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Mr. Mathew James Rocha Hammerstrom

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Mr. Mathew Rocha Hammerstrom

Language Skills

Language	Read	Write	Speak	Understand	Peer Review
English	Yes	Yes	Yes	Yes	Yes

Degrees

2016/9 (2020/5)

Bachelor's Honours, Bachelor's of Science, Kinesiology, University of Victoria
Degree Status: In Progress
Thesis Title: Portable Measurement of the Neural Basis of Clinical Decision Making

Areas of Research: Decision Making, Modeling of Learning Processes, Cognition

Research Disciplines: Neurosciences

Supervisors: Williams, Chad, 2018/2 - 2020/4; Krigolson, Olav, 2018/2 - 2020/4

Fields of Application: Biomedical Aspects of Human Health

Recognitions

National Sciences and Engineering Research Council (NSERC) Undergraduate Student Research Award (USRA) (Canadian dollar)
Prize / Award
The NSERC USRA is awarded to undergraduate students seeking financial support to develop skills in research that complement their studies. As a part of my work for this award, I will conduct data collection and analysis in efforts to create an improved method for the removal of ocular EEG artifacts.

Research Disciplines: Neurosciences

2019/9 - 2020/4

Jaime Cassels Undergraduate Research Award (JCURA) (Canadian dollar)
University of Victoria
Prize / Award
The goal of this award is to encourage undergraduates to pursue innovative and original research to enhance their learning while at the University of Victoria and to provide a valuable preparatory experience towards graduate studies or a research related career. It is granted to select undergraduate students completing a research component with their degree. As a part of my work for this award, I am completing an Honours Thesis project studying the neural basis of clinical decision making.

Areas of Research: Decision Making

Research Disciplines: Neurosciences

2019/5 - 2019/8	NSERC Undergraduate Student Research Award (USRA) (Canadian dollar) Natural Sciences and Engineering Research Council of Canada (NSERC) Prize / Award The NSERC USRA is awarded to undergraduate students seeking financial support to develop skills in research that complement their studies. As a part of my work for this award, I conducted data collection, analysis, and management for various neuroscience studies. These studies generally involved studying cognition, visual processing in the brain, and research methods. Areas of Research: Cognition, Vision Research Disciplines: Neurosciences

User Profile

Researcher Status: Researcher
Research Career Start Date: 2018/02/01
Engaged in Clinical Research?: No

Key Theory / Methodology: The main resarch methods I have used are electroencephalography (EEG) and functional near infrared spectroscopy (fNIRS). Generally, I use these methods to conduct research on cogntion, including the neural basis of decision making, learning, teamwork, and cognitive control.

Research Interests: I am interesting primarily in applied areas of neuroscience, namely in clinical, educational, and workplace environments. With my work on the neural basis of decision-making, learning, and cognitive control, I hope to reduce the incidence of clinical misdiagnoses and inform future strategies for medical education. By exploring the neural basis of teamwork, I hope to understand the physiological components of cooperation and competition. In the future, I wish to apply my work to settings where teamwork is becoming increasinly promoted, such as education and workplaces. Finally, I am also interested in studying theories of reinforcement learning. Specifically, I am currently researching the history and development of work on neural learning systems and how they are measured.

Research Experience Summary: The majority of my research has been conducted with the Theoretical and Applied Neuroscience laboratory at the University of Victoria. While working for this lab, I have been a part of data collection and analysis for various studies, both in our research facility and in applied settings. I also have experience in development of new research methods and analysis techniques. Additionally, I have assissted in writing for upcoming experiments and review papers.

Fields of Application: Education, Health System Management

Disciplines Trained In: Neurosciences

Countries: Canada

Areas of Research: Decision Making, Modeling of Learning Processes, Cognition

Research Specialization Keywords: Electroenchephalography, Decision Making, Reinforcement Learning, Cognitive Control, Neural Basis of Teamwork

Research Centres: University of Victoria

Research Disciplines: Neurosciences

Employment

2019/9

Researcher
University of Victoria
Part-time
Working with the Theoretical and Applied Neuroscience Laboratory at the Unversity of Victoria, I conduct neuroscience research projects on the long term effects of fatigue in students and student athletes. This invloves weekly sessions of neural assessment using electroenchaphalography. In addition, I assist in administration for other projects. This includes tasks such as planning future studies, organizing data for current projects, and other tasks that contribute to research goals of the lab.

