results suggest the role of the ST in the relationship between age and depression depends on level of family income, such that ST mFA explains more variance at lower income levels, and is no longer significant for children from families with income greater than 100k. These findings support the notion that environmental stressors (such as lower family income) may strengthen ST pathways via activity-dependent plasticity and repeated, coordinated activation (Rinaman et al., 2011). Future studies should examine these brain-behavior associations, as they may replicate in a larger sample, with more nuanced indicators of environmental stress.

Categories: Neuroimaging
Keyword 1: neuroimaging: functional connectivity
Keyword 2: social processes
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55 Within-Individual BOLD Signal Variability During a Letter N-Back Task: Implications for a Verbal Fluency Network

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Objective: Functional magnetic resonance imaging (fMRI) research has generally focused on drawing conclusions from average brain activation patterns. Importantly, the brain is inherently variable; growing literature has found that within-individual blood oxygen level-dependent (BOLD) signal variability may be meaningful, and not just "noise." For example, recent research has identified increased BOLD signal variability in healthy younger and older adults during more effortful/complex task loads of n-back paradigms, commonly used tasks that involve important elements of executive function (e.g., attention, working memory, planning, inhibition, etc.). Verbal fluency is a complex cognitive domain that also involves similar processes to generate words given certain rules. As a result, the current study builds on existing literature to investigate within-individual BOLD signal variability patterns in peak coordinates of a verbal fluency network during different loads of a letter n-back task. Due to greater executive demands, greater variability was expected during more effortful/complex n-back task loads in regions of a verbal fluency network.
Participants and Methods: Forty-eight healthy young adults (M_{age}(SD) = 22.41(4.47), 25 females) from the Atlanta area completed a letter n-back task in an MRI scanner. After standard processing in AFNI, images were corrected for motion and physiological artifacts, which may be confounding sources of variability. Volumes associated with each load of the letter n-back task (0-back, 1-back, 2-back, 3-back, crosshair) were identified. Task runs were normalized and respective run means were subtracted prior to concatenating all runs for each load type. Standard deviations were calculated across this mean-run corrected time series. Ten peak regions of interest (ROIs) were identified from a verbal fluency network generated from 84 peer-reviewed publications for this domain gathered on NeuroSynth. Paired samples t-tests with Benjamini-Hochberg correction for multiple comparisons were conducted to explore differences in variability during n-back task loads.
Results: In several of the verbal fluency network ROIs, within-individual BOLD signal variability was significantly greater for 2-back *versus* 0-back loads with medium to large effect sizes (p's < .001 - < .01, Cohen's d range: .53-.93). Variability was also significantly greater for 3-back *versus* 0-back loads with small to medium effect sizes (p's < .001 - < .01, Cohen's d range: .48-.74). Specific regions that evidenced this pattern included ROIs in the left inferior frontal gyrus, left cingulate, right inferior frontal gyrus, left middle frontal gyrus, and left superior parietal lobule. Only two regions demonstrated increased variability in the 1-back load *versus* crosshair (left middle frontal gyrus, p < .001, d = .63; left lentiform nucleus, p < .05, d = .42). No regions demonstrated a significant difference in variability in the 0-back load *versus* crosshair.
Conclusions: This study contributes to growing literature examining within-individual BOLD signal variability in healthy individuals by exploring variability patterns in a verbal fluency network. The observed pattern of results supports the hypothesis and is in line with previous research, demonstrating that greater variability occurs with greater executive task demands. Future research can use an in-scanner task of verbal fluency and can extend

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variability findings during this in-scanner task to out-of-scanner measures of verbal fluency.

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56 Chronic Musculoskeletal Pain, Biobehavioral and Psychosocial Resilience Index, and Brain Age Gap

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Objective: Chronic musculoskeletal pain is associated with neurobiological, physiological, and cellular measures. Importantly, we have previously demonstrated that a biobehavioral and psychosocial resilience index appears to have a protective relationship on the same biomarkers. Less is known regarding the relationships between chronic musculoskeletal pain, protective factors, and brain aging. This study investigates the relationships between clinical pain, a resilience index, and brain age. We hypothesized that higher reported chronic pain would correlate with older appearing brains, and the resilience index will attenuate the strength of the relationship between chronic pain and brain age.
Participants and Methods: Participants were drawn from an ongoing observational multisite study and included adults with chronic pain who also reported knee pain (N = 135; age = 58.3 ± 8.1; 64% female; 49% non-Hispanic Black, 51% non-Hispanic White; education Mdn = some college; income level Mdn = $30,000 - $40,000; MoCA M = 24.27 ± 3.49).
Measures included the Graded Chronic Pain Scale (GCPS), characteristic pain intensity (CPI) and disability, total pain body sites; and a cognitive screening (MoCA). The resilience index consisted of validated biobehavioral (e.g., smoking, waist/hip ratio, and active coping) and psychosocial measures (e.g., optimism, positive affect, negative affect, perceived stress, and social support). T1-weighted MRI data were obtained. Surface area metrics were calculated in FreeSurfer using the Human Connectome Project's multi-modal cortical parcellation scheme. We calculated brain age in R using previously validated and trained machine learning models. Chronological age was subtracted from predicted brain age to generate a brain age gap (BAG). With higher scores of BAG indicating predicated age is older than chronological age.
Three parallel hierarchical regression models (each containing one of three pain measures) with three blocks were performed to assess the relationships between chronic pain and the resilience index in relation to BAG, adjusting for covariates. For each model, Block 1 entered the covariates, Block 2 entered a pain score, and Block 3 entered the resilience index.
Results: GCPS CPI (R2 change = .033, p = .027) and GCPS disability (R2 change = 0.038, p = 0.017) significantly predicted BAG beyond the effects of the covariates, but total pain sites (p = 0.865) did not. The resilience index was negatively correlated and a significant predictor of BAG in all three models (p < .05). With the resilience index added in Block 3, both GCPS CPI (p = .067) and GCPS disability (p = .066) measures were no longer significant in their respective models. Additionally, higher education/income (p = 0.016) and study site (p = 0.031) were also significant predictors of BAG.
Conclusions: In this sample, higher reported chronic pain correlated with older appearing brains, and higher resilience attenuated this relationship. The biobehavioral and psychosocial resilience index was associated with younger appearing brains. While our data is cross-sectional, findings are encouraging that interventions targeting both chronic pain and biobehavioral and psychosocial factors (e.g., coping strategies, positive and negative affect, smoking, and social support) might buffer brain aging. Future directions include assessing if chronic pain and resilience factors can predict brain aging over time.

Categories: Neuroimaging
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