lacunar infarct in the white matter is associated with (distant) disturbances in neuronal metabolism and that this decrease is related to a reduced cognitive capacity.

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M. BRÜGMANN, C. KARLOWSKY, B.O. HÜTTER, & J.M. GILSBACH. Posttraumatic Stress Disorder After Subarachnoidal Hemorrhage.

Background: A third of the subarachnoidal hemorrhage (SAH) patients are suffering chronically from posttraumatic stress disorders (PTSD). Aim of the study is the evaluation of particularities concerning subjective impairment and coping strategies of PTSD patients. *Method:* We examined 247 adult patients on the average 32 months after subarachnoidal hemorrhage. Apart from sociological and medical variables the Health Related Quality of Life (HRQoL) was evaluated with the Aachener Quality of Life Inventory (ALQI). The patient's personality structures, coping and depression were also examined. *Results:* Getting vasospasms after having SAH are a big threat for the patients. Accordingly patients with PTSD had spasms more frequently ($p = .01$). Also they had more neurological impairments ($p = .02$) and suffered more from a psychoorganic syndrome ($p = .02$), 6 weeks after hospital discharge. HRQoL scores decreased significantly ($p < .01$) for PTSD patients. This result is acknowledged in social ($p < .01$) and physical issues ($p = .01$), and within 9 of 11 subscales of the ALQI ($p = .05$). In the FPI, PTSD patients had smaller values in the scale of life satisfaction ($p = .01$), and increased values in the scales of excitation ($p = .03$), aggressiveness ($p = .03$), physical complaints ($p < .01$) and emotions ($p < .01$). In coping, structures like depressive processing ($p < .01$) as well as wishful thinking ($p = .02$), were found more frequently. Additionally PTSD patients showed more often a depressive symptomatology (POMS: $p < .01$; BDI: $p < .01$). *Discussion:* The consequences of a chronic PTSD on the quality of life and coping suggests a future focusing more on PTSD diagnostics and therapy for SAH patients.

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Paper Session 6/1:00–2:30 p.m.

HEAD INJURY

I. EMANUELSON, E. HOLMQVIST, R. BJÖRKLUND, & D. STÅLHAMMAR. Quality of Life and Post-Concussion Symptoms in Adults After Mild Traumatic Brain Injury.

Objectives: To identify adults 16–60 years of age with perceived impairment in quality of life and remaining post-concussion symptoms at 3 months and 1 year after mild traumatic brain injury (MTBI). *Series:* One hundred seventy-three patients were reached at 3 weeks, 3 months and 1 year after injury. Of those 55% answered mailed questionnaires. *Method:* Health related quality of life was assessed with SF-36 which is a standardized measure validated for Swedish conditions. It contains 36 items in eight dimensions: physical functioning, role limitations due to physical functioning, bodily pain, general health, vitality, social functioning, role limitations due to emotional problems and general health. Remaining post-concussion symptoms were rated as either existing or non-existing in a 21-item post-concussion symptom checklist. *Results:* Health related quality of life showed significantly impaired scores in all domains compared to an age and gender matched normative control sample. Varying figures from 15–45% of the studied population reported postconcussion symptoms. There was a significant correlation between larger number of symptoms and low SF-36 scores. The symptoms appeared stable between second and third follow-up and no significant changes were found either in amount of post-concussion symptoms or in SF-36 scores between these items.

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T. NYBO, M. SAINIO, I. KOSKINEN, & K. MÜLLER. Vocational and Functional Outcome in Middle-Aged Patients with Severe Preschool Traumatic Brain Injury (TBI): The Second Long-Term Follow-Up.

In our long-term follow-up study we compared the outcome of middle-aged patients with severe childhood traumatic brain injuries (TBI) to their outcome in young adulthood (the first follow-up). 33 patients (19 male, 14 female) with a history of severe (mean length of unconsciousness 17.5 days, range 1–90) motor-vehicle-related preschool TBI were followed up for the second time at the mean age of 40 years (range 37–49 years). One patient had died, 2 were incapacitated to the extent that it was impossible for them to take part in the study, 1 had emigrated, and 7 refused to take part in the study either because they were doing well (2 had full-time jobs and were interviewed by phone) or because of their previously assessed high medical disability. Twenty-two patients (14 male, 8 female) were evaluated with comprehensive neuropsychological, neurological and psychosocial assessments. Seven (31%) were working full-time and 2 (9%) had subsidized jobs, 12 (55%) were living independently, and 1 needed help with daily routines. It was concluded that 15 patients (68%) had no change in outcome, 3 (14%) were doing better and 4 (18%) worse than 16 years previously. Cognitive, neurobehavioral and psychosocial factors contributing to overall functional outcome will be discussed, with emphasis on executive functions and the successful outcome of the subgroup of preschool TBI patients who were able to do full-time work.

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D. HOOFIEN, A. GILBOA, E. VAKIL, & O. BARAK. Unawareness of Cognitive Deficits and Daily Functioning in Persons with TBI.

Unawareness of deficits is a frequent outcome of traumatic brain injury (TBI). It is presumed to negatively influence motivation for and compliance with rehabilitation efforts. Previous studies have found that unawareness of deficits is differentially distributed across various functional domains and is only partially and inconsistently related to actual daily functioning. Most of these studies examined unawareness by comparing subjects' self evaluation of functioning to relatives' or therapists' evaluations. The present study utilized performance-based measures in order to investigate specific domains of unawareness of cognitive deficits and their relations with daily functioning. Seventy-six persons with TBI participated in the study. For each participant, four indices of unawareness of cognitive deficits were generated by subtracting the participant's scores in standardized tests of comprehension, attention, memory and psychomotor speed from their standardized self-evaluation scores of the same cognitive domains. The results show that unawareness of cognitive deficits is differentially distributed across the four cognitive domains, with lowest awareness of comprehension deficits and highest of psychomotor speed. A finding that is interpreted in terms of a concrete-abstract continuum of unawareness. To examine the relations between unawareness and activities of daily living (ADL), the unawareness indices were correlated with the participants' ADL performance as evaluated by a family relative. Unawareness of cognitive deficits was found to be unrelated to ADL in mobility, domestic activities and involvement in family and social affairs, a finding that renders questionable the relations between unawareness and outcome in persons with TBI.

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H. SVENDSEN, B.B. MATHIESEN, & T. TEASDALE. Problems Following Acquired Brain Injury: Patients' and Relatives' Perspectives.

Acquired brain injury (ABI) often results in a cascade of cognitive, emotional and social difficulties. The patients may report these problems, though the observation may be more reliably made by close relatives of the patient. Rehabilitation programs typically aim to alleviate this broad range of difficulties. The present study has two purposes: to evaluate how patient and relative perceive the problems following ABI before and after completing an intensive, neuropsychological rehabilitation program; and to compare these results to corresponding reports of problems from a non-injured control group. Between 1996 and 2000 more than 100 patients completed the European Brain Injury Questionnaire (EBIQ) before and after participating in the 4-month rehabilitation program at the Center for Rehabilitation of Brain Injury, at the University of Copenhagen. A close relative of each patient completed a parallel version. The EBIQ comprises 62 questions relating to the problems and difficulties typically experi-

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enced after brain injury, and generates eight scales describing different problem areas. The results show significant improvements in patients' problems, as perceived by both patients and their relatives, following rehabilitation. However, subsequent to rehabilitation the difficulties reported were still greater than those reported by a normal control group comprising over 50 non-injured persons and their relatives. Furthermore, within the brain-injured group, we have noted discordance between the perceptions of patients and their relatives. This suggests differences in patterns of awareness between patients and their relatives.
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Symposium 4/3:00–4:30 p.m.

MAPPING THE NEUROPLASTICITY OF MEMORY

Organizers: Agnes S. Chan and Mei-Chun Cheung
Chair and Discussant: Agnes S. Chan

A.S. CHAN. Mapping the Neuroplasticity of Memory.
While most studies on recovery of language and motor functions after brain damage support the notion of plasticity, studies on memory ability after lesion yielded inconsistent findings. Researches in primates have shown that early damage to mesial temporal lobe led to global amnesia that is long-lasting, and is similar to that of monkeys with lesions at adulthood. Several case reports demonstrated consistent results in which children with mesial temporal lobe damage in infancy develop severe memory problems. Thus, it seems that while compensatory mechanism of the brain for language and motor is well understood, whether there is similar mechanism for memory remains unclear. The proposed symposium is to discuss this issue with the data we have collected for the past 10 years. We have been investigating the effects of neuropathological change on memory plasticity by studying the episodic memory of patients with temporal lobe lesions, and by studying the semantic memory of patients with cortical degeneration. We have also conducted experiments on children and adults with musical training to examine the effects of early experience on memory development. Functional magnetic imaging technique was used to facilitate our mapping of the neuroplasticity of memory. Our findings demonstrated that neuropathological change and experience affect the processing mechanism of memory systematically and are consistent with the localization of brain functions.
Correspondence: *Agnes S. Chan, Department of Psychology, The Chinese University of Hong Kong, Shatin, Hong Kong, China.*

M.C. CHEUNG & A.S. CHAN. Neuropathological Change in the Mesial Temporal Lobe Alters Episodic Memory.
A group of patients with temporal lobe lesions due to epilepsy (TLE) was studied prior to and 1 year after temporal lobotomy. The baseline assessment included a 4-hr detailed neuropsychological assessment, the WADA test and an experimental functional magnetic resonance imaging (fMRI) paradigm. The results on their memory assessment was generally consistent with that of the WADA test, suggesting that their memory performance was affected by their neuropathological changes. That is, patients having left TLE tended to demonstrate relatively poorer verbal than visual memory, and patients having right TLE showed relatively poorer visual than verbal memory. In addition, fMRI was utilized to examine their hippocampal activation during an encoding task. Previous studies showed that normal people tended to demonstrate hippocampal activation while patients with TLE seemed to have left prefrontal activation during encoding. The results of our study showed that patients with shorter duration of epilepsy (M = 9 years) showed hippocampal activation and left frontal activation while patients with longer duration of epilepsy (M = 16 years) showed more frontal activation. Therefore, findings from our neuropsychological assessment and neuroimaging studies have provided evidence to suggest that the neuropathological changes in temporal lobe epilepsy seem to alter their processing mechanism of learning and memory.
Correspondence: *Agnes S. Chan, Department of Psychology, The Chinese University of Hong Kong, Shatin, Hong Kong, China.*

Y.C. HO & A.S. CHAN. Experience Affects Episodic Memory Development.
Abundant evidence has suggested that experience can affect cognitive development, and recent studies on the effect of music training on episodic memory development have demonstrated a systematic pattern concerning the underlying mechanism. Both studies on adults and children showed that early music training might selectively improve verbal, but not visual memory. In addition, a significant positive correlation was found between the duration of music training and verbal memory performance, even after controlling the effects of age and verbal IQ (r = .50, p = .000). However, no such relationship between that and visual memory ability was found. This dissociation in behavioral pattern was consistent with neuroimaging evidence revealing an enlargement in the left planum temporale in musicians relative to non-musicians. It was proposed that music training might have significant influence on the neurodevelopment of the left temporal lobe and thus improve the functions mediated by it (i.e., verbal memory). Since this specific area is less related to visual memory functions, no effect of music training on visual memory should therefore be observed. The phenomenon seems to suggest that early experience affects episodic memory development systematically according to specific neuroanatomical modification, which supports the notion that the effect of environmental stimulation on cognitive functions should be specific to the brain areas that were stimulated by such experience.
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R.W.Y. CHEUNG & A.S. CHAN. Neuropathological Change Alters Semantic Memory.
A series of studies that utilized scaling techniques to model the structure of semantic organization in Alzheimer's disease (AD) patients supports the notion that semantic memory can be altered due to neuropathological change in a predictable pattern. Alzheimer's disease is a cortical degenerative disease in which the neuropathological change begins at the temporal lobe while the occipital lobe is relatively spared till the late stage of the disease. On the other hand, it has been found that semantic knowledge can be organized by abstract or perceptual attributes, and abstract concepts are primarily mediated by the temporal lobe while perceptual concepts are processed by the occipital lobe. As the temporal lobe is involved at the early stage of AD, it was not surprising to find that these patients, unlike the normal control (NC) subjects who focus on abstract attributes to categorize concepts, rely more on concrete attribute for categorization. The results of a cross-sectional study with AD patients at different levels of dementia showed that the abstract dimension of their semantic networks became less and less salient as the disease progressed. Furthermore, patients with the same level of dementia or with the same degree of amnesia, but without the same neuropathological changes of the AD patients, demonstrated semantic networks assemble that of NC subjects. These comparisons provided strong evidence that the structure of semantic knowledge can be altered, and its alteration seems to be related to specific neuropathological change.
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K.P. CHAN, A.S. CHAN, M.C. CHEUNG, & Y.C. HO. Spontaneous Neuroplasticity of Memory After Brain Activation Tasks.
Signal changes detected by functional magnetic imaging techniques have been proposed to be representing an increase of biochemical activity of the

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synapses and neurons which may make the neurons highly responsive to the upcoming inputs. To study the after-effect of the brain activation, we tested the memory of a group of subjects after engaging them in the novel picture encoding task (NPET) for 2 min. Since the NPET is a task that has been found to be associated with bilateral activation of the hippocampus, we hypothesized that individuals engaged in this task would show better memory immediately after the NPET. Indeed, as compared to a group who had engaged in another task that was not associated with hippocampal activation (i.e., finger sequencing task), the group who performed the NPET demonstrated significantly better verbal memory. These findings are consistent with some of our fMRI findings in which subjects who demonstrated hippocampal activation during the NPET showed better learning and memory than those who demonstrated no hippocampal activation. Although localized brain activation seems to facilitate specific cognitive functions, our recent study on the duration of this after-effect of brain activation suggested that this advantage did not seem to sustain longer than 10 min. Thus, contrast to our finding about the effect of experience on memory which is long-lasting, the impact of the brief brain activation task seems to be short-lived.

