



How A Glove Is Helping Stroke Survivors

Here are five things you should know about
contralaterally-controlled functional electrical stimulation.



Jayme Knutson thinks back to the early days.



As a bioengineering graduate student at Case Western Reserve University, he spent much of his time behind a makeshift desk in the Cleveland FES Center lab, watching and listening to therapists work with spinal cord injury patients participating in research studies. Seeing how research could impact their lives offered a valuable lesson.

“It makes an engineer aware of clinical, medical, personal people issues,” says Knutson, associate director of regulatory affairs at the Cleveland FES Center, associate professor in Case Western Reserve’s School of Medicine and the director of research at MetroHealth Rehabilitation Institute of Ohio.

Knutson has taken that same approach to his work over the past 15 years to develop a therapy system for stroke survivors known as [contralaterally-controlled functional electrical stimulation](#). Although only available in a research setting, CCFES uses an individual’s working hand to stimulate the muscles controlling the opposite hand, weakened by the stroke, and then provides feedback to help the brain relearn how to control the stroke-affected hand.

[Jayme Knutson](#) will be discussing his work with contralaterally-controlled FES as part of the Cleveland FES Center’s First Tuesday series Oct. 1 from 4:30 to 5:30 p.m. at Market Garden Brewery. Here are five things you should know about CCFES before attending.

Brain Gains

In CCFES, the individual wears a sensor-laden glove on the hand not affected by the stroke, then thinks about opening both hands. The action of opening the working hand sends signals to the muscles of the opposite hand, which mirror the motion of the good hand. Other therapies just cycle stimulation on and off to the muscles of the affected hand. In Knutson’s largest research trial to date, contralaterally-controlled FES has proved more effective at helping the hand regain dexterity than other currently available methods. “We felt like the brain needed to be in control of the hand,” Knutson says. “It gets the brain back in the loop.”

Building Blocks

Knutson’s work has been used for additional research, including pairing it with [video games for children with cerebral palsy](#) and combining it with noninvasive brain stimulation in stroke patients. The latter study, conducted by Ela Plow, a Cleveland FES Center investigator and an assistant professor of the Cleveland Clinic’s Learner College of Medicine, received a [\\$3.5 million National Institutes of Health grant](#) in June. “It was another opportunity to see if the technology that we have developed could be done in conjunction with brain stimulation,” Knutson says. “There are reasons why that seems like it would be a good idea.”

Here’s To Colabs

Knutson values how doctors, researchers, bioengineers, therapists and others work across institutions and disciplines through the Cleveland FES Center to find answers for patients. “Community is critical,” he says. “There’s a good critical mass of these researchers here in Cleveland, and we all benefit from one another.”

Flex Appeal

Knutson’s latest research study involves adding contralaterally-controlled FES to include the tricep and the elbow. When the individual extends their strong-side elbow, stimulation causes the stroke-affected elbow to reach at the same time. After 12 weeks of therapy, participants showed improvements in their range of motion of up to almost three times their pre-therapy reach. “It’s just more evidence that this technology is helping stroke patients recover volitional upper limb movement,” he says.

Licensed to Thrive

In February 2019, CWRU licensed the CCFES intellectual property to a local company. Knutson expects a redesign of the current system and possible application for Food & Drug Administration approval in late 2020. “The best day of my career was when I went downstairs in my own building to the therapy clinic, not the research area, and saw a therapist working with a patient with this device,” he says. “The licensing agreement will allow that to take place across the country, so that’s the exciting thing.”

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- Jayme Knutson, PhD -

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About the Cleveland FES Center

The Cleveland FES Center is a consortium of the Louis Stokes Cleveland VA Medical Center, MetroHealth Medical Center, Case Western Reserve University, University Hospitals, and the Cleveland Clinic Neurological Institute. With their support, researchers, engineers and clinicians collaborate together to develop innovative solutions that improve the quality of life of individuals with neurological or other muscular skeletal impairments. Through the use of neurostimulation and neuromodulation research and applications, the Cleveland FES Center leads the translation of this technology into clinical deployment.

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