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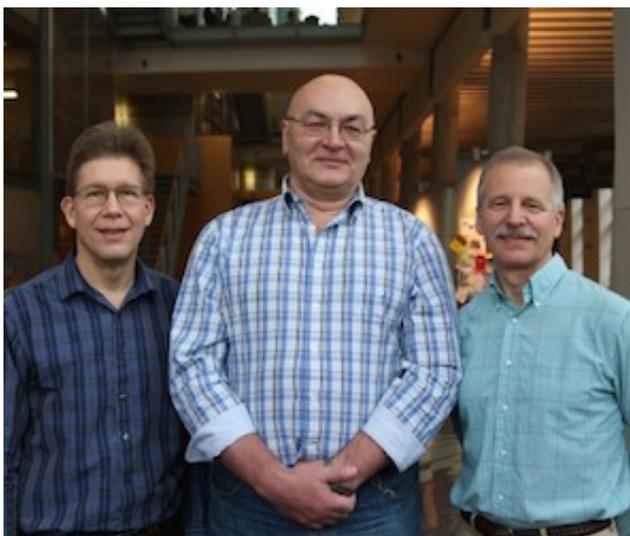
September 22, 2015 | by Todd Finkelmeyer

The **Tactile Communication and Neurorehabilitation Laboratory (TCNL)**, a unique research center that's on the leading edge of developing solutions for sensory and motor disorders, has found a new administrative home with UW-Madison's **Department of Kinesiology**.

TCNL, which is located in University Research Park on Madison's west side, was founded in 1993. It joined the Department of Kinesiology on July 1, 2015, after previous stints with UW-Madison's College of Engineering and the School of Medicine and Public Health. It is led by highly regarded researchers Yuri Danilov, Kurt Kaczmarek and Mitchell Tyler, each of whom has more than two decades of experience in their respective fields of neuroscience, electrical engineering and biomedical engineering.

"My career feels like it has come full circle," says Tyler, a mechanical and biomedical engineer who is TCNL's clinical director. "I originally came to UW-Madison in 1987 for a one-year research fellowship and was teaching a kinesiology course. Getting the chance to once again explore new opportunities and to collaborate with those across the Department of Kinesiology is very exciting."

Kinesiology is generally described as the study of human movement, including exercise physiology and psychology, sensory and motor control, and behavior -- all areas that fit nicely into TCNL's research portfolio. The lab has recently focused its efforts on enhancing the rehabilitation process for those struggling with movement control, particularly balance and gait, lost to traumatic brain injury, stroke or ailments such as multiple sclerosis and Parkinson's disease.



Kurt Kaczmarek (left-to-right), Yuri Danilov and Mitchell Tyler lead the Tactile Communication and Neurorehabilitation Laboratory (TCNL), which recently joined the Department of Kinesiology.

“We are thrilled to have them with us,” says Professor Dorothy Farrar-Edwards, chair of the Department of Kinesiology, which is housed within the **School of Education**. “They are making some incredibly interesting progress in finding answers to very serious problems for which there currently are not a lot of great treatments.”

Perhaps most notably, TCNL earlier this year was awarded a five-year contract from the Department of Defense to conduct research examining the effectiveness of its traumatic brain injury therapy with an aim to eventually help military personnel. This is a significant issue, with the Defense and Veterans Brain Injury Center reporting that there have been more than 320,000 military personnel diagnosed as having suffered a traumatic brain injury since 2000.

Although roughly three-quarters of these people will recover, others suffer from a range of residual and debilitating problems such as gait and balance disturbance, headaches, chronic pain, cognition, memory, and attention issues and more.

“The worst part,” says Tyler, “is many of these veterans also feel hopeless. There currently is nothing else out there that has been proven to help. Their nervous system seems to be stuck and not able to reset itself. We want to see if we can provide solutions -- and hope.”



The Portable Neuromodulation Stimulator (PoNS) device passes electrical stimulation into the brain via the tongue.

The five-year study will use the Portable Neuromodulation Stimulator (PoNS) device, which passes electrical stimulation into the brain via the tongue. TCNL researchers have shown that both using the PoNS device -- developed in their lab -- in combination with more traditional therapies can reduce symptoms, such as balance issues, related to traumatic brain injury.

“By using the PoNS device, it appears we are somehow unlocking this innate rehabilitative process within the brain,” says Tyler. “This study will allow us to more closely quantify how much change takes place with our patients in a controlled, clinical setting. We hope we can eventually demonstrate how this therapy can be applied outside a clinical setting and be part of long-term care.”

Before therapists can use the PoNS device on military personnel, it first must obtain Federal Drug Administration approval. Those trials started in May 2015.

Tyler admits it's not clear exactly how the PoNS device seems to be able to unlock the brain's ability to heal itself.

“We really are pushing the boundaries of our own knowledge and going into areas that are not well documented,” he says.

In this regard, TCNL will offer students with the Department of Kinesiology and from across the university an array of research opportunities in areas as varied as neuroscience, bioinstrumentation, biophysics and neurorehabilitation.

Similarly, the Department of Kinesiology is home to a range of faculty and staff dedicated to researching ailments such as traumatic brain injury, Parkinson's and stroke, while utilizing cutting-edge neuroscience and imaging techniques.

“There are a lot of great opportunities to create synergy between TCNL and the Department of Kinesiology,” says Tyler. “We’re just beginning to scratch the surface of discovering the brain’s potential to heal itself if given the right tools and the right environment. And our job, with help from others, is to develop the tools and training protocol, and a therapeutic toolkit for other researchers to utilize and go into realms that we don’t have the time or expertise to examine.”

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