University of Victoria | Graduate Studies

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

of

ROBERT TRSKA

BSc (Dalhousie University, 2015)

"Motor Expectancy: The Modulation of the Reward Positivity in a Reinforcement Learning Motor Task"

Interdisciplinary Studies

Friday, August 17th, 2018
10:00 a.m.
McKinnon Building
Room 187

Supervisory Committee:
Dr. Olav Krigolson, School of Exercise Science, Physical and Health Education, University of Victoria (Supervisor)
Dr. Clay Holroyd, Department of Psychology, UVic (Co-Supervisor)

External Examiner:
Dr. Gordon Binsted, Faculty of Health Sciences, University of British Columbia - Okanagan

Chair of Oral Examination:
Dr. James Nahachewsky, Department of Curriculum and Instruction, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

An adage posits that we learn from our mistakes; however, this is not entirely true. According to reinforcement learning theory, we learn when the expectation of our actions differs from outcomes. Here, we examined whether expectancy driven learning lends a role in motor learning. Given the vast amount of overlapping anatomy and circuitry within the brain with respect to reward and motor processes, it is appropriate to examine both motor control and expectancy processes within a singular task. In the current study, participants performed a line drawing task via tablet under conditions of changing expectancies. Participants were provided feedback in a reinforcement-learning manner, as positive (✓) or negative (x) based off their performance. Modulation of expected outcomes were reflected by changes in amplitude of the human event-related potential (ERP), the reward positivity. The reward positivity is thought to reflect phasic dopamine release from the mesolimbic dopaminergic system to the basal ganglia and cingulate cortex. Due to the overlapping circuitry of reward and motor pathways, another human ERP, the bereitschatftspotential (BP), was examined. The BP is implicated in motor planning and execution; however, the late aspect of the BP shares similarity with the contingent negative variability (CNV). Current evidence demonstrates a relationship between expectancy and reward positivity amplitude in a motor learning context, as well as modulation of the BP under difficult task conditions. Behavioural data supports prior literature and may suggest a connection between sensory motor prediction errors working in concert with reward prediction errors. Further evidence supports a frontal-medial evaluation system for motor errors. Additionally, results support prior evidence of motor plans being formed upon target observation and held in memory until motor execution, rather than their formation before movement onset.