Exercise to change the brain

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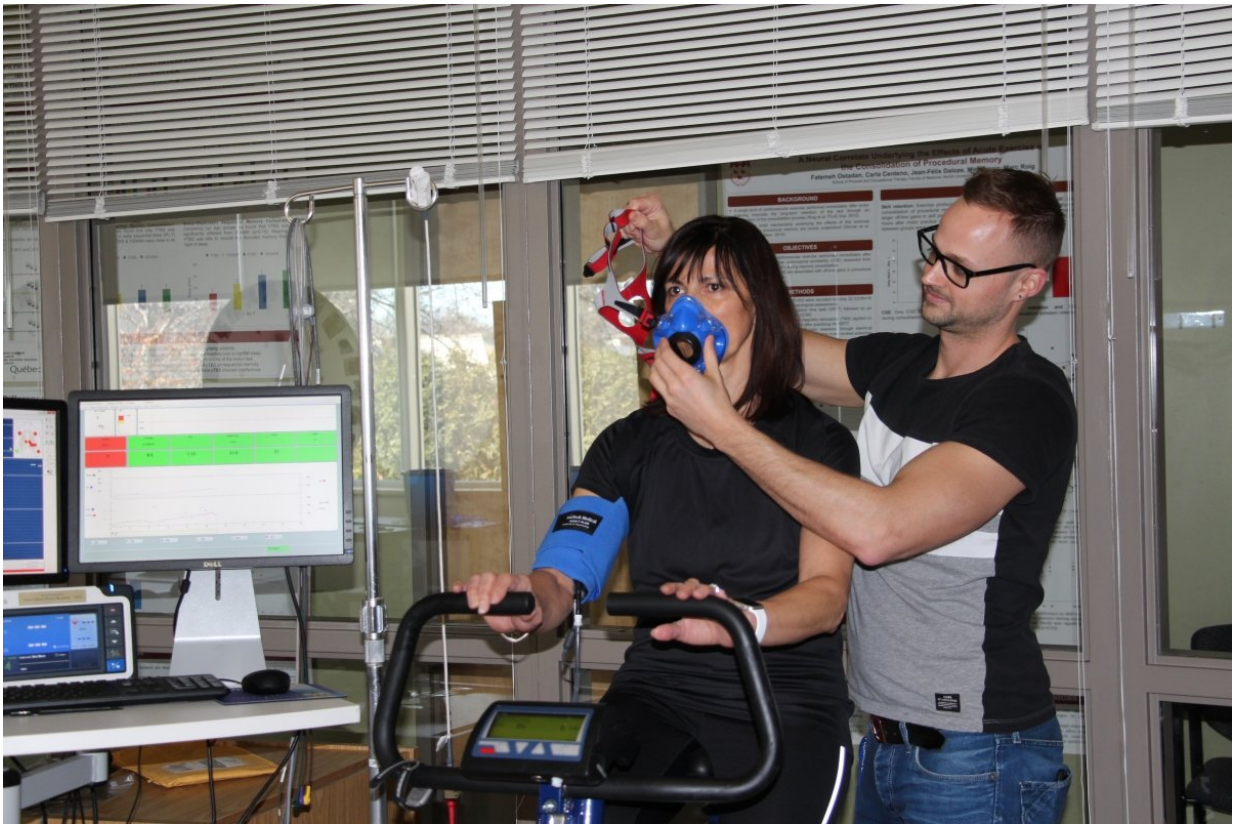

Credit: McGill University

For someone with Parkinson's disease (PD), the simple desire to grasp a glass of water can become an insurmountable task, made impossible by the tremors in their hand or arm. Finding strategies to improve these movement impairments is one of the major goals of rehabilitating people with Parkinson's disease.

At McGill University, Dr. Marc Roig, an assistant professor in the School of Physical and Occupational Therapy (SPOT), is studying the effects of using high-intensity exercise to stimulate the brain's ability to learn and change with repeated experiences.

Dr. Roig and his team are working with people who have Parkinson's disease, to see if they can improve their ability to move and to complete tasks like grabbing an object. The team is using high-intensity cardiovascular exercise to provoke changes in the brain that make it easier to train itself to relearn motor tasks.

"One of the main problems with people with Parkinson's is they lose their ability to do very simple motor tasks," says Dr. Roig, a neuroscientist. "We are trying to understand why this happens and find interventions to improve that."

Dr. Roig believes exercise may be the key to triggering the brain's ability to change and to open a window to improve motor learning. His current study is using Transcranial Magnetic Stimulation, a form of non-invasive brain imaging that moves a magnetic coil over the skull, to map the areas of the brain he wants to measure. By attaching electrodes to the muscles of the hand and then moving the magnetic coil until the fingers move, his team is able to map the changes in the brain that occur before and after intense exercise, and to record changes in the brain activity of people with Parkinson's who are on medication and those who are not on medication.

After they exercise, study participants are asked to complete a task involving the application of force in a computer game, to measure whether the exercise and the burst of brain chemicals it stimulates also improves their motor ability.

Most people with Parkinson's disease eventually take a synthetic form of

dopamine, called levodopa, to replace the levels of this brain signalling chemical that Parkinson's depletes. Roig is also testing his theory that the people with Parkinson's will need their medication to take advantage of the improvements exercise can produce.

"With the new information, we can better understand how exercise interacts with dopamine and with motor learning," Roig says.

His goal is to use that information to create new interventions during rehabilitation, and to explore the response of different areas of the brain. "If we can show that exercise interacts positively with medication, the next step would be to establish whether coupling exercise with medication has long-term benefits for people with PD," explains Dr. Roig. "This could be accomplished by studying the long term effects of exercise and medication taken together on the motor and cognitive alterations caused by the disease."

Dr. Roig notes that the study is going well, though they are in need of additional participants in order to complete the study. "To date, we have tested 19 people with PD. We predicted that we would need 48 people to finalize the study."

Dr. Roig and his team are looking for people with PD aged 45 to 80, who would be willing to travel to his lab on three occasions, with a total time commitment of five to six hours. "On the first visit, we measure their cardiorespiratory fitness with an exercise test," explains Dr. Roig. "This is important to assess their suitability for the study but also to know how fit they are. On the second visit, we ask them to practice a motor task followed by 15 minutes of exercise or rest. We also measure changes in their brain activity using a non-invasive brain stimulation technique, which is completely safe and painless. We ask them to return 48 hours later for a short third visit to assess their capacity to remember the task that they practiced on the second visit. We provide a generous

compensation that covers for parking and transportation expenses."

For her part Eileen Cortina recognizes the value in participating in this study. "I find it so important to participate in studies for Parkinson's because even though we are always too young to be diagnosed, we are never too old to hope for a cure," she says. "I hope that they find a solution to help people with the dexterity part of this disease as this is what bothers me most at this time, even more than the fatigue, pain and other symptoms."

"The final goal is to try to improve the quality of life of these people, but to do that you need to understand the mechanisms of the disease," says Dr. Roig.

Eventually, his work may lead to new techniques and new rehabilitative interventions that can help people with Parkinson's use exercise to train their brains to complete the simple tasks of everyday life that come so easily to others without this disease.

If you or someone you know would be interested in participating in this study, contact Dr. Roig at (515) 415-8353 or marc.roigpull [at] mcgill.ca ().

Provided by McGill University

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