



**University  
of Victoria**

Graduate Studies

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

of

**CHAD WILLIAMS**

BSc (Hons) (University of Victoria, 2016)

**“Neurocognitive Mechanisms of Type 1 and Type 2 Decision Making  
Processes”**

School of Exercise Science, Physical and Health Education

Wednesday, July 25, 2018

1:00 p.m.

McKinnon Building

Room 155

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. Amy Warren, Veterinary Clinical and Diagnostic Science, University of Calgary

Chair of Oral Examination:

Dr. Brianna Turner, Department of Psychology, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

## **Abstract**

In an attempt to understand how humans make decisions, a wealth of researchers have explored the commonalities of different decision making demands. Two ranges of systems have been classified. Whereas Type 1 decision making is fast, automatic, and effortless, Type 2 judgments are slow, contemplative, and effortful. Here, I sought to determine underlying mechanisms of these processes. To do this, I present an extensive review and two electroencephalogram experiments. My review addresses theoretical models defining Type 1 and Type 2 decision making, discusses the debate between dual-process and continuous frameworks, proposes a novel insight into how these processes are selected and executed, and outlines neuroanatomical findings. In one experiment, participants retained digits (Type 1 processes) and completed mathematical computations (Type 2 processes). I found that cognitive control – as reflected by frontal theta – and attentional mechanisms – as reflected by parietal alpha – are core mechanisms in Type 1 and Type 2 decision making. In a second experiment, I sought to replicate these findings when trained students diagnosed diseases. Differences in theta and alpha activity were not seen. I posit that the discrepancy between experiments may be because cognitive control relies on uncertainty which existed in experiment one but not experiment two. Moreover, attentional mechanisms involve the retrieval of knowledge in which the demands would have differed in experiment one but not two. I conclude by describing how cognitive control and attention fit into my hypothesis of different decision making steps: process selection and execution. These findings are important as they could lead to the assessment of decision making processes in real-world contexts, for example with clinicians in the hospital. Moreover, they could be used in biofeedback training to optimize decisions.