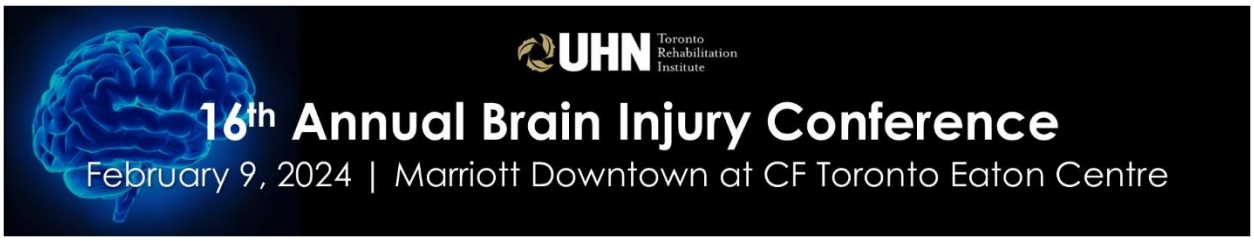

Poster #: 13

Abstract Title: Visual and Vestibular integration in Walking after Concussion

Author(s): Calaina Brooke[1], Stephen Perry[1,2], Stephanie Tran[1]

Organization/Affiliation: [1]University of Toronto, KITE; [2]University of Laurier

ABSTRACT:

Abstract Theme: Mild TBI / Concussion

Topic(s) of Interest: Basic Research

Purpose of Project: To observe the effects of concussion on sensory integration and balance during gait. This will be achieved by using virtual reality and galvanic vestibular stimulation to generate perturbations during gait.

Methods, Procedure, Results/Outcome, Conclusion: 25 total participants took part in the present study, of which 10 were concussed (CO; 28.4 +/- 7.3 years of age) and 15 were healthy controls (HA; 29.5 +/-4.5 years of age).

Participants completed three blocks of walking trials while wearing a VR headset and electrodes that elicited Galvanic Vestibular Stimulation (GVS). The first block (VIS) consisted of participants being presented a 'lab room' in the VR headset and a visual surround shift occurring as a function of the forward displacement of the participant. Visual perturbations were applied at -20° resulting in leftward deviation (L-VIS), +20° resulting in rightward deviation (R-VIS), or with no visual perturbation (N-VIS). 12 total trials were completed in this block (4 of each).

The second block (VES) consisted of the participants being presented with a dark room in the VR headset to mimic an eye's closed situation, with vestibular stimulation (right, left, or no stimulation). Thresholds were determined at the start of testing and GVS was elicited at 2x threshold. 12 total trials were completed in this block (4 of each).

Finally, the last block (INT) consisted of an integration perturbation where participants walked in the 'lab room' with vestibular stimulation. GVS was applied with no visual stimulation (R-GVS+N-VIS or L-GVS+N-VIS) or conflicting visual stimulation (R-GVS+L-VIS or L-GVS+R-VIS). This block included 16 randomized trials with four of each condition.

Primary outcome measures included absolute endpoint deviations and variability.

Results: An effect of group ($p<0.001$) was observed where CO (0.23 +/- 0.02m) had increased deviations compared to HA (0.12 +/- 0.02m) while walking in the dark environment. CO(0.24 +/- 0.02m) had increased deviations ($p<0.001$) in response to GVS perturbations compared to HA(0.15 +/- 0.02m). HA (0.44 +/-0.02)had increased deviations ($p<0.05$) in response to visual perturbations compared to CO(0.34 +/- 0.03m). CO (0.20 +/- 0.02m) had increased deviations during the GVS+N-VIS trials ($p<0.05$)compared to HA (0.10 +/- 0.02m). CO (0.34 +/- 0.02m) had increased deviations during the GVS+VIS trials ($p<0.05$) compared to HA(0.26+/-0.02m).

Conclusion: Increased deviations were observed in response to vestibular stimulation after concussion, however, no increased responses were seen in response to the visual stimulation. Individuals with concussion may use a more conservative strategy when completing a gait task thus resulting in the deceased response to visual stimuli.