



**University
of Victoria**

Graduate Studies

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

of

JORDAN MIDDLETON

BSc (University of Victoria, 2017)

**“Midfrontal Theta and Cognitive Effort:
Real World Applications in Medical Decision-Making”**

School of Exercise Science, Physical and Health Education

Wednesday, August 21, 2019
2:00 P.M.
Clearihue Building
Room B017

Supervisory Committee:

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

Dr. Bruce Wright, Division of Medical Sciences, UVic (Outside Member)

External Examiner:

Dr. Kent Hecker, Department of Community Health Sciences, University of Calgary

Chair of Oral Examination:

Dr. Cody Poulton, Department of Pacific and Asian Studies, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

Medical choices can be life or death, and thus improving the accuracy of diagnostic decisions within a time constrained environment has a large potential for positive change. To that end, an adaptation of Dual Process Theory was developed to create a theoretical framework for medical decision making. In order to effectively measure this framework, a possible electroencephalographical link was investigated. During a complex medical diagnostic task, 52 participants were asked to diagnose what liver condition simulated patients had based on procedurally generated biometric data. Feedback was provided during a learning phase until the pattern was learned. During the experimental phase, possible ranges for the biometric data were extended, allowing for increased diagnostic difficulty in some trials, thereby producing conflict for the participants. This difference between the control (Type 1) trials and the high conflict (Type 2) trials was measured using electroencephalography. It was predicted that an elevation in midfrontal theta power would be observed in high-conflict trials, which would provide a neurological correlate for Type 2 processing. This hypothesis was not verified, although several modifications to the experimental design were provided to inform future investigations. It is likely that an improved paradigm would be able to distinguish between the two processes, providing vital neurofeedback that could inform future medical students and emphasize effective learning to improve diagnostic outcomes.