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Paper Session 7/3:00–4:30 p.m.

REHABILITATION

R. KASCHEL, S. DELLA SALA, A. CANTAGALLO, A. FAHLBÖCK, R. LAAKSONEN, & M. KAZEN. Imagery Mnemonics for Rehabilitation: A Randomized Group Trial.

Apart from a few, encouraging, single-case studies, evidence of imagery-based mnemonics for the rehabilitation of memory in brain-damaged individuals is sparse. The literature suggests that if imagery is of any use, then it should be applied to mildly memory impaired patients, the learning process should be tailored and a direct transfer training to individual memory problems should be implemented into the training. We compared the outcome of such a programme (nine memory impaired patients) with other approaches to the rehabilitation of memory used in participating centres (12 memory impaired patients). After 4 weeks of baseline and a repeated test battery, patients received 30 single sessions of therapy in 10 weeks. Results suggest that imagery training significantly improves delayed recall of everyday relevant verbal materials (stories, appointments; ANOVAs; *t* tests for pairs). Frequency of memory problems observed by relatives is reduced and each of these effects are stable in a 3-month follow-up. This study suggests that a simple imagery technique can improve relevant aspects of everyday verbal memory performance.

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A. BILBAO, J. BARTH, S. CHATTERJI, & C. KENNEDY. Applications of the ICF to Neuropsychological Rehabilitation Following TBI.

The traditional disease and diagnostic medical model is not always useful to TBI professionals who need to describe, measure, and compare deficits associated with neurologic insult. Professionals in neurorehabilitation are in need of very new systems that will assist them in identifying impairments and areas of intervention. The aim of this poster is to present the International Classification of Functioning (ICF) and its applications to the field of TBI rehabilitation. Multi-disciplinary teams from 54 countries have collaborated in the development of the ICF to develop an instrument that serves different purposes in neurorehabilitation with a high transcultural validity. This manual developed by the World Health Organization, allows the classification and assessment of functioning, impairment and disability in everyday activities and social involvement for individuals with medical conditions. The ICF allows the standardized assessment of cognitive functioning, neurological impairment, personality and environmental factors, and handicaps in everyday activities. The Classification permits a holistic analysis of the different factors that cause handicap in TBI and therefore it is an instrument for better treatment planning. By knowing the differential influence of these factors we can decide on treatment goals and more efficient strategies in a case to case basis. It can be of great use for professionals working in the field of TBI rehabilitation who need to quantify in detail cognitive, emotional or sensory–motor deficits and their functional sequel.

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M. KIHLGREN, E. MUNCH, N. HØGSBRO, L. ANKERSTRØM, & A.M. KRAUL. A Community-Based Rehabilitation Project for Children With Acquired Brain Injury.

Many children surviving traumatic incidents to the brain or treatment of brain related medical conditions go back home and attend school directly after the hospital phase. The residual effects are not always obvious, usually some time elapses before the environment starts to see something has changed regarding the child's learning abilities or behavior. At the Children's Center for Rehabilitation of Brain Injury in Copenhagen, the purpose is to find ways to support children and adolescents living in the community, struggling with the effects of their acquired brain injury. The activities are complementary to the services already available within the community and the focus is on cognitive and social functioning. During the first 18 months a total of 22 children and adolescents and their network have received different kinds of support based on the child's neuropsychological profile. School and preschool personnel have received education and individually tailored information, as well as supervision regularly. Parents and siblings have participated in group activities for education, exchange of experiences and learning of coping strategies. Children have had groups of their own where they have learned about the brain and their brain injury, exchanged experiences and developed cognitive and social competencies in special training sessions. The activities have been appreciated by the families and schools and rated at enhancing the child's competencies and functioning in school and peer groups. The network also expresses a better understanding of the child's situation and greater capability of handling problems in everyday life.

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T. KLINGBERG, H. FORSSBERG, & H. WESTERBERG. Training of Working Memory Enhances Prefrontal Activity and Decreases Hyperactivity in ADHD.

Working memory (WM) capacity is the ability to retain and manipulate information during a short period of time. This ability underlies complex reasoning and has generally been regarded as a fixed trait of the individual. Children with attention deficit hyperactivity disorder (ADHD) represent one group of subjects with a WM deficit, attributed to an impairment of the frontal lobe. In the present study we used a new training paradigm with intensive and adaptive training of WM tasks and evaluated the effect with a double-blind, placebo controlled design. It is shown that this training can significantly enhance WM capacity and reasoning ability as well as decrease hyperactivity in children with ADHD. These results demonstrate that WM capacity and complex reasoning abilities are not fixed traits of the individual, but can be substantially affected by training. It also shows how cognitive functioning affects motor behavior. The results also indicate that WM training could be of potential clinical use for ameliorating the symptoms in ADHD. A second experiment identified training-induced changes in brain activity using functional MR. This revealed enhanced activity in prefrontal and parietal cortex. Event-related analysis

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of brain activity data showed that the activity was related to the delay period in the WM trials. This shows that WM training can enhance brain function related to active maintenance of information in WM.
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Paper Session 8/3:00–4:30 p.m.

Aging

K.A. LOCKWOOD, G.S. ALEXOPOULOS, & W.G. VAN GORP. Effects of Working Memory on Higher-Order Neurocognition in Late-Life Depression.
While neuropsychological deficits are recognized as a potential pathologic dimension in late-life depression, it is unclear the extent to which working memory as a processing resource contributes to the higher-order neurocognitive deficits documented in older depressed adults. The purpose of this study was to identify potential deficits in episodic verbal and non-verbal memory, as well as executive function in late-life depression and to examine whether a decline in working memory mediates impairment on tasks from these neuropsychological domains. Neuropsychological measures were administered to elderly patients (n = 20), 61 years of age and older, with Major Depressive Disorder (MDD) and healthy age- and education-matched control subjects (n = 20). Relative to control subjects, depressed geriatric patients evidenced significantly poorer working memory, as well as significant deficits on tasks of episodic memory and executive functioning. Data analyses using hierarchical regression indicated that a significant amount of variance in episodic memory and executive functioning was accounted for by working memory. Findings suggest that working memory deficits may be a fundamental source of the compromises seen in higher-order neurocognitive functions in depressed geriatric populations. Identification of deficits in memory and executive functions that are fundamental to the daily living activities of depressed older adults is critical to the development of effective interventions designed to prevent or delay admission to institutional settings.
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J. MANGELS & A. HEINBERG. Improved Episodic Integration Through Enactment: Implications for Aging.
Enactment may improve memory by facilitating episodic integration of object–action pairs. We suggest that this facilitation will be particularly critical when episodic and semantic associations are in opposition. Enactment effects may be magnified in older adults because they typically demonstrate poorer episodic memory and greater semantic interference under verbal encoding instructions. To test these hypotheses, older and younger adults were tested on memory for "*standard*" lists, in which real objects were paired with an object-specific action commonly performed with that item ("Sign your name with the *pen*"), and "*crossed*" lists, in which objects were paired with an action that was unusual for that item, but commonly performed with another list item ("Take a sip from the *glove*" where "*cup*" appeared on that list). Participants were shown each object and instructed to remember a command spoken to them. In the verbal task (VT), participants engaged in active rehearsal by repeating the command aloud. In the subject-performed task (SPT), participants enacted the command with the object. Overall, older adults performed more poorly than younger adults, but benefited similarly from enactment. In support of our hypotheses, enactment was particularly beneficial in improving episodic integration of crossed pairs. Participants recalled fewer crossed pairs than standard pairs in the VT, but not the SPT condition. Particularly for older adults, poor recall in the VT crossed condition was associated with failure to correctly recall the action portion of the pair. Enactment reduced this type of error overall and eliminated all group and condition differences.
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M. LAMAR, M. POPE, & S. RESNICK. Comparing Dorsolateral and Orbital Frontal Tasks Across Younger and Older Adults.
Frontal systems research typically focuses on dorsolateral (DL) prefrontal regions. Recently, orbital frontal (OF) regions are being investigated in select populations. Furthermore, results of volumetric analyses suggest that within prefrontal cortex, the OF region shows the greatest volume loss with aging. We administered tasks purported to tap DL and OF regions to a group of healthy young (n = 20; age = 28.4 ± 6.7, education = 14.5 ± 2.5) and healthy elderly participants (n = 13; age = 67.8 ± 4.4, education = 15.9 ± 2.8). Groups did not differ on education, overall cognitive status (MMSE: Young = 29.4 ± 0.9, Elderly = 28.6 ± 1.7) or depressive symptoms. On the 12-item version of Petrides' Self-Ordered Pointing Task, groups did not differ in the number of errors produced [SOPT-12: Young = 3.4 ± 2.2, Elderly = 4.7 ± 2.3; $F(1,31) = 2.8$, $p = .10$] displaying equivalent ability to plan and monitor responses under considerable working memory demands. In contrast, on the Iowa Card Task Young participants chose significantly more cards from the 'good' or low-risk decks when compared to their Elderly counterparts [Good: Young = 55.5 ± 10.6, Elderly = 47.9 ± 9.1; $F(1,31) = 4.5$, $p = .04$]; Elderly participants chose significantly more cards from the 'bad' or high-risk decks when compared to their Young counterparts [Bad: Young = 42.5 ± 10.6, Elderly = 50.1 ± 9.1; $F(1,31) = 4.5$, $p = .04$]. Thus, while Young participants were risk-aversive in their decision making, Elderly participants continued making poor decisions despite feedback. Results suggest that OF regions and tasks assessing these regions may be more sensitive to the effects of aging than measures of DL functioning.
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S. MILLER, M. LEWIS, M. JOHNSON, S. STABLER, & E. GIUMELLI. Cognitive Deficits Relate to Vitamin B_{12} Deficiency in Older Adults.
Vitamin B_{12} deficiency may be a substantial risk for older adults. We recently reported more than 20% of a sample of older adults in the US Administration on Aging's Elderly Nutrition Program as B_{12} deficient. Research suggests an association between nutritional factors including B_{12} deficiency and cognitive impairment but has been identified with either gross screening methods or small sets of cognitive tasks. Studies using larger protocols have used small samples or data inferred from special populations. We report initial cognitive data from a large treatment study of vitamin B_{12} and multiple health factors in an Elderly Nutrition Program. Cognition was measured using a well-validated, computer-prompted cognitive battery and factor indices [Memory (MEM); Information Processing Speed–Accuracy (IPSA); Attention (ATT); Reaction Time (RT)] as dependent measures. B_{12} deficiency was based on serum methylmalonic acid levels. In 114 older adults, 31 (27%) were B_{12} deficient. B_{12} levels were associated with cognitive functioning in this community-based sample (MEM, $r = -.246$, $p < .05$; IPSA, $r = -.220$, $p < .05$) and older adults deficient in B_{12} performed worse than non-deficient older adults on two of four cognitive indices (MEM, $t = 2.613$, $p < .05$; IPSA, $t = 2.337$, $p < .05$). Early evidence regarding vitamin B_{12} supplementation in enhancing cognitive impairment in B_{12} deficient older adults will also be presented.
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Presidential Address/4:40–5.40 p.m.

APRAXIA IN DEGENERATIVE DISEASES

Leslie Gonzalez-Rothi

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SATURDAY MORNING, JULY 27, 2002

Poster Session 3/9:00 a.m.–12:30 p.m.

