3 Are we Up-Front About Switching or are we Side-Stepping the Issue: Localization of Cognitive Switching Measures with Cortical Thickness

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Objective: Set-shifting/switching tasks, among other measures of executive functioning, are typically thought to represent frontal lobe functioning. However, the neuroanatomical correlates of these tests are not fully established. The aim of this study was to examine associations between individual measures of set-shifting/switching and cortical thickness. We hypothesized that performance on each switching measure would strongly correlate with aggregated cortical thickness within the frontal lobe.
Participants and Methods: Measures of interest included set-shifting subtests of the Delis-Kaplan Executive Function System (DKEFS): Color-Word Inhibition Switching, Category Switching, and Trail Making Test Number-Letter Switching. Archival data from an outpatient memory disorders clinic were reviewed to identify individuals whose neuropsychological evaluations included the measures of interest and had quality-assessed, volumetric MRI data available (n=243; 53.1% male, 81.9% Caucasian, M_{age}=72.4, SD_{age}=6.7). Cortical thickness values were generated by FreeSurfer and averages were calculated for both frontal and temporal lobes, separately. Using partial correlations, controlling for age, we explored associations between each switching trial separately with right and left, frontal and temporal cortical thickness. The strength of associations within each lobe were then compared using Fisher's r-to-z transformations.
Results: Category Switching was significantly correlated with left and right hemisphere temporal thickness (r=0.38 and 0.31, respectively), but was not significantly correlated with left or right frontal lobe cortical thickness (r=.12 and .07, respectively). Fisher's r-to-z transformations revealed significantly stronger relationships between Category Switching and temporal thickness, rather than frontal thicknesses. Trails Switching was also significantly correlated with left and right temporal cortical thickness (r=-0.28, and =-0.23, respectively) and bore weaker associations with frontal cortical thickness (r=-.13 and r = -.14 for left and right hemispheres, respectively). In contrast, Color-Word Inhibition-Switching did not show a significant relationship with frontal or temporal cortical thickness.
Conclusions: Contrary to our hypothesis, stronger associations were observed with temporal lobe cortical thickness for Category Switching. Category Switching involves a language production component which could explain the strong association with temporal cortical thickness compared to frontal cortical thickness. Additionally, the pattern of associations between Trails Switching and frontal and temporal thickness was non-specific. Perhaps most striking is the lack of association between each switching measure and frontal cortical thickness, which was unexpected, given that these measures are used to assess executive functioning, broadly localized to the frontal lobe. Future directions involve examining the associations of these measure with subcortical structures and replicating these findings in larger datasets.

4 Risk Factor and Biomarker Correlates of FLAIR White Matter Hyperintensities in Former American Football Players

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