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Developing behavioural testing and MR imaging to evaluate cognitive impairment in models of CNS autoimmunity

BrainsCAN, Western University

Steven Kerfoot

Sarah Morrow

Ravi Menon

Flavio Beraldo

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Background

Multiple Sclerosis (MS) is the most common neurodegenerative disease in young adults in Canada. Although treatments are improving, there is currently no cure. Those living with MS will be affected by neurodegeneration for decades of their life - this will result in considerable economic cost and loss of quality of life for both those with MS and their caregivers.

Most attention has been paid to the physical disability that develops over time, but there are also impacts on higher brain function. Cognitive impairment is found in 40-65% of MS patients, impacting attention and working memory. Patients often experience cognitive fatigue, limiting their capacity to remain focused. These symptoms can appear very early in the disease, often at or within a year of initial diagnosis. Even before physical impairment becomes prohibitive, cognitive impairment can significantly impact work and family life.

The Problem

The best evidence suggests that neurodegeneration in MS is driven by an autoimmune response affecting the central nervous system (CNS). However, it is not clear if neural function deficits and cognitive fatigue are the result of targeted autoimmune attacks, or if they are a bystander effect of local or systemic inflammation. Current research tools focus almost exclusively on the physical disability side of MS.

There is an urgent need to develop research tools and measures of higher brain functions in this type of CNS autoimmune disease. Such research tools could help in both understanding underlying mechanisms of the disease as well as studies of potential therapies. We are developing a research program to apply fMRI imaging to understand and measure the underlying mechanisms of cognitive fatigue and other higher-function deficits in MS patients.

Funding Program

BrainsCAN Accelerator Grant:
Stimulus

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Rodent Core
Imaging Core

Western Faculty, Group or Institution

Department of Microbiology &
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Related

None

The Project

This project will investigate cognition and cognitive fatigue in models of CNS autoimmunity. We will use automated touchscreens and fMRI to measure deficits in higher order brain functions.

We have two critical milestones in this project:

* to use touchscreen testing protocols to determine if mouse models demonstrate the same kinds of attention, working memory and cognitive fatigue deficits observed in MS, and

* to use fMRI to measure higher-order defects in the autoimmune models and identify any changes present that might be associated with cognitive dysfunction and the findings from human studies.

Western Researchers

Steven Kerfoot

Sarah Morrow

Ravi Menon

Flavio Beraldo

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