DEVELOPMENTAL AND CHILD NEUROPSYCHOLOGY/ PSYCHIATRIC CONDITIONS

T. SOLEDADE-RISÉRIO, N. ARGOLLO, & A. CARVALHO. Cognitive (Re)habilitation and New Technologies of Intelligence.
Introduction: This work describes how the Cognitive (Re)habilitation and New Technologies of Intelligence work at the Service of Psychology of Ruy Barbosa College (Brazil). *Objectives:* (Re)habilitate children with cognitive difficulties including their subjectivity. *Material and Methods:* Cognitive (Re)habilitation was developed in two steps: (1) diagnostic valuation: on 3 initial interviews with parents or someone responsible for the child and the use of the following material: WISC, Gestaltic Bender, Brazilian writing Neuropsychology Assessment from Luria test, Reading Valuation, HTP-F, Phonological Awareness test. The Neurological Valuation: Traditional Physical Exam and the Development Neurological Exam (Lefévre). (2) The intervention as well is made in group or with the use of educative softwares through the computer. *Results:* Until the present time, 47 subjects were diagnosed ($N = 48$, because for each one of the subjects were supposed two hypothesis diagnosis), 25.53% are female and 74.47% are male. Among these 48 hypothesis, 10.41% presents dyslexia; 43.75% cognitive deficit; 6.25% TDA-H; 10.41% neurological distraction (cerebral paralysis, secondary neurological lesion to anoxia perinatal, epilepsy); 4.16% nonverbal disturbance of learning; 8.33% with problem related to concentration and memory; and 16.66% were referred to psychotherapy. *Conclusions:* The collected facts corroborate modification on the IQ punctuation, motor perception maturity, phonological awareness, written language level and demonstrate significant changes relationships between children.
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T. SOLEDADE-RISÉRIO, A. CAPOVILLA, A. VERENA GALVÃO, Â. GODOY, A. MEIRA, C. PIRES, D. ANDRADE, E. MEDEIROS, F. LOPES, G. LAZARINI, I.F. BRANDÃO, J. CHASTINET, & M. MENEZES. Neuropsychology of Reading.
According to the reading model proposed by Ellis and Young, there are two reading routes, the phonological and lexical, and they are related to the possibility of the occurrence of reading out loud and silent reading, respectively. The etiology of dyslexia can be related with dysfunctions in one of the routes or in both of them. The research was made on Vale das Pedrinhas, a poor community in Salvador (Brazil). There were used the Bender Visual Motor Gestalt Test for Children, Phonological Awareness (Capovilla & Capovilla), Silent Reading Competence Test (Capovilla & Capovilla), Neuropsychological Writing Valuation (Luria) and Raven Coloured Progressive Matrices. The researchers connected the silent reading development and ability on writing with the hemispherical specialization of the cerebral areas related to reading, in a way that 100% of children made the copy, 70.7% made dictation and 30.2% made composition. These last ones showed more than 65% of rightness on the Silent Reading Competence Test. The connection between the possibility of silent reading and the writing of a composition can be related with the recording of word images (orthographic and semantic lexicons) and with the articulation with the linguistic work memory and the lexicon (long term memory).
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S.N. MATTSON & K.E. CALARCO. "What" and "Where" Visuospatial Processing in Children with Heavy Prenatal Alcohol Exposure.
Recently, Rovet and colleagues evaluated the dorsal and ventral visual processing systems in adolescents with congenital hypothyroidism using a factor analysis of neuropsychological test data. They determined that Block Design, Picture Completion, and Benton Judgment of Line Orientation (JLO) tests represented the ventral (or "what") processing stream and Memory for Human Faces and Object Identification Tests represented the dorsal (or "where") processing stream in this group of adolescents. We attempted to determine if this relationship held true for children with heavy prenatal alcohol exposure. We approached it in two ways. First, we compared the performances of alcohol-exposed children on tests similar to those outlined by Rovet and colleagues, including "what" tests of object naming (BNT) and Memory for Faces (NEPSY) and "where" tests of JLO, Visual Learning (WRAML), Arrows (NEPSY) and Block Design (WISC). Analyses revealed greater deficits on where tests than on what tests. To validate this finding we compared alcohol-exposed children to non-exposed controls on two sets of visual processing: Benton's JLO and Visual Form Discrimination (VFD), representing the "where" and "what" domains, respectively. In comparison to controls, alcohol-exposed children displayed greater deficits on JLO than on VFD. In summary, the results of these evaluations suggest that children with heavy prenatal alcohol exposure display selective deficits in "where" visual processing while performance in "what" visual processing is relatively spared.
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A. COLLOT D'ESCURY, L. HARTMAN, A.-L. VON KNORRING, M.W. VAN DER MOLEN, A.K. ÖSTLIN, & A. PONSIOEN. Planning and Executive Functions of MMR—Compared to Non-MMR Children.
Planning, monitoring, verifying goal attainment and strategic thinking are prefrontally ruled. Damage to the prefrontal cortex is associated with executive function deficits. The behavior of mentally handicapped children suggests difficulties in tasks governed by the prefrontal cortex. Several studies report a discrepancy between the ability to solve executive function tasks *versus* real life planning. Prefrontal neural systems are considered vulnerable to perturbation when the task demands increase. In order to extend the task requirements of the Tower of London (ToL) more complex items were added and a computerized version—containing no information about the number of moves required and allowing only one trial per item—was introduced. Planning of mildly mentally retarded (MMR) children (IQ from 55–80) ($n = 46$) and normal i.e., non-MMR children ($n = 46$), matched on chronological age and sex, was compared on a computerized and a manual version of the ToL. The MMR children did not differ from the non-MMR children in effect for complexity, planning time and age. Both groups were equally affected by the computerized version. Further analysis of the response strategies showed that the MMR-children made significantly more rule breaks, having difficulties in keeping with the constraints of the task. Welsh discussed a close interaction between working memory and inhibition in respect to executive function. The data described above will be discussed accordingly.
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I.C. VAN 'T HOOFT, K. ANDERSSON, T. SEJERSEN, A. BARTFAI, & L. VON WENDT. Attention and Memory Training in Children with Acquired Brain Injuries.
The aim of this open study was to evaluate the Amsterdam memory and attention training (Amat-c) in 3 Swedish children 9–16 years of age with acquired brain injuries and memory and attention deficits. AMAT-c is a method consisting of structured exercises in specific attention and memory techniques. The children trained for 30 min per day interactively with one teacher or parent for a period of 20 weeks. Once a week the children and their trainer were seen at the hospital. Pre- and post-training assessments were made using a neuropsychological test battery and behavioral rating scales for parents and teachers. The results showed a significant improvement in neuropsychological tests of sustained attention and in memory performance post training. The answers from the questionnaires

indicate that, using the Amat-c method, the children learned strategies that improve their school achievement and self-image. This method needs to be further evaluated but may be a valuable treatment option for improving cognitive efficiency in children with acquired brain injuries.
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S. KISELEV. The Relation of Reaction Time and Brain Dysfunction in Preschool Children.
Can Reaction Time reflect the dysfunction of different areas of brain in preschool children? Thirty children of age 6–7 took part in the research. With the help of the computer technique developed by the author, we have investigated the simple reactions, discrimination reactions and choice reactions. The neuropsychological investigation of children was carried out. We used a technique "Diakor," developed at Moscow State University. This technique permits to establish the dysfunction of 4 areas of cerebral cortex (forward-left, back-left, forward-right, back-right). The level of dysfunction (LD) of these areas of a brain was measured. The correlation analysis was carried out (between LD of different areas of brain and time of the investigated reactions). The time of simple reaction does not significantly correlate with LD. The time of discrimination and choice reactions significantly correlate with LD. The specific relation LD of some areas of a brain and time of some reactions was revealed. Particularly, correlation coefficient between LD of forward-left cerebral cortex and time of choice reactions equals 0.71, while appropriate correlation coefficient for the forward-right cerebral cortex equals 0.38. Thus it is possible to assume that the time of some reactions can be used for an estimation of a LD of some areas of brain in preschool children.
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C. LEUNG, W. GOH, & P. KHONG. Thalamic T2 Hyperintensities and Cognitive Function in Chinese Children With NF-1.
Moore et al. found that lower PIQ was associated with thalamic UBOs while Jerring et al. suggested that simple presence of UBOs in the thalamus did not contribute to further lowering of cognitive and motor performance. In this study 32 right-handed Chinese children with NF-1 (age range 5–16 years) underwent MRI and neuropsychological testing including Hong Kong Wechsler Scale for Children, Hong Kong List Learning Test (HKLLT), and Rey Complex Figure Test (RCFT). Twelve children were found to be thalamic UBO+, 12 had UBOs elsewhere, and 8 had no UBOs. NF-1 children scored lower across most of the subtests in Wechsler Test when compared with the normal population but not to a significant .05 level. UBO+ group had a lower FSIQ ($M = 94.63$) as compared to the UBO− group ($M = 100$) but again not to a significant .05 level. However, thalamic UBO+ group (FSIQ = 100.65) had a significantly lower FSIQ than thalamic UBO− group (FSIQ = 88.17; $p = .031$). Contrary to what one might expect, Pearson correlations showed that among the thalamic UBO+ group, the greater the volume of UBO in the site, the better the performance in cognitive functioning (FSIQ, $r = .745$, $p = .013$), verbal memory (HKLLT, $r = .635$, $p = .048$), and visual memory (RCFT, $r = .641$, $p = .046$). It is postulated that the growth of UBOs have positive effects in preserving the neuropsychological functions of the lesion area against further damage.
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C. SEEGMULLER, R. MASSA, A. DE SAINT MARTIN, E. HIRSCH, C. MARESCAUX, & M.N. METZ-LUTZ. Transient Cognitive Impairments in Idiopathic Focal Childhood Epilepsy: Myth or Reality?
Past studies have demonstrated the occurrence of momentary decrements in cognitive function concomitant to subclinical electroencephalographic (EEG) discharges. Although epileptiform discharges, particularly paroxystic spike-wave discharges are one of the main features of focal idiopathic childhood epilepsy, only a few studies have investigated, in this form of epilepsy, transitory cognitive impairments (TCI) induced by epileptic discharges. Studies demonstrating the specific effects of focal or lateralized subclinical discharges concluded that TCI result from a disruption of a specific function rather than from a general impairment of attention or overall slowing mental processing. However, such results have not yet been replicated. To fill this gap, we investigated, in 13 young children affected by focal idiopathic childhood epilepsy, the immediate effect of spike-wave discharges on performances in three computerized detection tasks involving verbal, coloured geometrical shapes and meaningless visual drawings. In order to specify the stage of information processing impaired by epileptic discharges we examined their effects considering the time of occurrence of discharges during performance. Besides, we looked at the possible effect of various neurophysiological features of epilepsy, like the overall frequency of discharges, their activation during sleep and the morphology of discharges. We examined their relationship to sustained attention and learning abilities. Our study did not fully replicate the findings of earlier studies. Impaired cognitive performances did not appear closely linked to the occurrence of spike-wave discharges nor specific to the location of epileptic focus. Other permanent electrophysiological features seem more related to cognitive impairments in childhood epilepsy.
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A. NAKAGAWA & M. SUKIGARA. The Relationship Between Early Reduction of Imitative Responses and Mechanisms of Frontal Lobe Inhibition.
Meltzoff and Moore showed human neonates can imitate some adult facial gestures. These imitative responses decreased at approximately 2 to 3 months of age. To date, the question of why imitation disappears is still open. The present study examine the hypothesis that early imitative responses disappear following the maturation of inhibitory mechanisms associated with the frontal lobes. Four-month old babies were stimulated with mouth opening and tongue protrusions by the experimenter. The infants' behaviors before and after stimulation were coded and an index of imitative behavior was constructed for each infant. Two eye movement tasks (countersaccades and inhibition of return) were studied to assess inhibitory mechanisms. Each parent completed the IBQ–R (Infant Behavior Questionnaire–Revised). There was a negative relationship between tendency to imitate and the ability to inhibit as shown by the countersaccade task. No such relationship was observed with the inhibition of return task. Inhibition as measured by countersaccades correlated positively with activity level and negatively with duration of orienting as measured by parental reports on the IBQ–R. Inhibition of return correlated negatively with the subscales for smiling, low pleasure and vocal reactivity. These results suggest that inhibitory mechanisms mediated by the frontal lobe, but not other forms of inhibition, are related to reduction in the tendency of 4-month-old infants to imitate.
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M.D. RIS, R. AMMERMAN, & N. WALZ. The Taxonicity of Nonverbal Learning Disabilities (NLD).
As currently defined, it is not clear whether NLD should be considered a matter of *kind* or *magnitude*. The taxonicity of NLD, or the degree to which it is best construed as discrete *versus* continuous, has not been investigated using methods devised for this purpose. This study represents a preliminary attempt, using a developing database, to apply taxometric procedures described by Waller and Meehl. Subjects include adolescents with spina bifida (SPIBIF; $N = 50$), adolescents presenting with features of NLD (FEAT; $N = 35$) but no medical condition, and normal peers (NORM; $N = 35$). These adolescents received comprehensive neuropsychological evaluations as part of a longitudinal study. Twenty five percent of the SPIBIF group met minimal criteria for NLD which included a

significant VIQ > PIQ discrepancy, Reading > Math discrepancy, and bilateral fine-motor deficits. Forty percent of the FEAT group and 1% of the NORM group met minimal criteria. Guided by Rourke's classification criteria for NLD, neuropsychological measures will be subjected to analyses using MAXCOV, MAMBAC, and other procedures to explore the taxometric properties of these criteria. Such investigations have important implications for future theoretical explications and clinical applications of the syndrome of NLD.

