

- [Home](#)
- [About the CVR](#)
- [News](#)
- [Members](#)
- [Seminar Series](#)
- [Conference](#)
- [Resources](#)
- [CVR Summer School](#)
- [Research Labs](#)
- [Training at the CVR](#)
- [Partnering with the CVR](#)
- [Contact Us](#)

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From sensorimotor science to sensorimotor rehabilitation: Canada's approach for parkinson's disease

The ability to control everyday movement is key to the functional independence of an aging Canadian population. Diseases such as Parkinson's (PD) have a dramatic long-term impact on functional motor ability and quality of life. This chronic and progressive disease affects over 100,000 Canadians and 3.8 million people worldwide. Within Ontario, the cost to the health care system is hundreds of millions of dollars annually. Significantly, Ontario is the only province that stands out with a higher mortality rate than the national average associated with PD.

While dopamine replacement therapy remains the gold standard for treatment of the symptoms of PD, significant complications of treatment (wearing off and dyskinesias) have prompted physicians and researchers to search for alternatives to drug therapy. One of the most promising alternatives is exercise. Recent animal studies have suggested that exercise may stimulate production of brain-derived neurotrophic factors, normalize dopamine production and protect the nigrostriatal neurons that normally deteriorate in PD. The potential to alter symptom progression is promising, if appropriate exercises can be identified to access these neurons.

Surprisingly, in Canada there are no scientifically-based exercise recommendations for individuals with PD. In fact, current recommendations are primarily focused on avoiding the negative influences of inactivity, rather than influencing the underlying mechanisms that may cause motor impairments. One very important objective for our research centre is to determine what these underlying mechanisms might be and how they could lead to movement deficits. In movement disorders like PD, patients become very dependent on vision to control movement. Research from our centre suggests that this may be a compensatory response for other sources of feedback that are poorly processed by our brains in the diseased state. Specifically, processing sensory information from muscles and joints that help guide our perception of limb and body motion (known as proprioception) may be impaired in Parkinson's disease.

From a rehabilitation perspective, we have been evaluating various exercise protocols (including exercises that we believe are focused on proprioception) in a multi-site study across Ontario. Both the basic science and rehabilitation research results from the MDRC labs (up to this point) will be discussed.

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