Areas of Research: Cognition, Decision Making

Research Disciplines: Neurosciences

Presentations

1. Hammerstom M., Trska R., Henri-Barghava A, Krigolson O.E. (2020). Developing a Tool for Mobile Brain Health Assessment. Precision Health and Data Science Showcase, Victoria, Canada
   Main Audience: Researcher
   Description / Contribution Value: Cost-effective means of measuring brain health in the real world isimperative. Be it in the emergency wing of a hospital or the operations of industrial machinery, assessingindividual brain health can be important for both individual health and safety, as well as minimizing cost ofpotential errors. By utilizing a portable electroencephalography (EEG) device, we may utilize human eventrelated potentials (ERPs) and frequency data in a cost-effective and reliable manner to assess individuals' brain health. Here, we build on previous work by disseminating results from recent applied projects.
2. Hammerstrom M., Williams C.C., Ferguson T., Abimbola W., Krigolson O.E. (2020). The Effects of Fatigue on Neural Learning Systems. Cognitive Neuroscience Society Annual Meeting, Boston, United States
   Main Audience: Researcher
   Description / Contribution Value: Walker(2008) demonstrated that without adequate sleep, hippocampal function isdisrupted and our ability to encode new memories is markedly decreased. Butwhat about non-hippocampal learning systems? Here,we sought to address this issue. Specifically, we examined if the number of hours slept in the previous night affected neural correlates of the medial-frontal reinforcement learning system. Our findings showed that participants with more sleep had faster and stronger neural learning signals, indicating the importance of sleep for reinfcorement learning.
3. Hammerstrom M., Williams C.C., Krigolson O.E. (2020). Portable Measurement of Clinical Decision Making. Jamie Cassels Undergraduate Reasearch Award (JCURA) Fair, Victoria, Canada
   Main Audience: General Public
   Invited?: Yes
   Description / Contribution Value: Poster highlighting new findings on the correlates of clinical decision making. Here, we sought todetermine whether decision-making systems employed in a medical context can be assessed with a portable electroencephalography system. Building of previous presentations of this project, we demonstrate the effects of bias on diagnosing rare patient cases.

4. Hammerstrom M, Trska R, Henri-Barghava A, Krigolson O. (2019). Developing a Tool for Mobile Brain Health Assessment. Biomedical Engineering and Health Technology Showcase, Victoria, Canada
   Main Audience: Researcher
   Invited?: No, Keynote?: No, Competitive?: No
   Description / Contribution Value: Cost-effective means of measuring brain health in the real world is imperative. Be it in the emergency wing of a hospital or the operations of industrial machinery, assessing individual brain health can be important for both individual health and safety, as well as minimizing cost of potential errors. By utilizing a portable electroencephalography (EEG) device, we may utilize human event-related potentials (ERPs) in a cost-effective and reliable manner to assess individuals' brain health by way of the ERP components and frequency analysis.

5. Hammerstrom M, Williams C, Middleton J, Krigolson O. (2019). Portable Measurement of Clinical Decision Making. Northwest Cognition and Memory, Victoria, Canada
   Main Audience: Researcher
   Invited?: No, Keynote?: No, Competitive?: No
   Description / Contribution Value: Williams and colleagues (2019) found that intuitive decisions increased alpha and decreasedtheta while the opposite was true for analytical judgments. Here, we sought to determine whether these systems are employed in a medical context and whether portable EEG can be used as anassessment technique. Findings replicated those of the Williams study, indicating that thesestrategies can be used in clinical decision making and that they can be measured portably.

6. Williams C, Ferguson T, Hammerstrom M, Colino F, Krigolson O. (2018). Putting the Learning Back into Neural Learning Systems. Northwest Cognition and Memory (NOWCAM), Richmond, Canada
   Main Audience: Researcher
   Invited?: No, Keynote?: No, Competitive?: No
   Description / Contribution Value: Neuroimaging research has brought to light a neural system that underlies how humanslearn. Most often these studies incorporate methodology in which participants perceive nonlearnable tasks to be learnable. Here, we present a series of neuroimaging experiments withlearnable tasks that demonstrate how this system changes across learning, how this persists acrosssimulated and real-world contexts, and how quickly this occurs. For this presentation, I conducted data collection and analysis.

7. Hammerstrom M, Williams C, Ferguson T, Colino F, Wright B, Krigolson O. (2018). Neural Learning Signals Reflect Task Performance in a Medical Context. Northwest Cognition and Memory (NOWCAM), Richmond, Canada
   Main Audience: Researcher
   Invited?: No, Keynote?: No, Competitive?: No
   Description / Contribution Value: In the current study, participants learned to diagnose diseases through reinforcementlearning principles and were classified as learners or non-learners depending on task completion. Results demonstrated that the learners' accuracy improved whereas the non-learners' accuracydid not. Correspondingly, there was a change in neural learning signals in learners but not nonlearners.