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Y. KANG, J. CHIN, D.W. SEO, & S.B. HONG. Re-examination of the Crowding Hypothesis in LTLE With Right-Hemisphere Language.

There has been a controversy about the cognitive effects of the pathological "shifting" in language dominance to the right hemisphere. Strauss et al. found that the pathological shifting impaired the development of other "right hemisphere" functions such as non-verbal, visuospatial ability (the crowding hypothesis). However, Rausch et al. reported that left temporal lobe epilepsy (LTLE) with right hemisphere language dominance did not show a relative decrease in visual–spatial functions. The present study was conducted to re-examine the crowding hypothesis. Forty-four LTLE patients were administered the intracarotid amobarbital procedure (IAP) and a comprehensive neuropsychological evaluation prior to the epileptic surgery. The IAP revealed that in 37 patients, speech was exclusively mediated by the left hemisphere (LHLD-LTLE) and in 7 patients, speech was in the right hemisphere (RHLD-LTLE). Four of the RHLD-LTLE were right-handed, and 3 of them were left-handed. Five out of 7 RHLD-LTLE reported that their first clinical event (e.g., right hemiparesis due to unknown reason) occurred prior to the age of 2 years. The RHLD-LTLD performed as well as the LHLD-LTLE on most neuropsychological measures including intelligence, language, visuospatial function, verbal/visual memory, attention, and fine motor coordination. However, the RHLD-LTLE performed significantly *worse* than the LHLD-LTLE on some measures of *frontal/executive functions* that were assumed to be related with the "right" prefrontal cortex. In sum, although no difference was found in visuospatial functions between the RHLD and the LHLD, the present results that found a relative decrease of right frontal lobe functioning in the RHLD-LTLE still support the crowding hypothesis that Strauss et al. argued.

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I. PAVÃO MARTINS, A. CASTRO-CALDAS, B.D. TOWNES, T. BENTON, G. FERREIRA, P. RODRIGUES, S. MARQUES, G. ROSEBAUM, T. De ROUEN, & J. LEITÃO. Age and Sex Differences in Neurobehavioral Performance: A Study of Portuguese Elementary School Children.

Objectives: The goals of this study were to develop normative data on a set of neurobehavioral tests for Portuguese elementary school children. *Method:* Subjects were 503 healthy children (228 F, 275 M), 8.0 to 11.9 years of age who participated in a dental study (Casa Pia Children's Amalgam Trial). Children were administered an intelligence test (C-TONI), and tests of attention, memory, motor/visual motor and executive abilities. Means and standard deviations for each test variable were computed separately for ages 8.0 to 8.11 (n = 73), 9.0 to 9.11 (n = 143), 10.0 to 10.9 (n = 203) and 11.0 to 11.9 (n = 84). *Results:* All tests were sensitive to developmental effects showing performance improvement with age. Girls performed better in rote verbal learning, psychomotor speed and speed of information processing and made fewer errors on a test of cognitive flexibility. Boys had higher scores on tests of visual learning, visual memory and fine motor speed and coordination. This is in accordance with the usual developmental differences in gender. Nonverbal IQ had a significant impact on all tests of memory, some attention tests and a visuomotor matching (requiring problem solving) test but not on tests measuring motor speed and coordination. Compared to USA norms, children had lower test scores on most measures (ranging from 0.5 to 1 *SD* below mean for American children), in all age groups, except for rote verbal memory tests. This was interpreted as a result of educational and socioeconomic differences.

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E.S. DMITRIEVA & V.Ya. GELMAN. The Developmental Aspects of Children's Memory for Emotional Speech Component.

Auditory sensory memory is a first stage in auditory perception and is essential for recognition of speech stimuli. In behavioral and electrophysiological studies the maturational changes in the duration of auditory sensory memory were found out. Here, we investigated the peculiarities of sensory memory using behavioral measures of auditory processing of emotional speech component in children of different ages (7–17 years old). The stimuli used as actual test items were the fragments of different duration (0.5–3.0 s) of a sentence spoken in positive, negative and neutral emotional tones of voice. The 24 test signals were presented at random either on right or left ear of each subject through the headphones with contralateral white noise. Subjects answered by pressing the appropriate button of the three-choice answer console. At stimulus duration of 0.5 s the accuracy of recognition was reduced and the time of recognition increased as compared to the other durations of the stimuli for all children's age groups. At stimulus duration of 3 s children answered before the end of the test signal and exhibited the maximal accuracy of recognition. This allows to suppose that speech signals of 2-s duration and less are accumulated in echoic memory for further recognition of emotional component. The improvement of emotions recognition and the reduction of the reaction time were observed in age course through the maturational changes in the duration of auditory sensory memory were not found out.

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T. FERNANDES, R.L. SILVA, C. LOUREIRO, & I. PAVÃO MARTINS. Development in the Absence of the Prefrontal Cortex: A Case Report.

Background: There are few cases of early frontal lesions studied in detail. It is not clear if prefrontal cortex has a general modulatory influence upon neuropsychological development or a circumscribed role upon executive functions. *Case report:* E.F., a 16-year-old girl, underwent a right prefrontal lobotomy at 2.5 months (following a brain abscess). Her psychomotor and language development were within the normal range. She managed to proceed up to the 6th grade (at age 15). *Neuropsychological assessment:* E.F. scores on WAIS VIQ = 69, PIQ = 71, FSIQ = 71. E.F. performed within normal range in tests of language, reading writing, elementary calculation, verbal learning (WMS) and motor initiation and control (Luria hand–motor sequences and auditory go–no-go). On executive functions tasks E.F. showed a very poor performance. In Verbal Fluency Tasks, E.F. presented a low global score, and a reduced number of switching, although she produced a large mean cluster size in all tasks. This pattern is usually found in patients with frontal lesions and is consistent with the hypothesis proposed by Troyer. Her performance on proverb interpretation and tests of abstraction was also poor. She performed below normal range on tests of sustained attention test, short-term memory and episodic memory tests (CVLT). *Conclusions:* Further to a low IQ, E.F. showed a specific impairment on executive function tests, with normal performance on other cognitive domains. This performance pattern poses limitations to the hypothesis suggesting a fundamental role of the frontal lobes in the organization of other cognitive domains.

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R. WEINSTEIN & J. WEINSTEIN. Consequences of Child Neglect on Brain Development: A Case Study.

Current understanding of brain development demonstrates the need for proper nutrition and stimulation in order to ensure proper and healthy brain development. Neuronal plasticity allows for some recovery of func-

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tion, but the lack of early development has permanent and irreversible consequences leading to problems in physical, cognitive, emotional and social domains. The presentation will include an overview of the present knowledge of brain development as it relates to child neglect. A case study of a 16-year-old adolescent who was born and raised in Russian orphanages for the first eight years of her life and then adopted and brought to the United States will be presented. Extensive neuropsychological data, psychoeducational information, quantitative EEG, and MRI are used. Salient information reveals that this child had almost no language, and was severely undernourished and underdeveloped. With the proper nutrition and stimulation she was able to recuperate some functions. Neuropsychological and neurophysiological deficits persist to the point of severe learning disabilities and poor social skills. The presentation calls for a re-examination of child neglect legislation. Public policy should be based on current knowledge of brain development and its significant impact on adult functioning. Major preventive efforts must be applied and made available to every child. The United States is behind many other countries in this regard because of lack of social policies that would provide services such as visiting nurses, early education and properly trained substitute infant and toddler caretakers.

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P.D. HARVEY, C.R. BOWIE, L. WHITE, M. PARRELLA, & K.L. DAVIS. A Comprehensive Study of Verbal Fluency in Schizophrenia.
Deficits in verbal fluency are apparently common in schizophrenia and may provide keys to some of the abnormalities in the semantic system in schizophrenia. Recently, interest has increased in the functional importance of cognitive deficits, although verbal fluency has not been studied in detail in this regard. In this study, 392 older (age >60) patients with schizophrenia were administered phonological and semantic (i.e., category) fluency examinations, as well as tests of memory, praxic skills, clinical symptoms, and measures of functional status. When compared to normative standards, 82% of the patients were impaired in semantic fluency and 68% were impaired in phonological fluency ($p < .01$). Both semantic and phonological fluency impairment was significantly ($p < .001$) correlated with total scores on the functional status measure (rs = .50 and .49), and with the social and self-care subscales of the measure. Scores were uncorrelated with the severity of psychosis, but were correlated with the severity of negative symptoms. Furthermore, the severity of poverty of speech (a clinical measure of verbal underproductivity) were moderate in magnitude (rs = .28 and .31), indicating that impaired fluency scores are not simply an artifact of general underproductivity or mutism. When a regression analysis was employed, animal fluency scores accounted for 10% of the variance in functional status measures even when memory functioning and negative symptoms were considered. These data indicate that verbal fluency impairment is common and functionally relevant in schizophrenia. Consistent with a recent meta-analysis, semantic fluency appears more commonly impaired in patients with schizophrenia and more strongly related to functionally important outcome measures.

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J. EGELAND, K. SUNDET, B.R. RUND, N.I. LANDRØ, K. HUGDAHL, A. LUND, A. RONESS, & K.I. STORDAL. Selective Attention, Speed and Fatigue in Schizophrenia and Depression.
Introduction: Attention is considered among the most impaired cognitive subfunctions in both schizophrenia and major depression. The aim of this study was to identify possible nonspecific deficits and impairment differentiating the illnesses. *Methods:* Subjects with schizophrenia (53), major depression (50) and healthy controls (50) were assessed with Stroop, CALCAP, DS-CPT and Dichotic Listening Tests. Results were grouped into composite scores of speeded and non-speeded attention as well basal speed. The empirical validity of this categorization was tested in factor analysis. Decrement in continuous performance test was calculated as a possible measure of fatigue. The three groups were comparable in age, education and gender. *Results:* Factor analysis indicated the independence of processing speed and selective attention. Schizophrenic and depressed subjects were specifically impaired in selective attention. There was evidence of a mild fatigue effect in depressed compared to schizophrenic subjects. *Conclusion:* Low results on speeded attention tests must be corrected for basal speed before interpreting the results as attention deficit. As a group, subjects with major depression are slow, but not specifically inattentive. Schizophrenic subjects show both a nonspecific speed reduction and a specific deficit in selective attention indicative of executive dysfunction.

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M. KIM, S. PARK, M. SHIN, & J. KWON. Neuropsychological Profile in Obsessive-Compulsive Patients: 4-month Follow-Up.
This study investigated the changes of the neuropsychological functions over a 4-month period of treatment in patients with obsessive-compulsive disorder (OCD). Thirty-nine OCD patients and 31 controls were evaluated with psychological and clinical tests. The same tests were readministered 4 months after pharmacological treatment for OCD patients. At the 1st series of tests, compared to the controls, OCD patients were significantly impaired on the immediate ($p = .000$) and delayed recall ($p = .000$) of Rey-Osterrieth Complex Figure Test (RCFT), and on the letter ($p = .002$) and category ($p = .000$) of Controlled Oral Word Association Test (COWA). They also showed a prolonged response time on Trail Making Test (TMT) ($p = .020$), part A. The severity of OCD measured by Yale-Brown Obsessive-Compulsive Scale (Y-BOCS) correlated well with the performance on the immediate and delayed recall of RCFT and the response time on TMT, part A. After 4 months follow-up, OCD patients still showed impairment on the immediate and delayed recall of RCFT and COWA category. This is despite the fact that they had improved significantly on these functions in comparison with the controls over the period of treatment. In addition, an association between OCD symptoms and the performance on the neuropsychological tests was not observed. The neuropsychological profile of OCD patients found in the present study indicates that the frontal–striatal system is the possible pathophysiological mechanism underlying the development of OCD.

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A. SANDSTRÖM, I.-L. NYSTRÖM, M. LUNDBERG, L. NYBERG, & T. OLSSON. Impaired Processing Speed and Visuospatial Function in Chronic Burnout Syndrome.
Objective: To evaluate cognitive dysfunction in chronic burnout syndrome. *Patients and Methods:* 65 female patients (M age 43.7 ± 8.1 years) with a preliminary diagnosis of chronic burnout syndrome (described in ICD 10 as "*burnout-state of total exhaustion*") were studied. Subjects had a sick leave period of at least three months with symptoms related to the burnout syndrome. Patients suffering from major depression were excluded as well as patients with ongoing medications affecting brain functions. Standardized test batteries were used at two different occasions. Neurocognitive abilities were tested with Wechsler's Adult Intelligence Scale–Revised (WAIS–R), the Claeson Dahl–Revised inventory of learning and memory, Rey Complex figure test, and the Intermediate Visual and Auditory Continuous Performance test. All results were age adjusted. Weighted test scores were, when necessary, transformed into t scores. *Results:* Performance below standardized norms; i.e., deviating more than 1 *SD* from the norm, was found for 47–68% of the subjects for tests measuring visuospatial memory and processing speed. A decrease (≥ -1 *SD* in auditive speed was found in 68% of the subjects. A striking incongruence found was between verbal and performance results in WAIS–R, with impaired "performance" and intact "verbal" skills. *Conclusion:* Evaluation of cognitive dysfunction in patients with chronic burnout shows impaired performance in specific cognitive domains (visuospatial memory and speed). The test profile indicates right hippocampal and prefrontal cortex dysfunction. The fact that the tests are heavily dependent on exec-

utive function necessitates further studies on the executive origin of visuospatial memory problems in patients with chronic burnout.
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Symposium 5/9:00–10:30 a.m.

