2018

Development of fMRI compatible reversible deactivation to examine cerebral networks

BrainsCAN , Western University

Stephen Lomber
Western University

Blake Butler
Western University

Stefan Everling
Western University

Blaine Chronik
Western University, tadam@uwo.ca

Western BrainsCAN
Transforming brain research.

Project **Summary**

KNOWLEDGE MOBILIZATION & IMPACT

Development of fMRI compatible reversible deactivation to examine cerebral networks

Background

The development of functional magnetic resonance imaging (fMRI) has greatly expanded our ability to examine neural processing while subjects perform a variety of perceptual, cognitive or motor tasks. It permits the simultaneous examination of functional activity in many different brain regions and provides a better understanding of how multiple regions work together to produce particular behaviors.

The Problem

The next step is to deactivate a specific region in the brain, while a subject is being scanned, to determine the contribution of this site to the activity in sites throughout its functional network. We can then examine the activity of other network components in the absence of the deactivated region.

To accomplish this goal, we propose to develop a reversible deactivation approach that is fMRI-compatible. Compatibility with fMRI means that a system has to be completely non-metallic. Reversible regional deactivation is possible using the well-established cryoloop technique, which cools specific parts of the brain. Cooling prevents the release of neurotransmitters in the cooled region but rewarming the brain returns normal function.

The cooling process has a number of advantages to other methods of deactivation - it is a controlled and reversible process that is very stable over time (repeated coolings over extended periods show no evidence of harm to or compensation by the brain) and it does not trigger degeneration in the cooled region or other more distant regions that would otherwise impact a study.

The Project

This study will permit us, for the first time, to examine the effects of deactivation of one cortical site on large-scale neural networks. It will permit neural networks to be functionally disassembled and the consequences of 'reversible' lesions, strokes or tumors to be assessed and modeled before they occur.

Funding Program

BrainsCAN Accelerator Grant: Stimulus
Awarded: $109,917

Additional BrainsCAN Support

Imaging Core

Western Faculty, Group or Institution

Department of Physiology and Pharmacology, Schulich School of Medicine and Dentistry

Keywords

fMRI, novel neuroscience/neuroimaging techniques

Related

none

Share this page

Tweet Share

The first step of this project is to develop the non-metalic cooling device that can be tested in the imaging equipment here. The second step will be to establish that the device is reliable. When these two steps have been achieved, it will considerably expand the research that can be accomplished in this area.

Western Researchers

Stephen Lomber
Blake Butler
Stefan Everling
Blaine Chronik