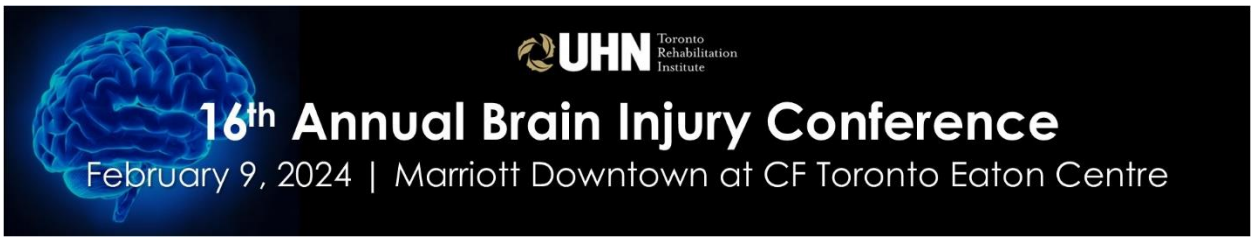

Poster #: 19

Abstract Title: Utility of an Augmented Reality (AR) Task for Assessing Mult-Domain Performance in Individuals with Persisting Concussion Symptoms: A Case Series Study

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ABSTRACT:

Abstract Theme: Mild TBI / Concussion

Topic(s) of Interest: Applied Research

Purpose of Project: In this case study, we examined the efficacy of a whole-body augmented reality (AR) task in assessing cognitive-motor integration (CMI) performance in individuals with persisting concussion symptoms.

Methods, Procedure, Results/Outcome, Conclusion: Methods: This case study included two young adults with persisting concussion symptoms following sport concussion (both female, mean age 24.5 years). Both participants first completed questionnaires recording their injury history, athletic experience, previous experience with technology, and following the experiment, completed a Simulator Sickness Questionnaire.

We used a Magic Leap 2™ AR system and custom programming (Unity, Inc.) to deliver a circuit that allowed the participant to walk freely while interacting with virtual objects in three dimensions. The nature of the AR system was such that participants had a complete view of their environment at all times, therefore reducing nausea and fall risk.

There were eight conditions (i.e., circuits) in the AR task: The basic level comprised natural walking while moving coloured objects (birds) to matching colour targets (nests) around the room with direct matching of hand motion and object motion. Increasing levels of difficulty required tandem walking, hand motion in the opposite direction to object motion, an object-target colour non-match, and a task/target switch. These conditions were performed both alone and in combination.

Before and after the AR task, which took approximately 15 minutes, participants performed a separate CMI assessment on a tablet (BrDI™ 3MotionAI inc.).

Results: We observed that increasing the difficulty level by adding concurrent balance and cognitive challenges worsened their circuit time by on average 54%. When completing the most difficult task, the users reduced their movements in the environment, restricting their hand motion by 6.7%. Further, we observed that following 15 minutes in the AR environment, both participants demonstrated improved CMI performance. Specifically, both participants showed improved reaction time, movement time, and precision by 14%, 17%, and 12% respectively, when performing the rule-based visuomotor task. Lastly, neither individual reported worsening symptoms after their time in the environment. Rather, they reported that it was enjoyable.

Conclusion: These data provide evidence that performing object interaction and gait in AR is a safe and ecologically valid approach for assessing rule-based visuomotor performance in adults with persisting concussion symptoms. Further, this novel technological approach shows promise as a useful and well-tolerated intervention in this population.