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Evaluating cognitive impairment, imaging and blood biomarkers in a pre-clinical model of concussion

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Western BrainsCAN
Transforming brain research.

Project **Summary**

KNOWLEDGE MOBILIZATION & IMPACT

Evaluating cognitive impairment, imaging and blood biomarkers in a pre-clinical model of concussion

Background

Concussion is a growing healthcare problem. Visits to emergency rooms and healthcare offices in Ontario related to concussions have quadrupled in the last 10 years. There is a tremendous need to better understand the condition and how we can help people with concussions.

Diagnosis, prognosis and treatment of concussion is much more difficult without a standard biological indicator, a clinical biomarker. Biomarkers enable the development of evidence-based treatment protocols.

Current animal models of concussion also lack cognitive, imaging or blood biomarkers, which is a significant obstacle to really understanding the condition and developing new approaches to treatment.

The Problem

The goal of our work is to develop a model of concussion to study and validate biomarkers. A new concussion mouse model must show similar cognitive impairments and changes in imaging and blood biomarkers as concussed people if it to be used to further research. Validating cognitive impairments is difficult as standard behavioural testing in mice is fraught with external influences that impact the outcomes (such as animal handling).

The touchscreen technologies available here in BrainsCAN through the Rodent Cognition Core are ideal cogitive tests as they are highly sensitive, reproducible, clinically relevant and are very similar to human behavioural testing. Drs. Saksida and Bussey have developed rodent cognitive testing using touchscreens that is modeled on standard human cognitive dysfunction testing know as CANTAB. Because the touchscreen technology is automated, it decreases animal handling and environmental influences, which in turn makes the testing more robust and reliable.

Broadly in this research, we hope to address three questions:

* What are the disease processes that underlie biomarker changes following concussion?

* Are these biomarkers changes diagnostic for concussion?

* Do these biomarkers help predict who will recover quickly from concussion and who may require longer convalescence and care?

The Project

The foundational milestone for the research, that we are addressing in this project, is to demonstrate that cognitive impairments in mouse models and humans are similar by using touchscreen technology. We will also be applying fMRI and MRS analyses to mouse models since they are analogous to that used in human studies - it will help us establish relevant endpoints for the studies as part of understanding the underlying characteristics, pathways and effects of concussion.

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Schulich School of Medicine & Dentistry

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Concussion, fMRI, MRS, biomarkers, touchscreens

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none

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