we used a single voxel method to examine 31p MRS ratios (bilateral prefrontal and left temporal). Mitochondrial function was estimated by computing 5 ratios for each voxel: summed adenosine triphosphate to total pooled phosphorous (ATP/TP; momentary energy), ATP to inorganic phosphate (ATP/Pi; energy consumption), phosphocreatine to ATP (PCr/ATP; energy reserve), phosphocreatine to inorganic phosphate (PCr/Pi; oxidative phosphorylation), and phosphomonoesters to phosphodiesters (PME/PDE; cellular membrane turnover rate). All ratios were corrected for voxel size and cerebrospinal fluid fraction. Separate repeated measures analyses of variance controlling for scanner site differences (RM ANCOVAs) were performed.
Results: 31p MRS ratios were unrelated to demographic characteristics and were not included as additional covariates in analyses. Results of separate RM ANCOVAs revealed all 31p MRS ratios of mitochondrial function were greater in left temporal relative to bilateral prefrontal voxel: ATP/TP ($p < .001$), ATP/Pi ($p = .001$), PCr/ATP ($p = .004$), PCr/Pi ($p = .004$), and PME/PDE ($p = .017$). Effect sizes (partial eta squared) ranged from 0.6-.20.
Conclusions: Consistent and extending one prior study, all 31p MRS ratios of mitochondrial function were greater in temporal as compared to frontal regions in older adults at-risk for AD. This may in part be related to the intrinsically high metabolic rate of the temporal region and preferential age-related changes in frontal structure-function. Alternatively, findings may reflect the influence of unaccounted factors (e.g., hemodynamics, auditory stimulation). Longitudinal study designs may inform whether patterns of mitochondrial function across different brain regions are present early in development, occur across the lifespan, or some combination. In turn, this may inform future studies examining differences in mitochondrial function (as measured using 31p MRS) in AD.

Categories: Aging
Keyword 1: neuroimaging: structural
Keyword 2: frontal lobes
Keyword 3: temporal lobes
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19 Exploring GABA Concentration Changes in Sensorimotor Cortex in Older Adults During Motor & Cognitive Performance

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Objective: Aging is associated with changes in cortical excitability which may affect motor learning and cognitive function via selective modulation of gamma aminobutyric acid (GABA). Previous studies using magnetic resonance spectroscopy (MRS) to measure GABA in older adults found that increased baseline GABA levels in the sensorimotor cortex (M1S1) were associated with better motor performance. GABA levels in M1S1 have tended to decrease during the execution of a repeated motor sequence. The dynamic change in GABA density in M1S1 in older adults is currently unknown and represents a critical gap in our understanding of how it could impact motor learning and cognitive performance. As such, the purpose of the current study is to quantify changes in cortical GABA during motor learning in the aging brain and examine those changes in relation to motor and cognitive performance. We hypothesize that older adults with greater dynamic range in M1S1 GABA levels will display more efficient motor learning and increased cognitive scores.
Participants and Methods: We report on a total of 18 healthy older adults aged 64 to 80 years ($M = 70.44$, $SD = 4.99$, 12 females). Using MRS at 3T, we measured changes in GABA concentration in M1S1 at rest, during an eight or

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12 finger-movement motor entrainment task, and during a recall task. Gannett was used for GABA quantification relative to water. Change in GABA was calculated by subtracting Rest1 GABA from Recall1 GABA. In a separate session, participants completed a battery of cognitive assessments. We computed linear regressions to examine the relationship between dynamic GABA change, recall accuracy of the motor task and cognitive performance.
Results: In relation to motor performance, we found that both greater baseline (Rest1) GABA levels and greater dynamic change in GABA significantly predicted better recall accuracy on the motor task. For cognitive performance, we found that greater dynamic change in GABA significantly predicted better performance on Word Reading in the Stroop Color and Word Test and Delayed Recall in the Hopkins Verbal Learning Test (HVLT). No additional significant relationships were found for the remaining cognitive assessments.
Conclusions: Older adults who were able to accurately perform the task had a greater dynamic change in GABA and increased baseline GABA levels. These adults with greater dynamic change also had better cognitive performance on HVLT Delay and Stroop Word Reading. This modulation of GABA associated with better performance could be related to changes in neuroplasticity. Although these results are in the preliminary stages, they point to a greater understanding of aging related changes in motor and cognitive performance. We'll continue to explore the relationship between sensory motor performance and changes in GABA concentration as a potential predictor for cognitive performance and future rehabilitation.

Categories: Aging
Keyword 1: cognitive neuroscience
Keyword 2: brain plasticity
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20 The Impact of Perceived Pain on Neural Efficiency During Walking in Older Adults

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Objective: Pain is a mechanism for attention disruption due, in part, to a shared reliance on the prefrontal cortex (PFC). Amongst older adults, the experience of pain is both prevalent and functionally impactful. Dual-task walking (DTW) paradigms are a useful means of assessing the impact of pain on attentional control and known to be sensitive to changes in the cortical hemodynamic response within the PFC. To date, however, few studies have utilized such paradigms to examine the impact of self-reported pain on attentional control via assessment of cognitive, gait and neuroimaging outcomes. Examining these associations would facilitate a better understanding of the ways in which pain may negatively impact neural efficiency, thereby increasing risk of adverse functional outcomes, in healthy aging.
Participants and Methods: Study participants (N= 408; mean age = 76 ± 6.5ys; % female = 55.4) were grouped into pain (n= 266) and no pain (n= 142) groups based upon their responses on the MOS-PSS and MOS-PES. These questionnaires were also used to assess self-reported levels of pain severity and interference amongst individuals with reported pain. Functional near-infrared spectroscopy was used to measure intraindividual variability (IIV) of the cortical hemodynamic response within the PFC during a DTW paradigm which consisted of Single-Task-Walk (STW), Cognitive Interference (Alpha), and Dual-Task-Walk (DTW) conditions. Participants walked along an electronic walkway and quantitative gait data were extracted in order to assess IIV in stride length during STW and DTW conditions. The rate of correct letter generation was used as a measure of cognitive accuracy during Alpha and DTW conditions. Linear mixed effects models (LMEMs) were used to examine the effects of perceived pain on neural and behavioral responses as well as on the change in these outcomes form single- to dual-task conditions. Stratified LMEMs were used to examine whether these associations differed by gender.
Results: LMEMs revealed that perceived pain presence was associated with reduced IIV in PFC oxygenation (estimate = -0.032, p = 0.037) and reduced IIV in stride length in the DTW condition (estimate = -1.180, p = 0.006). High pain severity was associated with a greater

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