decreased white matter integrity. Higher WMH load associates with reduced threshold for clinical expression of cognitive impairment and dementia. The effects of WMH on response to cognitive training interventions are relatively unknown. The current study assessed (a) proximal cognitive training performance following a 3-month randomized control trial and (b) the contribution of baseline whole-brain WMH load, defined as total lesion volume (TLV), on pre-post proximal training change.
Participants and Methods: Sixty-two healthy older adults ages 65-84 completed either adaptive cognitive training (CT; n=31) or educational training control (ET; n=31) interventions. Participants assigned to CT completed 20 hours of attention/processing speed training and 20 hours of working memory training delivered through commercially-available Posit Science BrainHQ. ET participants completed 40 hours of educational videos. All participants also underwent sham or active transcranial direct current stimulation (tDCS) as an adjunctive intervention, although not a variable of interest in the current study. Multimodal MRI scans were acquired during the baseline visit. T1- and T2-weighted FLAIR images were processed using the Lesion Segmentation Tool (LST) for SPM12. The Lesion Prediction Algorithm of LST automatically segmented brain tissue and calculated lesion maps. A lesion threshold of 0.30 was applied to calculate TLV. A log transformation was applied to TLV to normalize the distribution of WMH. Repeated-measures analysis of covariance (RM-ANCOVA) assessed pre/post change in proximal composite (Total Training Composite) and sub-composite (Processing Speed Training Composite, Working Memory Training Composite) measures in the CT group compared to their ET counterparts, controlling for age, sex, years of education and tDCS group. Linear regression assessed the effect of TLV on post-intervention proximal composite and sub-composite, controlling for baseline performance, intervention assignment, age, sex, years of education, multisite scanner differences, estimated total intracranial volume, and binarized cardiovascular disease risk.
Results: RM-ANCOVA revealed two-way group*time interactions such that those assigned cognitive training demonstrated greater improvement on proximal composite (Total Training Composite) and sub-composite (Processing Speed Training Composite, Working Memory Training Composite) measures compared to their ET counterparts. Multiple linear regression showed higher baseline TLV associated with lower pre-post change on Processing Speed Training sub-composite ($\beta = -0.19$, $p = 0.04$) but not other composite measures.
Conclusions: These findings demonstrate the utility of cognitive training for improving post-intervention proximal performance in older adults. Additionally, pre-post proximal processing speed training change appear to be particularly sensitive to white matter hyperintensity load versus working memory training change. These data suggest that TLV may serve as an important factor for consideration when planning processing speed-based cognitive training interventions for remediation of cognitive decline in older adults.

Categories: Aging
Keyword 1: aging (normal)
Keyword 2: cognitive rehabilitation
Keyword 3: neuroimaging: structural
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3 Associations Between Exercise Type, Fluid Intelligence, and Processing Speed in the Oldest-Old

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Objective: Exercise elicits a variety of physiological responses in the body. In the brain, exercise can modulate levels of neurotransmitters and other neurochemicals as well as sparking neurogenesis and structural changes. Downstream psychological effects of exercise include changes in mood and cognition. These changes vary depending on the type of exercise conducted (e.g., running versus strength training). While much is known about the effects of exercise in animals and adult humans, literature on the oldest-old (>= 85 years

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old) is sparse. The present cross-sectional study explores the relationship between exercise and cognition in the oldest-old.
Participants and Methods: The final sample includes 194 cognitively healthy participants (106 females, MoCA mean score = 24.75) aged 85 to 99 years old (mean = 88.48). Each participant completed the Community Healthy Activities Model Program for Seniors (CHAMPS) questionnaire and a cognitive battery comprising of the NIH Toolbox, digit coding, symbol search, verbal fluency, and Stroop task. Three groups (sedentary, cardio, and cardio plus strength training) were derived from responses on CHAMPS.
Results: The cardio plus strength training group performed significantly better on the cognitive measures compared to the sedentary group. For two measures, digit coding and symbol search, the cardio plus strength training group also performed significantly better than the cardio group. Cardio group did not significantly differ from the sedentary group on the cognitive measures. All at $p < 0.05$ and adjusted for multiple comparisons.
Conclusions: Our findings suggest exercise in the oldest-old is linked with higher fluid intelligence and better performance on cognitive measures of processing speed and that there may be an additive effect of exercise types on cognition.

Categories: Aging
Keyword 1: aging (normal)
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4 Misinterpreting cognitive change over multiple timepoints: When practice effects meet age-related decline

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Objective: Practice effects (PE) on cognitive testing impede our ability to accurately assess change. In particular, they hamper the detection of mild cognitive impairment (MCI) and progression to dementia by delaying the point at which test scores fall below diagnostic impairment cutoffs. When decline over time is expected, as with older adults or progressive diseases, failure to adequately address PEs may lead to inaccurate conclusions because PEs artificially boost scores while pathology-related or age-related decline reduces scores. The participant-replacement method accounts for PEs by comparing performance of demographically-matched replacement participants to returnees who have been tested previously. Unlike most methods, the participant-replacement method can separate pathology- or age-related decline from PEs; however, this method has only been used across two timepoints. Neuropsychologists tend to think that PEs level out after the first follow-up, but this issue has not been evaluated in models that allow PEs in the presence of overall decline. Including more than two timepoints makes it possible to determine if PEs level out after the first follow-up, but it is analytically challenging because individuals may not be assessed at every timepoint.
Participants and Methods: We examined 1190 older adults in the Alzheimer's Disease Neuroimaging Initiative who were cognitively unimpaired (n=809) or had MCI (n=381) at baseline. Participants completed six neuropsychological measures (Trails A, Trials B, Boston Naming Test, Category Fluency, Logical Memory, Rey Auditory Verbal Learning Task) at three timepoints (baseline, 12-month, 24-month). We implemented the participant-replacement method using generalized estimating equations in comparisons of matched returnees and replacements to calculate PEs. Propensity scores matched individuals on age, education, sex, and an estimate of premorbid functioning. Generalized estimating equations modeled PEs and age-related decline separately for each cognitive measure.

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