Clinical trial uses robotics and brain stimulation to try to improve movement, body perception after stroke

StrokeCog Clinical Trial Training Platform fellowship will allow Matthew Chilvers to reboot important trial that was scuttled by the pandemic

University of Calgary post-doctoral researcher Matthew Chilvers has been awarded a StrokeCog Research Post-Doctoral Fellowship Award to conduct research into whether robotics plus brain stimulation can help improve proprioception, an individual's sense of limb position and movement.

"As many of half of people who've had a stroke have an impairment in proprioception - they've lost that innate sense of where their limbs are in space," says Dr. Chilvers, who has a PhD in neuroscience from the University of Calgary. "We want to find promising evidence-based interventions that can roll into larger clinical trials to identify feasible and effective ways to rehabilitate people."

Despite being a common after-effect of stroke, there is limited research into proprioception. The condition can lead to people bumping into things, dropping objects, and tripping and falling.

Dr. Chilvers had originally planned to conduct this robotics-brain stimulation trial for his doctoral research, but the project was stopped due to COVID-19 restrictions and he pivoted his research to neuroimaging. Thanks to the Clinical Trials Training Program, Dr. Chilvers will be able to restart the work for his post-doctoral fellowship.

The concept of proprioception first drew Dr. Chilvers's attention during the final phase of an undergraduate degree in sport and exercise science at the University of Birmingham in England. "I volunteered at a local rehabilitation institute where I could see some of the difficulties people were having. I decided this is where I wanted to focus."

He pitched a research idea to Dr. Sean Dukelow, an international leader in stroke rehabilitation, and moved to Calgary to work with him. Dr. Dukelow remains his fellowship supervisor. "Calgary is a great place to conduct stroke research," Dr. Chilvers says. "There is a ton of opportunity."

The rebooted trial involves 39 people, who are at least six months post-stroke. It is a 10- day intervention with participants randomized into three groups. The first group gets daily robotic therapy and 20 minutes of concurrent brain stimulation; the second group gets the same robotic therapy paired with sham brain stimulation; and, the third group receives usual care for the same time period.

Robotic therapy is delivered in a device called the Kinarm, developed by researchers at Queen's University in Kingston. The brain stimulation used in the trial is transcranial direct stimulation – a weak electrical current passed between two electrodes on the scalp.

There is consensus in the field of stroke rehabilitation that robotics has merit for rehabilitation because the intensity and the dose of therapy can be increased, compared to conventional treatment. And, brain stimulation has been shown to have potential benefits to prime the brain to change. "If we do these two together, can we deliver an intensive and effective rehabilitation program for proprioception?" Dr. Chilvers asks.

On a personal level, Dr. Chilvers says the StrokeCog fellowship means he can help increase understanding of this under-studied condition, possibly find an effective therapy, and "it's reassurance that the science we are doing is appreciated by others in the field."

"It's validation that this is meaningful and to keep pursuing