IDENTIFYING SUBTLE CHANGES IN MOTOR CONTROL AFTER STROKE

Organizer and Chair: Janet Cockburn

J. COCKBURN, M.D. BOGDANOVIC, T.J.H. BOVEND'EERDT, H. DAWES, & H. JOHANSEN-BERG. Identifying Subtle Changes in Motor Control After Stroke.
Imaging techniques that identify subtle changes in neural circuitry in association with change in behavior allow more precise exploration of guided recovery after brain injury. Further effective advancement for functional recovery after stroke depends on close co-ordination between identification of tasks that can be performed under imaging constraints and targeted treatment programs that lead to measurable outcomes. A necessary corollary is the development of reliable and valid measures of behavioral change in a recovering neurological population. Identification of change in patterns of neural reactivation alone is insufficient. The four papers in this symposium present associated neural and behavioral approaches to identification of subtle changes in motor control after stroke. Although constraint induced therapy has previously been reported to improve hand function after stroke, the functional magnetic resonance imaging (fMRI) study presented by Johansen-Berg identifies specific brain areas, notably in premotor cortex, where alterations in movement-related activity may mediate functional improvement. Dawes outlines a sensitive method of analyzing precise aspects of functional movement control associated with changes in neural activation. The importance of identifying reliable tests of functional change specific to individuals with acquired neurological disorders is highlighted by Bovend'Eerdt in the third paper. Finally, Bogdanovic presents an exciting new study identifying plastic changes in motor cortex in normal volunteers after grip-strength training that will enable detailed comparisons to be made with neural changes recorded from stroke patients undergoing similar training. Together, these papers make a substantial contribution to understanding of principles governing neural reorganization and their potential for accelerating neurorehabilitation.
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H. JOHANSEN-BERG, H. DAWES, C. GUY, D. WADE, & P.M. MATTHEWS. An fMRI Study of the Neurobiological Basis for Motor Rehabilitation After Stroke.
Motor rehabilitation is commonly employed after strokes, but outcomes are variable and there is little specific information about the changes in brain activity that are associated with improved function. We performed serial functional magnetic resonance imaging (fMRI) on a group of 7 patients receiving a form of rehabilitation therapy after stroke in order to characterize the nature of functional changes in the brain that correlate with behavioral improvements. Patients were scanned while performing a hand flexion–extension movement twice before and twice after a 2-week home-based therapy program combining restraint of the unaffected limb with progressive exercises for the affected limb. As expected, the extent of improvements in hand function after therapy varied between subjects. Therapy-related improvements in hand function correlated significantly with increases if fMRI activity in a network of brain regions involved in sensorimotor control (cerebellum, secondary somatosensory cortex, dorsal premotor cortex). However, the strongest correlation between regional brain activation changes and improvements in hand function was in the premotor cortex (PMC) bilaterally (contralateral PMC, $r = .86$, $p = .03$; ipsilateral PMC, $r = .85$, $p = .035$). fMRI offers a promising, objective approach for specifically identifying changes in brain activity potentially responsible for rehabilitation-mediated recovery of function after stroke. Our results suggest that changes in premotor cortex activity are associated with successful motor rehabilitation.
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H. DAWES, K. HOWELLS, T. J.H. BOVEND'EERDT, & D.T. WADE. Kinematic Analysis of Changes in Arm Use Following CI Therapy.
There are numerous approaches to rehabilitation of the moderately impaired upper limb following stroke, although there is insufficient evidence to draw conclusions regarding the best therapeutic approach. One treatment intervention, constraint induced (CI) therapy, has demonstrated improvements in arm dexterity and strength alongside cortical reorganization. However, detailed kinematic examination of the effect of this intervention on motor control have not been described. This study utilizes a three-dimensional infrared system that has previously been shown to be a sensitive and stable measure of motor function of the upper limb in moderately impaired individuals. Individuals at least 6 months from ischemic stroke and taking part in the CI study are being examined alongside an age matched control group. Testing is carried out on three occasions, two before and one after the CI intervention. Kinematic analysis is made of performance of two tasks: a simple drinking task and the nine-hole peg test. Data will be analyzed for stability under two pre-intervention testing conditions and for changes post intervention. The following variables will be examined: movement time, total displacement in x, y and z co-ordinates, velocity profile of stages within each task, the number of movement units, and changes in movement components under dual task conditions. Alterations in the skillfulness and automaticity of movement will be discussed in relation to the type and timing of therapeutic interventions of the upper limb.
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T. J.H. BOVEND'EERDT, H. DAWES, & D.T. WADE. Evaluation of Two Measures for Use of Hand Function in Stroke.
Impaired arm function in individuals after stroke is a common problem and recovery of dexterity is essential for functional recovery in these individuals. In order to measure function and changes in function, instruments are needed that are valid, reliable, sensitive to change and practical to use. The Jebsen Test of Hand Function was modified (MJTHF) to fulfill the need for a sensitive measure of gross functional dexterity. The University of Maryland Arm Questionnaire for Stroke (UMAQS) is a questionnaire considering unimanual and bimanual functional arm activities, handedness and measuring daily use of the affected hand. The objective of this study was to establish the concurrent validity, test-retest reliability and sensitivity to change of the MJTHF and the UMAQS in subjects with acquired neurological disorders with mild to moderate impaired arm function. The MJTHF and the UMAQS were compared to the Nine Hole Peg Test and grip strength. The MJTHF showed good concurrent validity and the UMAQS didn't correlate significantly with any measures used. Test–retest reliability of the MJTHF was high ($r = .96$). The UMAQS for the *affected hand was the dominant hand* was $r = .72$ and for the *affected hand was the non-dominant hand*, $r = .83$. The present study supports the use of the MJTHF as a measure of gross functional dexterity with good concurrent validity, test–retest reliability and sensitivity to change. We suggest more research into the UMAQS before it can be used in clinical practice.
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M.D. BOGDANOVIC, T.J.H. BOVEND'EERDT, H. DAWES, H. JOHANSEN-BERG, & P.M. MATTHEWS. Defining the Neuroanatomic Substrate of Grip Strength Training.
Performance gains are commonly observed following physiotherapeutic intervention in patients with neurological conditions. Previous studies have suggested that these improvements are partly a result of functional changes

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in the cerebral cortex. A comparison of cortical responses to training in normal and brain injured subjects may lead to novel rehabilitative techniques for brain injury. We present interim data from a functional magnetic resonance imaging (fMRI) study, which demonstrates plastic changes in the cerebral cortex resulting from motor training. Two normal volunteers underwent 2 sessions of fMRI imaging prior to a 2-week period of grip strength training of their dominant hand. This involved squeezing of a rubber bulb (4 blocks of 20 repetitions 3 times daily). The resistance was gradually increased during training. An increase in grip strength was observed. A follow up fMRI scan was then performed using the same motor paradigm (rubber bulb squeezing at the original submaximal resistance). Both subjects showed increases in the mean percentage signal change (compared to the rest condition) in the contralateral sensorimotor cortex and contralateral premotor cortex for post-training *versus* pre-training. One subject also showed a similar increase in the supplementary motor area. These findings suggest that progressive strength training can induce changes in cortical organization, and that premotor and sensorimotor cortex may be implicated in the processes responsible for performance gains. We are currently investigating whether these results hold for a larger group of normal subjects and will go on to ascertain whether changes seen in stroke patients differ from those in normals.

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Paper Session 9/9:00–10:30 a.m.

DEMENTIA I

R. ALPITSIS, M. SALING, & W. LOUIS. Memory Complaint and Future Memory Performance.

As the population ages, the incidence of Dementia of the Alzheimer Type (DAT) is rising exponentially. This poses a significant social and economic burden on the community and it has become crucial that we detect DAT at the earliest point possible. Patients with mild cognitive impairment (MCI) have an increased likelihood of developing DAT, but what of patients with a subjective memory complaint alone? The current 3-year longitudinal study examines 68 subjects, 50 with subjective memory complaint and 18 normal controls, using standard neuropsychological measures, computerized measures sensitive to the early detection of DAT (CANTAB) and Apolipoprotein E genotyping (a risk factor for developing DAT). The results suggest that memory complaint does not predict future memory decline in a sample with a high frequency of the epsilon 4 allele (>40%). We present the results of this investigation in the context of prodromal DAT, MCI and normal aging.

Correspondence: *Rubina Alpitsis, Department of Neuropsychology, Austin & Repatriation, Medical Centre, Studley Road, Heidelberg, Victoria 3084, Australia.*

A. COLLIE & P. MARUFF. Progressive and Static Cognitive Impairment in Older People.

Background: Analysis of existing literature suggests that approximately 50% of older people with mild cognitive impairment (MCI) progress to develop neurodegenerative conditions such as Alzheimer's disease (AD). The neuropsychological test performance of the remaining 50% appears to remain relatively stable. In previous longitudinal investigations we have identified groups of MCI subjects with declining (MCI-D) and static (MCI-S) cognitive impairments. This study aimed to directly compare and contrast the neuropsychological test performance of these two subgroups. *Method:* Word list delayed recall (WLDR) test performance was assessed on five occasions over a 2-year period in 131 healthy older individuals. Older people with declining and static cognitive impairments on the WLDR were identified, as well as matched control participants. A comprehensive battery of neuropsychological tests was used to examine cognitive function in these groups. *Results:* Both MCI-D and MCI-S groups displayed impairments on tests of episodic memory, although in the MCI-S group this was more severe. Further, MCI-S subjects also displayed deficits on pattern recognition and spatial working memory tests. *Conclusions:* Older people with deteriorating and static memory impairments display a different pattern of cognitive dysfunction on careful neuropsychological examination. Impairments in MCI-S subjects are more severe and encompass more cognitive domains, perhaps indicating a later stage of neurodegenerative illness. Conventional cross-sectional criteria for classifying MCI may need to be incorporate serial cognitive assessment.

Correspondence: *Alex Collie, Neuropsychology Laboratory, Mental Health Research Institute, Locked Bag 11, Parkville Victoria 3052, Australia.*

L. CLARE, B.A. WILSON, J.R. HODGES, & I. ROTH. Awareness in Early-Stage Alzheimer's: Implications for Cognitive Rehabilitation.

Level of awareness may affect functioning and response to intervention in early-stage Alzheimer's, yet studies have so far produced few clear findings, and a comprehensive explanatory model remains elusive. A theory-driven approach to assessing awareness of memory difficulties was developed, using performance on an objective test of everyday memory coupled with isomorphic rating scales for completion by participants and caregivers, and supplemented by detailed interviews. Using this method, awareness of current memory functioning was assessed in 12 participants with early-stage Alzheimer's, who then engaged in a brief cognitive rehabilitation intervention in the form of a controlled trial of face–name association learning. There were significant improvements in recall of trained, but not control, items following intervention, and higher awareness scores were associated with better outcome. There was no association between awareness and performance on tests of executive function, and the data did not provide clear support for current neuropsychological models of unawareness. Participants who showed lower awareness were less depressed, but their caregivers were more depressed and reported more behavior problems. The results have important implications for theoretical models of unawareness and for the provision of cognitive rehabilitation interventions.

Correspondence: *Dr. Linda Clare, Sub-department of Clinical Health Psychology, University College London, Gower Street, London WC1E 6BT, UK.*

L. RICO DUARTE, M. JIMENEZ, M. LAUNAY, & A. SYSSAU. Category-Specific Naming and Normal Judgment of Sentences in Alzheimer's Disease.

The heterogeneity of cognitive impairment in Alzheimer's disease (AD) is well known. Among the systems involved, deterioration of semantic memory is stated. The origin of these deficits has been a controversial matter. Some authors consider that this deficit may reflect impaired access to semantic system. Others think that it is a breakdown of semantic system itself. The aim of this study is to evaluate the organization of semantic memory. With this goal, we have studied the dichotomy link to problem of access or storage and the category-specific effects (living and nonliving things). The study was carried out on a sample of older subjects and Alzheimer patients. Those subjects have been evaluated with two types of tests: visual (naming) and verbal (sentences judgement). The results showed a significant difference between Alzheimer's patients and control subjects at the naming task. In return, their performances are similar in the verbal task. As far as the category-specific effects is concerned, this dissociation is observed in Alzheimer group in the visual task. We noted better responses when using nonliving things than when living things were involved. The fact that the impairment of Alzheimer's disease concern only naming task and that they had the same performances with the control subjects in sentences judgement leads us to conclude that their cognitive defect is mostly due to a problem of access to the semantic system than a deterioration of the semantic system by itself.

