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New finding may aid recovery from spinal cord injury

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Researchers in the Vanderbilt University Institute of Imaging Science (VUIIS) have achieved the first conclusive non-invasive measurement of neural signaling in the spinal cords of healthy human volunteers.

Their technique, described today in the journal *eLife*, may aid efforts to help patients recover from spinal cord injuries and other disorders affecting spinal cord function, including multiple sclerosis.

"We definitely hope that this work can be translated to address many neurological disorders," said the paper's first author, Robert Barry, Ph.D., a postdoctoral research fellow in the institute directed by senior author John Gore, Ph.D.

The researchers used ultra-high field functional magnetic resonance imaging (fMRI) to detect for the first time "resting state" signals between neural circuits in the human spinal column. These signals are continuously active, not in response to external stimuli.

"We see these background resting circuits as being inherent measures of function," said Gore, the Hertha Ramsey Cress Professor of Medicine, University Professor and vice chair of Research in the Department of Radiology and Radiological Sciences.

The technique may be valuable for understanding how spinal cord injury changes the "functional connectivity" between neural circuits, for example, and for assessing and monitoring recovery that occurs

spontaneously or following various interventions.

"The hope is that when you have impaired function that there will be changes (in the signals)," Gore said. "We've already got evidence for that from other studies."

Studies of the "resting" brain reveal how neural circuits coordinate to control various functions and to produce different behaviors. The spinal cord has been more difficult to study because it is much smaller than the brain, and conventional fMRI isn't sensitive enough to pick up its signals.

The Vanderbilt team overcame this challenge by using an fMRI scanner with a 7 Tesla magnet, multichannel spinal cord coils, and advanced methods for acquiring and analyzing the images. One Tesla is roughly 20,000 times the strength of the magnetic field of the earth.

Provided by Vanderbilt University Medical Center