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2020 Part the Cloud Gates Partnership (PTC-G) - $859,752

Exercise as a primer for excitatory stimulation in VCIND (EXPRESS-V)

This clinical trial will examine whether a brain stimulation technique, in combination with exercise, is safe and able to benefit cognition in individuals with early vascular cognitive impairment.

PI

- Ph.D., Clinical Psychopharmacology, University of Toronto 1998
- Vice Chair, Basic and Clinical Research, Department of Psychiatry, University of Toronto, Canada, 2019-
- Senior Scientist, Sunnybrook Research Institute

STUDY

- CADRO category: Translational Research & Clinical Interventions
- Prior to this award, Dr. Lanctôt received the 2018 Alzheimer's Association Part the Cloud (PTC) grant to study whether a drug designed to boost levels of a key antioxidant in the brain helps delay or prevent the onset of dementia.

Background

Blood vessels in the brain provide nerve cells with oxygen-rich blood that is vital for the cell's ability to function properly. Inadequate blood flow can damage and eventually kill cells anywhere in the body, but the brain is especially vulnerable. Studies show that loss of brain blood vessel (or cerebrovascular) function may be an early brain change in dementia. These changes may be associated with nerve cell damage and death observed in dementia. Individuals who have "cerebrovascular" changes may be considered to have vascular cognitive impairment, no dementia (VCIND) and could be more likely to develop dementia later on. Studies show that individuals with VCIND may experience impairments in processing speed and memory.

A brain stimulation technique called tDCS (transcranial Direct Current Stimulation) applies very low levels of electric current to stimulate specific regions of the brain. This non-invasive technique is thought to improve memory in dementia but has not been tested in VCIND. Studies show that for tDCS to work effectively it needs active nerve cell networks. Based on these findings, Dr. Krista Lanctôt believes that exercise may be additive to this intervention, helping to improve blood flow to the brain thereby improving brain activity and may help tDCS work better.

Research Plan

In participants with VCIND, Dr. Lanctôt and colleagues will conduct a two-week clinical trial. The participants will be split two groups: one group where participants will undertake moderate intensity physical exercise and another group that does not exercise. Within each of groups, half of the participants will receive tDCS and the other half will receive a placebo (not the actual tDCS but a very weak stimulation that neither harms nor benefits the participants). The researchers will test for memory, mood and behavior changes in these participants prior to the

intervention, immediately post trial and 1 month after the trial. At the same time points, the researchers will also collect blood samples from the participants and study the biological markers associated with Alzheimer's, tDCS and exercise. Furthermore, they will evaluate changes in brain blood flow in these participants before and immediately after the intervention. Overall, the researchers will study whether the intervention impacts learning and memory in the participants. They will then prepare for larger clinical trials.

Impact

If successful, the results may help improve our understanding of the tDCS technique and how it could potentially be applied to individuals with cerebrovascular changes to improve cognition and prevent decline.

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