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66 Omega-3 Fatty Acids, Cognition, and Brain Volume in Healthy Elderly Adults

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Objective: One common concern amongst the aging population is that of worsening memory. Speed of processing and executive functions are also areas of age-related decline that affect daily living. Lifestyle modifications such as diet, exercise, and sleep have garnered intense interest as potential methods to prevent or delay cognitive decline. Among dietary factors, omega-3 fatty acids (FAs) have been documented as containing a myriad of health benefits, including neuroprotective effects. The aim of this study is to examine the associations between omega-3 FAs, cognitive function, and neuroanatomical regions of interest in a healthy aging population.

Participants and Methods: Adults aged 65 and older (n=40, 48.9% Female) were recruited for the Loma Linda University Adventist Health Study-2 Cognitive and Neuroimaging Substudy. Participants had a mean age of 76.25 years (SD=8.29), 16.78 years of education (SD=2.53), and were predominantly White (85.0%). Participants received a two-hour neurocognitive battery, including measures of immediate and delayed memory (Rey Auditory Verbal Learning Test, RAVLT; WMS-IV Logical Memory, LM), processing speed (Stroop), and executive functions (Stroop Color/Word). Participants underwent brain imaging on a 3T Siemens MRI, including a 3D T1-weighted MPRAGE sequence. Cortical reconstruction and volumetric segmentation were performed using FreeSurfer software. Blood samples were collected for fatty acid analysis. Individual FAs were expressed as a percent of total FAs. An omega-3 index was constructed as the sum of

eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) FAs. Correlational analyses, controlling for age, sex, and education, investigated relationships between omega-3 levels (individual and index) and (a) cognitive function (immediate and delayed memory, processing speed, executive functions), and (b) brain volumes in specific regions of interest (hippocampus, entorhinal cortex, frontal pole, white matter).

Results: EPA was significantly positively correlated with Stroop Color ($r=.34$, $p=.048$). Although not statistically significant, trends were observed between the omega-3 index and Stroop Color ($r=.30$, $p=.08$), and between both DHA and the omega-3 index with RAVLT – delayed recall ($r=.29$, $p=.095$; $r=.30$, $p=.08$, respectively). With regards to regional brain volumes, EPA and the omega-3 index were both significantly positively correlated with the entorhinal cortex ($r=.34$, $p=.041$; $r=.41$, $p=.01$, respectively) and white matter volume ($r=.36$, $p=.028$; $r=.34$, $p=.038$, respectively). DHA was significantly positively correlated with white matter volume ($r=.34$, $p=.044$).

Conclusions: Blood levels of EPA were positively correlated with a measure of processing speed, and trends were observed between DHA, the omega-3 index and [GN1] verbal memory, and between the omega-3 index and processing speed. We also found that omega-3 FA values were associated with greater brain volume in the entorhinal cortex and white matter in our sample of healthy older adults. Atrophy of the entorhinal cortex has been associated with pathological processes. Additionally, white matter is known to effect processing speed. These findings may offer support for the idea that omega-3 FAs exert their neuroprotective effects by fortifying areas of the brain, specifically the entorhinal cortex and white matter, that promote maintenance of cognitive function in late life.

Categories: Aging

Keyword 1: aging (normal)

Keyword 2: cognitive functioning

Keyword 3: neuroimaging: structural

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67 Cognitive Reserve, Depressive Symptoms, and Functional Ability in Older Adults

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Objective: Cognitive reserve has been linked to functional ability, and depression has been shown to be associated with more functional impairment in older adults. While cognitive reserve and depression are associated and have each been shown to impact functional impairment, the independent impact of cognitive reserve on functional ability after accounting for depressive symptoms has not been explored. For the purpose of this study, years of education served as a proxy for cognitive reserve, which is consistent with the literature. It was predicted that higher levels of education would be associated with better functional ability regardless of age and severity of depressive symptoms.

Participants and Methods: Participants (ages 55 to 90) were drawn from the Alzheimer's Disease Neuroimaging Initiative (N=3407); participants with major depression were not included. Subsyndromal depressive symptoms were measured using the Geriatric Depression Scale (GDS < 6) and functional impairment was assessed using the Functional Activities questionnaire. A three-stage hierarchical regression was conducted with functional ability as the dependent variable.

Results: Age, entered at stage one of the regression model, was a significant predictor ($F(1,1427) = 49.75, p < .001$) and accounted for 3.4% of the variance in functional ability. Adding depressive symptoms to the regression model led to a significant increase in variance explained ($F(1,1426) = 64.57, p < .001$), accounting for an additional 4.2% of the variance in functional ability. Adding years of education to the regression model explained an additional 1.4% of variance in functional ability and this increase in variance explained was significant ($F(1,1425) = 22.53, p < .001$).

Conclusions: Cognitive reserve (operationalized as higher levels of education) was associated with higher functional ability even after accounting for age and depressive symptoms.

Categories: Aging

Keyword 1: activities of daily living

Keyword 2: cognitive reserve

Keyword 3: depression

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68 Associations between within-domain intraindividual variability and functional abilities in cognitively healthy older adults

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Objective: Cognitive performance, particularly in the domains of memory and executive functioning (EF), have been shown in previous research to predict decline in everyday functioning in older adults. The goal-control model posits that episodic memory difficulties cause weak or decaying task goals that lead to the omission of every day task steps (low accomplishment). EF difficulties preclude control over the execution of task goals that lead to inefficient and error-prone performance (high errors). Intraindividual variability (IIV) in neuropsychological test performance has been proposed as a noninvasive early marker of dementia and has utility in cognitively healthy older adults. In this study we examined cross-sectional relations between within-domain IIV in memory and attention/EF with performance of everyday tasks in the lab. We expected greater memory IIV to be associated with task accomplishment (goal decay), and greater attention/EF IIV to be associated with errors (poor control over goals).

Participants and Methods: 40 cognitively normal (CN) older adult (65+) participants (M age=71.44, SD=10.62; 73.8% women; 85.7% White; M education=18.55, SD=8.38) completed the Naturalistic Action Test (NAT), requiring completion of standardized, everyday tasks (i.e., breakfast, lunch) and scored for accomplishment of steps and various errors (micro-errors - misreach to distractor object, extra actions; overt -sequence, perseverative behaviors, etc.; motor errors). Within-domain IIV measures were calculated for 6 memory measures (HVLt-R, BVMT-R) and 6 attention/EF measures (Digit Span, Trail Making Test, Salthouse Letter/Pattern Comparison). First, raw scores for each test were z-transformed, then the