Exploring white matter integrity and cognitive-motor performance in healthy aging compared to increased dementia risk
Alica Rogojin$^{1,2}$, Diana Gorbet$^{1,2}$, Kara Hawkins$^1$, Lauren Sergio$^{1,2}$

$^1$School of Kinesiology and Health Science, York University, Toronto, ON, Canada
$^2$Centre for Vision Research, York University, Toronto, ON, Canada

Introduction: Cognitive-motor integration (CMI) involves concurrent thought and action, which requires the interaction of large networks in the brain$^1$. Previous findings have shown that CMI performance is impaired in individuals with specific dementia risk factors (family history of dementia and presence of the APOE e4 allele)$^2$. These findings suggest that CMI impairments are associated with early dementia-related brain changes. The objectives of the current research study are 1) to examine changes in white-matter integrity associated with dementia family history, sex, and APOE status, and 2) to assess the relationship between white matter integrity and cognitive-motor performance.

Methods: Participants included right-handed older adults with a high-risk (n=25, 12 female) and a low-risk (n=24, 12 female) for dementia. Participants were tested on four visuomotor tasks where reach and gaze were increasingly spatially dissociated using two linked touchscreens. These tasks included a standard condition requiring direct interaction with visual targets, and three dissociated non-standard conditions requiring CMI (visual feedback reversal, plane-change, and plane-change + feedback reversal). APOE genotyping was determined from salivary measures, and diffusion-weighted magnetic resonance images (dw-MRI) were collected to look at white matter integrity. Automated fiber quantification (AFQ) was used to characterize white matter properties in healthy aging compared to increased dementia risk.

Results: Preliminary analysis of these data has revealed significant correlations between the mean fractional anisotropy in white matter tracts and CMI task performance. These data support our hypothesis that disruptions in CMI performance are associated with identifiable brain alterations early in disease progression.

Conclusion: The preliminary findings provide insight into the impact of AD pathology on neural networks underlying complex visuomotor transformations, and demonstrate that the CMI paradigm discussed in this study may be used as a non-invasive, easily accessible assessment tool for dementia risk.