Correspondence: *Liliana Rico Duarte, Laboratoire de Psychologie Expérimentale et Cognitive Université Paul Valéry Montpellier III Route de Mende 34199 Montpellier, Cedex 5, France.*

Paper Session 10/9:00–10:30 a.m.

CLINICAL PROBLEMS IN CHILDHOOD

J. DONDERS & H. WOODWARD. Gender Differences in Memory After Pediatric Traumatic Brain Injury.
Memory abilities of 35 boys and 35 girls with traumatic brain injury (TBI) were evaluated with the Screening version of the Wide Range Assessment of Memory and Learning (WRAML–S). No children with premorbid neurological, psychiatric, or special education histories were included. The gender groups were matched on basic demographic variables (e.g., age, gender) as well as neurological injury variables (e.g., length of coma, neuroimaging findings). There were no statistically significant differences between the gender groups in Verbal Comprehension or Perceptual Organization scores on the Wechsler Intelligence Scale for Children–Third Edition ($p >$ .10 for both variables). However, the performance of the boys on the WRAML–S composite index was statistically significantly worse than that of the girls [$F(1,68) = 8.17$, $p < .01$]. This was associated with a moderate effect size ($\eta^2 = .11$). In the complete sample, gender also added a significant degree of incremental prediction (12%; $p < .01$), above and beyond the amount of variance in CVLT–C performance that was accounted for by length of coma (22%, $p < .01$). These results are consistent with previous findings in a completely independent sample in our laboratory that have shown gender differences in performance on the California Verbal Learning Test–Children's Version after TBI. It is concluded that boys are at increased risk for memory deficits after TBI than girls, possibly because of the more diffuse cerebral organization of complex functions in girls as well as hormonal differences that may have a neuroprotective effect in girls.
Correspondence: *Jacobus Donders, Psychology Service, Mary Free Bed Hospital, 235 Wealthy Street S.E., Grand Rapids, MI 49503, USA.*

J. FREEMAN, K. PEACE, D. PEREZ, & G. TRIPP. The Effect of Adjuvant Chemotherapy on Neuropsychological Functioning.
Patients with cancer who receive adjuvant chemotherapy often complain of short and long-term difficulties with memory, concentration, and slowed mental agility. Despite this, few empirical studies have assessed the neuropsychological functioning of this patient group, and all use cross sectional designs. The current study uses a prospective design to document the prevalence and nature of acute and sustained cognitive impairment in breast and bowel cancer patients receiving adjuvant chemotherapy. Breast and bowel cancer patients receiving adjuvant chemotherapy completed neuropsychological assessments prior to commencing chemotherapy, four months after beginning treatment, and again nine months after completing treatment. Their performance was compared with that of an age, sex, and premorbid IQ matched sample of cancer patients who received local treatment for cancer only and a healthy control group. Results indicated that the patients receiving chemotherapy perform significantly worse than the cancer control and healthy control groups on tests of working memory, delayed memory, speed of information processing and verbal fluency. These performance differences were not due to the effects of anxiety or depression. The observed symptom patterns are consistent with a mild neurotoxicity syndrome. These results suggest adjuvant chemotherapy does have at least short-term effects on cognitive functioning.
Correspondence: *Jane Freeman, Department of Psychological Medicine, University of Otago, P.O. Box 56, Dunedin, New Zealand.*

S. RICE, E. BIGLER, J. LAINHART, D. TATE, W. McMAHON, H. COON, & S. OZONOFF. Corpus Callosal Differences in Macrocephalic Autism and Relationship to IQ.
Some differences in corpus callosum (CC) surface area in autism have been reported. However, there is also a higher frequency of macrocephaly in autism, which could be a factor in CC size, but has not been investigated as such. In the current study we examined CC surface area in autism subjects unselected for head size as well as those with macrocephaly and compare to controls selected and unselected for head size. We also examined the relationships of CC surface area and regional differences with intellectual status. Surface area measurements of the genu, splenium and isthmus regions of the midsagittal area of the corpus callosum were based on MRI scans from 43 autistic (12 with macrocephaly) and 42 controls (10 with macrocephaly) using the Witelson protocol. Autistic subjects met ADI–R, ADOS-G, and DSM-IV criteria for autism. Intellectual testing was based on the WAIS–III or the WISC–III. The only significant size difference was with the genu, which was found to have significantly larger area measurement ($f = 9.961$, $p < .05$) in the macrocephaly controls. The macrocephaly autism subjects did not have significantly larger CC surface area than the unselected for head size autism subjects but there were trends at the level of the isthmus. No relationship was found between any region of the CC in autism and IQ. In contrast, posterior regions of the CC were significantly related to IQ in control subjects. These findings suggest an aberrant size–function relationship of the CC in autism. Potential neuropathological relationships of the CC findings with autism will be discussed.
Correspondence: *Sara Rice, Brigham Young University, Psychology Department, 1001 SWKT, Provo, UT 84602, USA.*

M. KORKMAN, A. RENVAKTAR, P. SJÖSTRÖM, D. SJÖBLOM, & G. POMRÉN. Influence of Bilingual Family Background on Reading Acquisition.
Many children today grow up in bilingual families. Yet, the impact of bilingualism on verbal learning has not been fully clarified. Finland provides an opportunity for such study because the two official languages, Finnish and Swedish, are linguistically entirely different while the linguistic sub-populations are socio–culturally similar. Bilingual families are common among the Swedish-speaking minority. Dyslexic ($n = 67$) and control ($n = 39$) children were recruited by first administering a reading test to 1432 8- to 12-year-olds attending schools for Swedish-speaking children. Children with stanine scores of 1–2 and control children with stanine scores of 4 or above were then administered WISC–III and children with average intelligence were selected. Parental language of 47 children was Swedish. The parents of 49 children spoke different languages. Assessments included subtests of phonological awareness, speeded naming, name learning and list learning from the NEPSY. There was no difference in frequency of dyslexia between the unilingual and bilingual groups. Repeated measures ANOVA demonstrated significant differences between the dyslexic and the control group on all language tests but no effect of bilingualism. When subdividing the children into those with language problems (scores ≤ 8 on 2–4 of the NEPSY subtests; $n = 42$) and those without ($n = 63$) there was no significant interaction of language impairment and bilingual background on the reading score. It was concluded that bilingualism is not a significant risk factor in reading acquisition even in children with signs of language impairment.
Correspondence: *Marit Korkman, 89 Av. Albert Jonnart, Brussels, B-1200 Belgium.*

Invited Lecture/11:00 a.m.–12:30 p.m.

DEVELOPMENT OF NEW TREATMENTS FOR ADHD: OVERCOMING LIMITATIONS OF PHARMACOLOGICAL INTERVENTION (ACUTE TOLERANCE TO STIMULANTS) AND PSYCHOSOCIAL INTERVENTION (PARTICIPATION, SUCCESS, AND MAINTENANCE RATES)

James Swanson

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Paper Session 11/11:00 a.m.–12:30 p.m.

DEMENTIA II

O. ALMKVIST, A. NILSSON, A. WALL, & A. NORDBERG. Brain Activation Shown by PET and Attention in Alzheimer's Disease Patients.

A typical feature of Alzheimer's disease (AD) is impairment of attention. In the early stage of AD, there are neuropathological changes in medial temporal areas as well as in posterior association cortices. Parts of these brain regions are involved in sustained attention in healthy young individuals, in which a right frontoparietal network has been identified. In order to explore brain regions that are responsible for sustained attention in AD, the present study investigated regional blood flow using positron emission tomography (PET) in 12 AD and 4 Mild Cognitive Impairment (MCI) patients. Sustained attention was studied during a rapid visual information processing task varying in task demands in relation to resting state. Aggregating all patients, an increased activation was found in parietal regions bilaterally in addition to basal ganglia (thalamus and mesencephalon) and decreased activation was found in the dorsolateral prefrontal regions bilaterally. Disease-related differences were found in anterior cingulate cortex as well as frontal regions bilaterally. In conclusion, the present study on sustained attention has demonstrated disease-related variations of activation in frontal regions bilaterally and disease-invariant activation of parietal regions in AD patients at different stages of disease.

Correspondence: *Ove Almkvist, Division of Geriatric Medicine B84, Huddinge University, Hospital, SE-14186 Stockholm, Sweden.*

A. GADE, J. BROWN, L. CHAKRABARTI, P. JOHANNSEN, S. GYDESEN, & FReJA (FRONTOTEMPORAL RESEARCH IN JUTLAND ASSOCIATION). Chromosome 3 Frontotemporal Dementia (FTD-3): Disease Course and Neuropsychology.

Approximately half of the cases diagnosed with frontotemporal dementia are familial, often with an autosomal dominance inheritance. Yet mutations in the tau gene on chromosome 17 are responsible in only about 20% of the familial cases. We have studied a large kindred in Jutland with autosomal dominant frontotemporal dementia linked to chromosome 3, the only such family yet known. Twenty-three individuals in 3 generations have been affected. Onset is between 46 and 65 years of age and is insidious with subtle personality changes. Most patients eventually become mute, and motor symptoms often appear late in the disease. Duration averages 8 years. Neuropathological findings are non-distinctive. Few cases have been seen in the early phase of the disease. Retrospective interviews of relatives based on the Barber et al. questionnaire indicate early preservation of episodic memory and topographical orientation and early affection of personality and drive. There is no insight. Empathy is lost early on, but behavioral disinhibition is not prominent. Two patients have been studied neuropsychologically in the early phase within the last year. In spite of MMSEs of 26 and 28, a nearly global affection of cognition was demonstrated and seemed more impressive than personality changes. Visual perception and memory were relatively preserved. Some, but not all, frontal lobe functions were severely affected. In one patient, widespread cortical blood flow deficits in the early stage correlated with the global cognitive changes. Although FTD-3 fulfils diagnostic criteria for frontotemporal dementia and is sharply different from Alzheimer's disease, it appears to affect the cortex widely early on.

Correspondence: *Anders Gade, Memory Disorders Clinic N6131, Department of Neurology, Rigshospitalet, 9 Blegdamsvej, DK-2100 Copenhagen, Denmark.*

J.M. GRAY & W.A. BARKER. Impairment of Facial Expression Recognition in Presymptomatic Huntington's Disease: Organic and Psychological Causes.

Gray et al. examined 40 clinically asymptomatic individuals at risk for HD (AR) who were undergoing predictive testing. Those who turned out to have the disease causative gene (AR+) were impaired in the perception of facial expression of disgust compared to those who did not (AR−). The impairment was specific in that the perception of other facial expressions (happy, surprise, fear, sad and anger) was not impaired compared to controls. Analysis of a further 93 AR individuals undergoing genetic testing (57 AR+ and 76 AR−) confirmed that AR+ individuals were impaired in the perception of facial expression of disgust compared to AR−. However, the deficit was not specific; fear was also impaired. Further analysis showed that the difference between the results in the two series was due to differences in the control (AR−) groups. Gray et al. noted that AR− scores on fear were lower than previously reported, and suggested this might be due to the effects of anxiety. Data from a third series, including mood and anxiety measures, are used to examine the possibility that the observed results are the product of two independent concurrent processes, one organic and related to carrying the causative gene, and the other psychogenic and related to being at risk for this dreadful disease. The findings are discussed in the context of affective neuropsychology where structural lesions to the brain, psychogenic states and drug induced states commonly produce similar effects.

Correspondence: *John Gray, Neuropsychiatry Service, St. Nicholas Hospital (Collingwood Clinic) Gosforth, Newcastle, UK.*

E. MUZIO. Neuropsychological Correlates of Selected Rorschach Variables in a Geriatric Population.

There is a growing body of research suggesting that the Rorschach, a widely used personality assessment tool, also makes neuropsychological sense. To complete a first approach correlating Rorschach variables to neuropsychological measures in a psychiatric population, our study proposes a similar approach with elderly subjects. All subjects who were administered the Mini Mental State Examination (MMSE), another French global cognitive assessment scale (BEC96) and the Rorschach Comprehensive System were extracted from the data bank of a Parisian geriatrics department. The data bank generated 76 protocols (15 men, 61 women; *M* education = 8.7 years, *M* MMSE = 22.6). Neurological diagnosis included 11 DAT, 2 Vascular Dementia, and 16 Dementia Not Otherwise Specified (DSM–IV criteria). Fourteen subjects presented cognitive impairment not answering diagnostic criteria for Dementia, and 33 subjects showed MMSE > 25. Results show that there are significant correlations between the selected Rorschach variables and both global cognitive status (GCS) and various sub-scales of the BEC96: (1) Rorschach variables measuring available psychological resources (EA) and thought disorders (WSUM6) correlated most with GCS; (2) perceptual accuracy, as measured with the Rorschach (X-%), was not correlated to GCS but correlated to semantic recall fluency and visual recognition; and (3) a Rorschach measure of implication in the stimulus field (Lambda) was not correlated to GCS as expected, and might be better understood as a coping style. These findings lead us to reconsider the relevance of the Rorschach in neuropsychological assessment, and to a better understanding of brain–behavior relationships.

