



# 16<sup>th</sup> Annual Brain Injury Conference

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## Poster #: 16

**Abstract Title:** Concussion recovery and multi-domain integration in working-aged adults: Integrating cognition, balance, and visuomotor action for skilled performance in adults with persistent symptoms

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### **ABSTRACT:**

**Abstract Theme:** Mild TBI / Concussion

**Topic(s) of Interest:** Basic Research

**Purpose of Project:** Concussion in working-aged adults is understudied, yet compromised brain network connectivity involving cognitive-motor and visual-vestibular integration may contribute to persisting concussion symptoms. Thus, the purpose of this project is to characterize integration task performance deficits of working-aged participants as a function of post-concussion symptoms (vs. healthy controls) and sex.

**Methods, Procedure, Results/Outcome, Conclusion:** Methods: 27 concussed participants (symptomatic(SC)=17, asymptomatic(AC)=10, 16 female) and 17 healthy controls (9 female), aged 26-52 years, completed two tasks: cognitive-motor integration (CMI) and visual-vestibular integration (VVI). CMI performance was assessed using a tablet. Participants completed a complex visuomotor task involving movements of a target on the bottom half of a screen while viewing the target move in the reverse direction on the upper half of the screen. Visuomotor measures included upper limb movement time (MT), peak velocity (PV), and total path length (PL) of the hand. VVI performance was assessed using a virtual reality environment. Participants stood on a force plate while they were visually moved down a grocery store aisle at 3 optic flow speeds (1.5, 3.0, and 4.5 m/s). Visual perturbations (linear accelerations) were introduced at either predictable or unpredictable intervals. Posturography measures included center of pressure total path length (postural sway), path length in the anterior-posterior (AP) and medial-lateral (ML) planes, and mean velocity in the AP and ML planes.

**Results:** In the CMI task, we observed a significant difference in MT between the sexes and between the concussed groups, with females and SC participants demonstrating greater MT than males and AS participants, respectively ( $p < 0.05$ ). For PV, we observed a significant difference in performance between the sexes, with SC males demonstrating slower PV compared to AC males, whereas females demonstrated similar velocities in both groups ( $p < 0.01$ ). For PL, we observed a significant difference in performance between the sexes, with SC females demonstrating longer PL compared to SC males ( $p < 0.05$ ). For the VVI task, we found that the unpredictable optic flow trials led to greater total postural sway than the predictable trials, but only for the SC group and primarily for the fastest optic flow speed ( $p < 0.05$ ). Further, this interaction was observed in the AP direction for both postural sway and velocity, whereas no interaction effects were observed in the ML direction ( $p > 0.05$ ).

**Conclusion:** Taken together, these findings show that performance in both integration tasks is impaired in working-aged adults with persisting concussion symptoms and that there are sex-related differences in their performance, suggesting that multi-domain integration issues may underlie the persistence of concussion symptoms and impairments differentially between males and females.