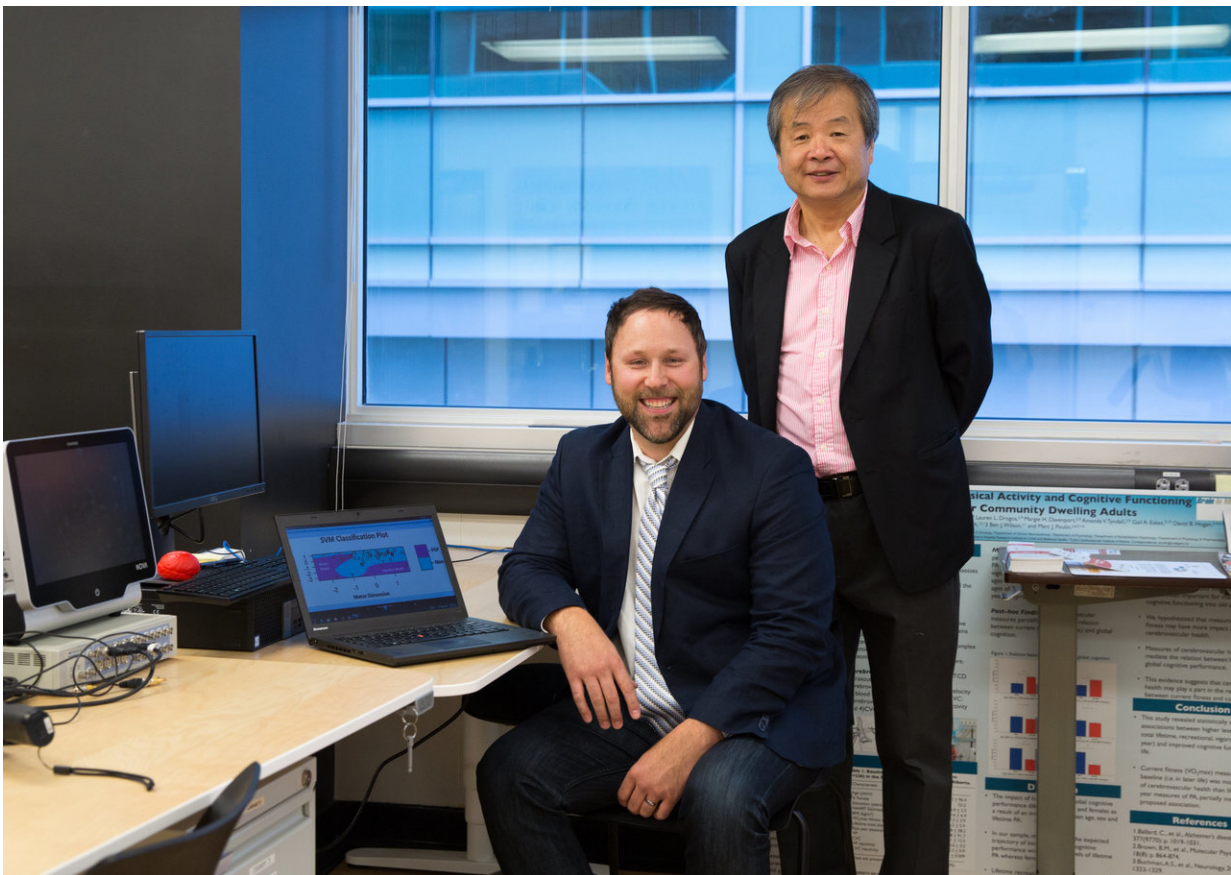# Scientists discover a way to diagnose types of fear of falling in Parkinson's patients

September 25 2018, by Kelly Johnston

Cumming School of Medicine researchers discover a way to diagnose subtypes of fear of falling, a common condition experienced by people who have Parkinson's disease. The findings indicate the current standard of treatment for fear of falling may not be effective for all patients. From left: Taylor Chomiak and Bin Hu. Credit: Riley Brandt, University of Calgary

Parkinson's disease, a progressive nervous system disorder that affects movement, causes one of the highest risks of falling among all neurological conditions. Due to this, many patients develop a fear of falling (FOF), even if they have never fallen. For some the fear can be excessive. Patients become prisoners in their own homes, scared to venture out despite the fact that they are physically able to do so. Others can develop a "fearlessness" putting themselves at high risk of falling.

Vivien Poon was diagnosed with Parkinson's 10 years ago. She walks with the use of a cane and says her fear of falling is something she has to deal with on a daily basis. "I'm pretty lucky. Although I've fallen many times, I've only broken a finger. For a lot of patients, falls lead to serious injury," says Poon.

Drs. Bin Hu, Ph.D., and Taylor Chomiak, Ph.D., with the Cumming School of Medicine (CSM) have developed a way to measure different types of FOF in hopes of improving treatment and quality of life for patients. Traditionally, FOF is considered to be a problem with motor function. Standard treatment focuses on improving a patient's gait, balance and muscle strength. However, in a recent multi-centre study, these researchers discovered that cognitive function plays an important role.

"The findings indicate the current standard treatment for fear of falling may not be effective for all patients. Many may benefit from treatments aimed at addressing their fear and improving their level of confidence to get up and be active," says Hu, professor in the departments of Clinical Neurosciences and Cell Biology and Anatomy and member of the Hotchkiss Brain Institute.

Vivien Poon, who was diagnosed with Parkinson's disease 10 years ago, demonstrates one of the mobility tests conducted in the research study. Participants underwent a six-minute walking test using an Ambulosono wearable sensor system (seen on Vivien's right leg). The demonstration occurred at the Clinical and Translational Exercise Physiology Laboratory, which investigates the role of exercise in the prevention and management of chronic diseases, including neurodegeneration conditions related to aging such as Parkinson's disease and Alzheimer disease. Credit: Riley Brandt, University of Calgary

"Some patients have developed an excessive fear of falling that's keeping them from participating in activities, but physically, they have no reason to be afraid," says Hu. "On the opposite end of the spectrum we discovered patients who are physically at a high-risk of falling, but cognitively don't recognize their weaknesses and aren't taking proper precautions."

The researchers incorporated machine learning to compare cognitive and mobility tests from 57 patients. This aspect of artificial intelligence allows computer systems to learn from the data and find hidden patterns. The algorithms produced visual maps that helped separate the patients with FOF into different categories: those with mobility issues, those with cognitive dysfunction with relatively mild motor impairment, and those with a combination of the two. The study is published in the Nature Partner Journals *npj Parkinson's Disease*.

"Up to now there has been no generally accepted scientific method that can be used to diagnose patients with different types of fear of falling," says Chomiak, an adjunct assistant professor in the Department of Clinical Neurosciences. "This is the first step toward the development of an effective diagnostic tool to identify types of FOF that combines conventional clinical assessments with mobile and computer technology."

Parkinson's disease is difficult to treat. The symptoms and progression of the disease are unique to each individual. People with the disease can have problems controlling their body; tremors and muscle weakness are common symptoms. They can also experience cognitive impairment, including loss of memory, anxiety and depression. There is no cure.

  More information: Taylor Chomiak et al, Differentiating cognitive or motor dimensions associated with the perception of fall-related self-efficacy in Parkinson's disease, *npj Parkinson's Disease* (2018). DOI: 10.1038/s41531-018-0059-z

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