Correspondence: *Emiliano Muzio, 9, rue Nicolo, Paris 75016, France.*

Paper Session 12/11:00 a.m.–12:30 p.m.

MIXED CLINICAL CONDITIONS

R.P.C. KESSELS & F.K. BOSMA. Cognitive Dysfunction, Coping, and Psychological Factors in Whiplash-Associated Disorder.

Whiplash-Associated Disorder (WAD) is apparent in a minority of subjects after a hyperflexion–hyperextension injury of the neck. Basically, it consists of physical, cognitive, and psychological–emotional problems. However, the etiology of this disorder is unclear, with possible explanations varying from minor brain injury to malingering. Psychological factors are also hypothesized to have an influence on the WAD-related cognitive complaints, adding to the controversy about their etiology. Moreover, objective test results do not always support the subjective complaints. The current study investigated underlying mechanisms of cognitive dysfunction in WAD, focusing on psychological factors and coping mechanisms.

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In this study, 31 patients diagnosed as WAD Grade I–II were compared to thirty patients with brain injury visible on CT or MRI and a non-neurological control group (i.e., subjects with 'non-organic' psychological symptoms) on memory, attention and cognitive flexibility. In addition, questionnaires (MMPI–2, SCL–90 and UCL) were used to investigate psychological functioning (both at trait and state level) and coping. On the cognitive tasks, WAD-patients performed worse than the control group (especially on memory), but had a similar performance compared to the neurological patients. Furthermore, WAD patients reported high levels of psychological distress compared to the neurological and control group, especially on subscales related to somatization (i.e., physical complaints). With respect to coping, the WAD group displayed a predominantly active, but palliative coping style. In conclusion, psychological distress, in combination with inadequate coping, might play a role in the existence, persistence or aggravation of whiplash-related symptoms, such as pain or cognitive dysfunction.

Correspondence: *R.P.C. Kessels, Helmholtz Instituut, Department of Psychonomics, Utrecht University, Heidelberglaan 2, 3584 CS Utrecht, The Netherlands.*

J. LUCAS, E. HOLKER, R. UITTI, M. TURK, & R. WHAREN. Long-Term Cognitive Sequelae of Left Deep Brain Stimulation of the Ventral Intermediate Nucleus in Tremor Patients.

Background: Deep brain stimulation (DBS) of the ventral intermediate (Vim) nucleus of the thalamus represents an effective treatment for tremor-predominant disease. To date, however, few studies have examined the long-term cognitive effects of treatment. *Method:* Eleven right-handed, White patients (9 M, 2 F) with parkinsonian ($n = 4$) or essential tremor ($n = 7$) were administered measures of attention/executive function, word fluency, visual perception, and verbal memory prior to surgery, and again three months and one year after surgery. On follow-up, patients were tested with and without active stimulation. Stimulation conditions were counterbalanced and alternate test forms were administered when available. Patients ranged in age from 42–88 years ($M = 72.7$ years), with a mean education of 12.5 years. Tremor groups did not differ in demographics or baseline mental status as measured by the Mattis Dementia Rating Scale. *Results:* Repeated measures ANOVAs revealed significant main effects for time on letter fluency ($p < .02$) and Stroop Color-Word interference ($p < .05$). *Post-hoc* analyses revealed that both measures declined significantly from baseline to 3-month follow-up, with no improvement by 1 year follow-up. Nonsignificant trends in the same direction were observed on semantic fluency ($p = .06$) and Trails B ($p = .06$). A nonsignificant trend toward increased speed in completing Trails A ($p = .09$) after surgery was also observed. No significant postsurgical change was observed on measures of attention span, visual perception, learning, or memory. *Conclusion:* Results suggest that left Vim DBS is associated with persistent cognitive sequelae, possibly via interruption of corticothalamic pathways important to executive function. Other cognitive domains appear unchanged up to 1 year post surgery.

Correspondence: *John Lucas, Mayo Clinic, Dept. of Psychiatry and Psychology, 4500 San Pablo Rd, Jacksonville, FL 32224, USA.*

M.C. CORBALLIS, P.M. CORBALLIS, & K. BARNETT. Line Motion Illusions in the Normal and Divided Brain.

Twenty normal and 1 callosotomized participant were shown vertical lines that appeared instantaneously between solid rectangles in one or other visual field. When the illumination of one of the rectangles was briefly increased (i.e., "flashed") prior to the presentation of the line, the line seemed to spread from that rectangle to the other. This has been termed the "line-motion illusion," and there is dispute as to whether it is due to spread of attention, or an "impletion effect" related to the phi phenomenon. In both normals and the split-brained participant, the illusion was seen more often in the right than in the left visual field, consistent with other evidence that the left hemisphere is more finely tuned to rapid temporal succession. When a line *disappeared* instantaneously following brief increase in illumination of one of the rectangles, it seemed to do so away from the flash, an effect inconsistent with impletion, but consistent with a spread of attention. When a line appeared that matched the color of one of the rectangles appeared instantaneously, but there was no flash, normal participants saw no systematic movement. The callosotomized participant, in contrast, consistently reported movement away from the matching color, but only in the left visual field. This suggests that the right hemisphere may infer motion from gestalt properties of stimulus succession, but is overruled in normal participants by the left hemisphere.

Correspondence: *Michael Corballis, Department of Psychology, University of Auckland, Private Bag 92019, Auckland, New Zealand.*

E. VAKIL, T. SHAROT, M. MARKOWITZ, S. ABERBUCH, & Z. GROSWASSER. Script Memory for Typical and Atypical Actions: Control *Versus* Closed-Head Injured Participants.

When typical and atypical information about a situation are presented, the latter is usually found to be better recognized. This phenomenon is referred to as the "typicality effect." It is claimed that typical and atypical information are mediated by automatic and effortful processes, respectively. Previous studies reported that CHI patients are impaired on memory tasks that required effortful but not automatic processes. Twenty-two patients with closed-head injury (CHI) and 23 matched controls listened to two scripts that consisted of typical and atypical activities. It was hypothesized that CHI patients, unlike the control participants, would not show the typicality effect when presented with scripts composed of typical and atypical actions. As predicted, the findings of the present study revealed impaired typicality effect for CHI patients as compared with controls. The findings obtained are not a result of different response bias in the groups, but a genuine difference in memory. First, because the groups did not differ on their false alarms rate; and second, because identical results were obtained whether or not confidence rating was taken into account. The results are discussed in terms of the limited attentional capacity or passive learning strategy characteristic of memory impairment in CHI patients.

Correspondence: *Eli Vakil, Department of Psychology, Bar-Ilan University, Ramat-Gan 52900, Israel.*

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Author Index
Twenty-Fifth Annual Meeting of the International Neuropsychological Society Mid-Year Conference

July 24–27, 2002
Stockholm, Sweden

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Minutes From The Twenty-Fourth Annual International Neuropsychological Society Mid-Year Conference

Brasilia, Brazil

Board of Governors Meeting
July 3, 2001

Members Present: Lucia Braga, Alexandre Castro-Caldas, Michael Corballis, Robert Heaton, Michael Kopelman, James Malec, Ann Marcotte, Wilfred Van Gorp, Anne Watts, Robert Bornstein (ex officio)
Members Absent: Ida Sue Baron, Martha Denckla, Bjorn Ellersten, Leslie Gonzalez-Rothi, and Sandra Weintraub

1. Call to Order

Alexandre Castro-Caldas called the meeting to order at 9:45 am. He welcomed new board members, and thanked Lucia Braga for facilitating the INS meeting in Brasilia.

2. Minutes Approved

The reading of the minutes of the Board Meeting and the Business Meeting held in February 2001 in Chicago, Illinois was waived and both sets of minutes were unanimously approved without revision (motion-Van Gorp; second-Heaton).

3. Treasurer's Report

Robert Heaton reviewed the INS Treasurer's Report. As of January 1, 2001, the Society had $1,087.606.75 balance brought forward. Collected revenues for 2001 to date, including membership dues, contributions, subscriptions, meeting incomes, and earned interest on accounts, total $340.236.83. Expenses for 2001 to date totaled $332,357.70, yielding a net income for the current calendar year of $7,879.13. The Chicago INS meeting was costly in comparison to other meetings in large measure due to AV charges incurred as equipment had to be operated by unionized hotel staff. The feasibility of future meetings being held in Chicago was discussed in light of costly expenses. Dr. Heaton further reported that several certificates of deposit were reinvested in $100,000 increments. INS continues to meet its goal of having one year's operating funds available. The Treasurer's Report was accepted unanimously (motion-Corballis; second-Kopelman).

4. Executive Secretary's Report

A. Membership

As of May 31, 2001, the Society has 3.741 active members (2.854 United States, 260 Canada, and 627 International). Membership has held relatively steady over the past several years (3,884 in May 2000, 3.787 in May 1999.

At its February 2001 meeting, the Board approved the formation of a new committee to explore ways to increase international and multidisciplinary members in the Society. Upon further discussion, a motion was made to charge the International Liaison Committee (ILC) with the task of examining ways of increasing international membership and presence within INS, with monitoring and input from the Board (motion—van Gorp; second—Kopelman). A separate committee (Gonzalez-Rothi, Chair; Kopelman and Corballis) will explore mechanisms for increasing multidisciplinary membership in the Society. These committees were requested to make reports in February 2002.

B. Dues Payment

As of May 31, 2001, 3,160 members (84.4%) had paid their 2001 dues, compared with 80.9% in May 2000 and 81.6% in May 1999.

5. Standing Committee Reports

A. Program Committee

1. Local Arrangements—Brasilia

Lucia Braga reported that 300 people have registered to date to attend the INS meeting in Brasilia, with registrants representing many disciplines, including neuropsychology, neurology, pediatrics, speech/language pathology, genetics, psychiatry, nursing, physical and occupational therapies, and neurosurgery. The meeting has received a great deal of media attention within Brazil. The SARAH Hospital Network facility in Brasilia has equipment and personnel to allow for simultaneous translation in English and Portuguese during all sessions. The Hospital has designed banners and maps to help conference attendees locate sessions. A number of tours have been arranged for participants of Brasilia as well as the hospital facility. The Board extended their thanks to Dr. Braga and the SARAH Hospital Network for their kind hospitality and outstanding arrangements and facilities.

2. Program Committee—Brasilia

Stefano Cappa, Chair of the Program Committee, prepared the following report. A total of 142 abstracts and 4 symposia were submitted for consideration for presentation in Brasilia. Of these, 132 abstracts and 2 symposia were accepted.

Bornstein added that a small number of members whose submissions had been accepted were unable to attend the conference. Concerns were also raised by the Program Committee about the quality of English grammar used in some of the accepted abstracts. The Board discussed the issue, and has asked the IOC to explore possible solutions to this problem.

3. Program Committee—Toronto

Bornstein reported that 60 to 70 abstracts have been received to date for the Toronto meeting. The postmark deadline for submissions is July 13, 2001.

B. Continuing Education

Neil Pliskin prepared a written report. CE courses for the Toronto meeting have been arranged, and 27 total courses will be offered. Lunch and twilight programming will again be offered due to the strong approval ratings received from the Chicago meeting. The special topic theme for Toronto will be Behavioral Neurogenetics, with 7 courses offered. Course providing updates in neuropsychopharmacology and technology will also be offered. Work is already underway for CE offerings for the 2003 North American meeting in Hawaii. The specialty topic at that meeting will be Diversity in Neuropsychology.

Pliskin also provided data from the survey completed after the Chicago meeting about the new CE activities first offered in Chicago. The small percentage of the membership who returned the surveys was most favorable in opinion about the special topic theme and new course time options.

C. Publications

Igor Grant prepared a financial statement for *JINS* for fiscal year 2001. *JINS* remained well within its budget for the year, and ended the year with a balance of $6,159.72.

Bornstein reported on contract negotiations with Cambridge University Press for *JINS*. A 10-year agreement has been reached, with the journal subscription rate to be increased from the current $43 to $47, for 5 years. Journal subscriptions will also include electronic access to the journal, tentatively scheduled to begin in January 2002. The search for a new Editor for *JINS* will begin in 2003, with the new Editor to assume the position in January 2006.

D. International Liaison

Bornstein reported that Bernice Marcopoulos has agreed to serve as Chair of the IOC. A report will be filed at the February 2002 Board meeting.

E. Site Selection

Bornstein reported that future meetings are scheduled as follows: Toronto, Ontario at the Royal York Hotel, February 13–16, 2002; Stockholm, Sweden, July 24–27, 2002; Honolulu, Hawaii at the Sheraton, February 5–8, 2003; Berlin, Germany at the Intercontinental Hotel, dates to be arranged; Baltimore, Maryland in February 2004; and, Brisbane, Australia in Summer 2004.

