Notice of the Final Oral Examination
for the Degree of Master of Science

of

HILARY CULLEN

BKin Hons (Acadia University, 2013)

“Striking a balance with concussion assessment: Use of the Wii Balance Board to evaluate postural control”

School of Exercise Science, Physical and Health Education

Thursday, April 27, 2017
10:00 a.m.
Medical Services Building
Room 150

Supervisory Committee:
Dr. E. Paul Zehr, School of Exercise Science, Physical and Health Education, University of Victoria (Supervisor)
Dr. Brian Christie, School of Exercise Science, Physical and Health Education, UVic (Member)

External Examiner:
Dr. Shelina Babul, Department of Pediatrics, University of British Columbia

Chair of Oral Examination:
Dr. Juan Ausio, Department of Biochemistry and Microbiology, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies
Abstract

Background: Concussion assessments rely on a multifaceted approach where evaluation of balance and postural control plays an important role. Following a concussion, 67% of individuals report dizziness as a persistent symptom and 30% experience balance impairments. Studies incorporating the common Balance Error Scoring System (BESS) tool suggest that these impairments return to pre-injury baselines within ten days of incident. In contrast; however, studies incorporating more advanced posturography methods observe significant differences in balance up to one year following injury. While the BESS is consistently associated with low sensitivity and poor reliability scores, advanced posturography systems using force plates are not practical or accessible in most recreational sports environments. Recently, the Wii Balance Board (WBB) has been identified as a potential force plate proxy. Research confirms that the WBB is both valid and reliable in collecting center of pressure data. Thus, the WBB may be useful for investigating post-concussion balance deficits. Objective: The purpose of this study was to investigate the potential utility of a customized WBB program to assess postural balance in an athletic population. The study aimed to assess change in postural balance using the clinical BESS and WBB assessment tools to evaluate balance at fixed intervals during a regular athletic season and following concussion. Design: Prospective partial cohort. Methods: Balance was assessed at baseline, mid-, and post-season. Individuals who sustained a concussion during the study period were further assessed weekly for four weeks post-injury. Results: No significant differences were observed in raw BESS scores across regular season or post-concussion time points. In contrast, significant differences in several WBB outcome measures were observed. In the single stance condition, COPML worsened by 24% and COPT worsened by 9% between baseline and post-season time points (p=.002 and p=.007). In contrast, participants improved by 14% on a timed dynamic task (p=.003) between baseline and post-season time points. Following concussion, only the WBB dynamic outcome measures were found to be statistically significant. A positive trend was observed post-concussion, suggesting that a learning effect exists with the WBB program. Conclusion: Study results emphasize the importance of considering the progression of athletic season when interpreting baseline and post-concussion balance measurements. Study results support the use of a quantitative balance assessment, such as with a WBB, to improve measurement of static and dynamic postural balance.