



**University
of Victoria**

Graduate Studies

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

of

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BSc (University of Wisconsin - Stout, 2014)

**“Assessing the Impact of Concussion History on the N200, P300 and
Reward Positivity”**

School of Exercise Science, Physical and Health Education

Monday, December 4th, 2017
10:00 a.m.
McKinnon Building
Room 179

Supervisory Committee:

Dr. Olav Krigolson, School of Exercise Science, Physical and Health Education, University of Victoria
(Supervisor)

Dr. Steve Martin, School of Exercise Science, Physical and Health Education, UVic (Member)

External Examiner:

Dr. Gord Binsted, Department of Human and Social Development, University of British Columbia

Chair of Oral Examination:

Dr. Justin Albert, Department of Physics and Astronomy, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

Traumatic brain injuries (TBI) are one of the leading causes of disability worldwide (Zitnay, 2008), yet one of the least understood neurological conditions (Duncan, 2011). Research has examined short-term deficits; however, less focus has been on the consequences of multiple concussions. Previous electroencephalography (EEG) concussion research has examined the N200 and P300 human event-related potential (ERP) components, yielding inconclusive results (Duncan, 2005). A component not as frequently examined is the reward positivity, generated by the anterior cingulate cortex (ACC), a region which experiences increased anatomical stress following injury.

In this study, fifty-one students from the University of Victoria took a 'Concussion Survey' to determine participant history and groups; no history of concussion, a single injury or multiple injuries (2+). Participants performed an oddball and decision-making task while EEG data was collected.

No significant differences were found between groups for the N200, P300 or reward positivity peak latencies or amplitudes. Both concussion groups yielded attenuated peak amplitudes, but no differences existed between the group with a single concussion versus multiple. Unexpectedly, N200 and reward positivity peak latencies were greater in the group with single injuries, compared to those with a history of multiple concussions.

This study adds to a continuous line of inconclusive research on the N200 and P300, suggesting minimal cognitive deficits result from concussive injuries. Furthermore, no noticeable differences were observed between groups with a single versus multiple injuries. While the ACC is in a region of increased stress following head injury, functional deficits impacting the reward positivity may not be as significant as previously hypothesized. Results may be impacted by confounding variables, including not confidently being able to account for time since injury, injury severity and differences in gender dispersion of participants. With concussion on the rise, continued research, particularly longitudinally and within-subjects is critical for advancing both prevention and management of head injuries.