F. Nominations

Bornstein reported that the election slate is still not firm at this time, but should be set by this Friday. Bornstein will poll Board members at that time to gain Board approval of the final election slate. Robert Heaton will be stepping down as Treasurer having served the Society for 18 years in this position. The need for a transition plan and budget to assist in the transition with the newly elected Treasurer was discussed. A motion was made and approved to provide a $5,000.00 budget for the transition of the Treasurer's office (motion-Marcotte; second-Van Gorp).

6. Old Business

A. Educational Institute

Over the past few weeks, the Board has been communicating via electronic mail about the proposed Vivian Smith Advanced Studies Institute of the International Neuropsychological Society. A committee formed in February 2001 and chaired by Andrew Papanicolaou developed the proposal. The Board members have been in strong agreement that the proposed Institute is a very positive development and opportunity for the Society. The Board reviewed the history of the proposal and the committee's recommendations. Discussions raised a number of issues the Board felt remained to be resolved, including the geographic location of the institute, the composition of the administrative committee overseeing the institute, the feasibility of proposed stipends, as well as potential legal liability concerns for the Society. The Board directed Bornstein to communicate a series of questions to Papanicolaou, as well as to seek legal advice for the Society. Bornstein will then present the information to the Board, and a decision to adopt the proposed Institute will be reached.

B. Awards Committee

The Board has not received a report from this committee, charged with developing an infrastructure to the INS Awards Program to regulate and normalize the naming of the Society's awards. Bornstein will contact the Committee Chair.

C. Resources Committee

This committee, charged with developing a systematic plan for future allocations of the Society's financial resources, has not yet convened. The Board discussed several issues to be addressed by the Committee, such as cash revenues, dues, registration fees for meetings, and increased fees for journal subscriptions. The Society's expenses are increasing while membership has remained stable.

7. New Business

A. Electronic Abstract Submission

Bornstein presented information about the systems used for electronic submission of abstracts to scientific meetings by other organizations. An issue that remains to be explored is how an electronic submission system will interface with the Cambridge University Press system for abstracts to appear in *JINS*. The Board unanimously voted to have the Society move to an electronic abstract submission method by the February 2003 meeting in Honolulu (motion—Heaton; second-Van Gorp).

B. Board Travel Support

Several Board members raised concerns that the current Society policies for reimbursement for travel for Board members to attend the two Board meetings are not adequately covering actual expenses. Current reimbursement policies were reviewed, as were several examples provided by Board members of personal expenses incurred in the past year. After extensive discussions, the Board voted to change the reimbursement policy. Effective for the 2002 budget, Board members will be provided with up to $4,000.00 annually to cover travel and hotel expenses incurred for attending the Society's meetings, with an extra $1,000.00 allotted to any Board member who must make two cross-ocean trips within one year (motion-Heaton; second-Malec).

C. Development Committee Proposal

The Board discussed a proposal to formalize efforts to obtain industry funding for INS Annual meetings. A motion made to estab-

lish a Meeting Development Committee was unanimously approved (motion-van Gorp; second-Heaton).

D. Global Neurobehavioral Meeting

President Castro-Caldas presented information on efforts to organize a global neurobehavioral meeting to be held in Lisbon, Portugal in Summer 2007. The meeting organizers envision bringing together all scientific organizations involved in the study brain-behavioral relationships for this global meeting. The Board was supportive of the concept of the Society's involvement in such a meeting, and we would likely not schedule a separate INS mid-year meeting in 2007. A decision about the Society's involvement in the global meeting will be made when more definite information about the proposed global meeting is delineated.

E. Second International Luria Memorial Conference

An INS member brought to the Board's attention a recently distributed description for the Second International Luria Memorial Conference to be held in Moscow in September 2002 that lists INS as collaborating with the Conference. Dr. Bornstein will contact Dr. Janna Glozman to obtain further information, as the Society has not officially been approached for such collaboration.

8. Meeting Adjournment

There being no further business, the meeting was adjourned at 3:09 by President Castro-Caldas.

(*Minutes Approved February 12, 2002*)

Membership Business Meeting
July 7, 2001
Brasilia, Brazil

1. Call to Order

President Alexandre Castro-Caldas called the meeting to order at 5:20.

2. Treasurer's Report

Robert Heaton reviewed the INS Treasurer's Report. As of May 31, 2001, the Society had $1,087,606.75 balance brought forward. Collected revenues for 2001 to date, including membership dues, contributions, subscriptions, meeting incomes, and earned interest on accounts, total $340,236.83. Expenses for 2001 to date totaled $332,357.70, yielding a net income for the current calendar year of $7,879.13.

3. Committee Reports

A. Local Arrangements Committee

Lucia W. Braga reported that 350 people registered for the Mid-Year Conference. Sessions have been well attended, and the simultaneous translation services have been well received. A dinner will be held at the SARAH Hospital Lakeside Center July 7 in the evening and will feature local dancers and music, as well as traditional Brazilian dishes and wines.

On behalf of the membership, President Castro-Caldas extended warm thanks to Dr. Braga and the SARAH Hospital Network for their efforts in organizing and implementing the present meeting.

B. Program Committee

Stefano Cappa reported that the Program was running very smoothly. He thanked his committee members for their hard work, as well as the INS Central Office staff for their assistance.

4. Executive Secretary Report

Robert Bornstein reviewed for the membership the new 10-year contract signed with Cambridge University Press to publish the *Journal of the International Neuropsychological Society* (*JINS*). Electronic access to *JINS* was also negotiated in the deal, and it is hoped that this access will become available to Society members by January 2002.

Bornstein also reported on the Board's decision to move forward with electronic abstract submissions for future Society's meetings, beginning with the meeting in Honolulu, Hawaii in February 2003.

Bornstein then reviewed future sites for the Society Meetings, including: Toronto at the Royal York Hotel, February 13–16, 2002; Stockholm, Sweden July 24–27, 2002; Honolulu, Hawaii, February 5–8, 2003; Berlin, Germany at the Intercontinental Hotel, dates to be arranged; Baltimore, Maryland in February 2004; and, Brisbane, Australia in Summer 2004. Future possible mid-year sites being explored include Dublin, Ireland and Hong Kong.

5. New Business

Frank LeFever reviewed issues he has raised at recent Business Meetings pertaining to promoting the participation of INS members or potential members for whom participation in Society activities is difficult due to economic and/or geographic variables. At the present meeting, LeFever has posted and distributed a handout outlining a proposal for the establishment of a Vertical Liaison Committee. LeFever made a motion for the establishment of a Vertical Liaison Committee "for sustained study of what would be needed to implement the specifics of my prior motions, and/or to develop alternative ways of enabling full participation in *all* INS activities by *all* current and potential INS members (students as well as economically, geographically, or linguistically "disadvantaged" professionals)." President Castro-Caldas asked for a second for the motion and none was received. The motion therefore failed for lack of a second.

6. Meeting Adjournment

President Castro-Caldas concluded by making a few remarks about the history of INS holding scientific meetings around the world, and his pleasure at having presided over the Society's first South American meeting. There being no further business, he adjourned the meeting at 5:39.

(*Minutes approved February 12, 2002*)

Journal of the International Neuropsychological Society (2002), **8**, 529–530.

International Neuropsychological Society 2001 Annual Report

January 1, 2001–December 31, 2001

Balance brought forward		**$1,087,606.70**
REVENUES		
Dues & Application Fees		
1999 Regular	720.00	
2000 Regular	5,925.00	
2000 Associate	485.00	
2001 Regular	89,587.00	
2001 Associate	9,957.50	
2001 Emeritus	140.00	
2001 Institutional	50.00	
2002 Regular	198,574.50	
2002 Associate	11,520.00	
2002 Hardship	135.00	
2002 Emeritus	700.00	
2002 Institutional	50.00	
2001 Application Fees	2,400.00	
2002 Application Fees	1,355.00	
Total		321,598.00
Awards and Funds		
Benton Award	1,246.00	
Butters Award	841.00	
Cermak Award	661.00	
Matthews Scholarship Fund	1,266.00	
Rennick Award	341.00	
Total		4,355.00
Mailing List rental, P/P, Infomedix		
Label Orders	10,771.61	
Positions and Posts, mail	1,200.00	
Total		11,971.61
JINS		
Cambridge Editorial Support	35,000.00	
Royalties	4,221.43	
Total		39,221.43
Meeting Income		
Brussels		
Reimbursement from Momentum	14,000.00	
Total		14,000.00
Chicago		
Exhibitors	7,100.00	
Registration	73,390.00	
CE Fees	63,220.00	
California CE Fees	140.00	
Sponsorship	17,950.00	
Advertisements	1,050.00	
Audio Tape Royalties	1,218.00	
Total		164,068.00
Brazil		
Exhibitors	900.00	
Registration	12,535.00	
CE Fees	940.00	
Travel Tours	890.00	
Accompanying Person	400.00	
Total		15,665.00
Toronto		
Advertising	150.00	
CA MCEP	100.00	
CE Fees	50,253.97	
Exhibitors	7,650.00	
Registration	53,545.00	
Sponsorship	6,900.00	
Total		118,598.97
Interest Income		
Federated Interest	1,262.93	
Investment Interest	44,765.25	
Total		46,028.18
Miscellaneous Income		
American Neuropsychiatric Association		
phone, fax, postage	1,197.18	
rent	1,200.00	
Oxford Royalties	202.93	
Total		2,600.11
TOTAL REVENUES		**$738,107.30**
EXPENSES		
Administration		
Board Conference Calls	1,163.50	
Board Insurance	1,520.00	
Board Travel	27,378.74	
Incorporation fees	80.00	
Treasurer's office (labor)	4,000.00	
Treasurer's office (supplies)	52.95	
Treasurer's office (stipend)	10,000.00	
Total		44,195.19
Executive Secretary		
Stipend	12,000.00	
Printing	17,116.68	
Postage	14,161.12	
Mailing	2,718.55	
Shipping	871.86	
Telephone & Fax	3,453.00	
OSU Computer Services & Software	703.00	
Supplies	3,920.73	

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Rent	14,400.17	
Travel Reimbursement	4,226.73	
Labor	64,174.94	
Equipment Repairs & Maintenance	2,556.53	
Audit & Consulting	1,280.00	
Total		141,583.31
JINS		
Editor in Chief stipend	10,000.00	
Editorial Expenses	10,000.00	
Labor & Rent	27,000.00	
Supplies	3,000.00	
Cambridge	167,198.95	
Total		217,198.95
Continuing Education Committee		
Stipend	4,000.00	
Labor	606.25	
Travel Reimbursement	112.97	
Supplies	100.40	
MCEP-CA Fees	238.00	
OSU CME Fees	1,500.00	
ASHA Fees	375.00	
APA Fees	350.00	
Total		7,282.62
ILC		
Phone	138.21	
Sponsored Programs	1,167.00	
Labor	444.00	
Web Site Fees	60.00	
Total		1,809.21
Publications Committee		
Stipend	4,000.00	
Travel Reimbursement	268.00	
Total		4,268.00
Meeting Expenses		
Chicago		
Board Dinner	2,242.84	
Travel Reimbursement	12,731.73	
CE Expenses (copies)	4,579.36	
Shipping (includes package room charges)	4,427.61	
Supplies	11,968.54	
Labor	10,853.00	
Honoraria	18,450.00	
AV Charges	64,477.57	
Food & Beverage	92,943.22	
Postage	160.58	
Total		222,834.45
Brazil		
Travel Reimbursement	3,023.43	
Printing	548.46	
Honoraria	5,250.00	
Shipping	1,173.11	
Supplies	548.46	
Total		10,543.46
Toronto		
Program Chair Labor	2,397.89	
Shipping	1,247.61	
Supplies	400.00	
Travel Reimbursement	400.00	
Total		4,445.50
Stockholm		
Shipping	153.24	
Total		153.24
Awards		
Butters Award	250.00	
Cermack Award	500.00	
Rennick Award	250.00	
Total		1,000.00
Miscellaneous		
Bank fees	10,283.20	
Total		10,283.20
TOTAL EXPENSES		**$665,597.13**
NET INCOME (Revenue − Expenses)		**72,510.17**
Assets		
Fund Balances		
Benton	13,314.00	
Butters	13,933.00	
Cermak	5,670.00	
Matthews	11,156.00	
Rennick	1,825.00	
Fund Balances Total		45,898.00
Investments		
33743M43	100,000.00	
39739CHK8	100,000.00	
4418003P2	100,000.00	
14056MAA3	100,000.00	
74407MMC6	100,000.00	
BPM117497	95,763.33	
BPM121471	96,133.59	
52519CSK5	1,000.00	
Investment Total		791,896.92
Federated Money Market		34,492.33
Huntington Checking (less fund balances)		186,967.22
OSU Account		100,834.03
TOTAL ASSETS		**$1,160,116.90**

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ARTICLES AND DEPARTMENT SECTION