Some kids with spinal cord injury may be overlooked for walking rehabilitation

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The traditional way to predict whether children can regain movement after spinal cord injuries may exclude a small subset of patients who could benefit from therapy, according to two studies presented by University of Florida researchers at the Society for Neuroscience meeting this week in San Diego.

In one study, researchers present details of a child with incomplete spinal cord injury who continues to improve four years after recovering walking ability in a locomotor training program at UF, even though clinical assessment tools predicted he would never walk again.

In another presentation, the scientists discussed findings in which three of six children with severe, chronic and incomplete spinal cord injuries — patients who retain some sensation or movement below the injury — improved through locomotor training, to the point where they could take steps. Even the three who did not regain stepping ability acquired greater trunk control.

The research was part of the Kids Step Study conducted at UF and Brooks Rehabilitation and led by Andrea Behrman, Ph.D., PT, an associate professor of physical therapy in the College of Public Health and Health Professions, and Dena Howland, Ph.D., an associate professor of neuroscience with the College of Medicine. Both also are affiliated with the McKnight Brain Institute and the Malcom Randall Veterans Affairs Medical Center.

"The prevailing clinical view is patients who are able to recover need to display early leg movement," said Howland. "The children in our studies displayed minimal or no movement, yet some were still able to make significant improvement."

One study participant was a 4 ∏-year old boy who received a disabling cervical spinal cord injury at the age of 3∏. Before he began in the locomotor training program, a clinical measure known as the lower extremity motor score predicted he would not recover walking. He had not walked for the 16 months since his injury. Then, for 76 sessions, the child participated in the program of locomotor training run by Behrman and Howland and their research team. The training takes a task-specific, intense repetitive practice approach with the goal of activating the neuromuscular system essential for walking.

The child was evaluated one month after locomotor training and then annually for four years. With the help of a rolling walker, he walks independently and can achieve speeds of nearly two-thirds of a meter per second. Without further training, he learned to pedal a tricycle, crawl, climb stairs and swim. He reported improved bladder sensation and attended elementary school full time without a wheelchair.

But, despite his functional improvements, his lower extremity motor score never changed — he remains unable to perform isolated leg joint movements even though he walks full time.

"The idea is that there may be a small subset in the spinal cord injury population that can benefit from training whom we have not identified, and the reason we have not identified them is that the traditional way isn't informing us," Behrman said. "These are all severely injured kids. Just think across the lifespan of a child who may be 3- or 6- or 10-years-old at the time of injury, what a difference it would make if they could regain a fraction of mobility. Even better trunk control means quite a bit

— pushing a wheelchair, or sitting behind a desk more comfortably, can be very important."

The Kids Step Study is supported by the Craig H. Neilsen Foundation and includes researchers and clinicians from UF's McKnight Brain Institute, the Veterans Affairs Brain Rehabilitation and Research Center at the Malcom Randall VA Medical Center in Gainesville, Shands Jacksonville and the Brooks Rehabilitation Hospital in Jacksonville. Support also comes through grants from the Florida Department of Health Brain and Spinal Cord Injury Program, the University of Florida Clinical Translational Science Initiative and the National Institutes of Health.

Currently, no rehabilitation approach exists to restore walking in children or adults with severe injuries. Typically, these patients are confined to a wheelchair or their legs are braced to obtain mobility. But neither approach activates the neuromuscular system below the injury level to promote recovery.

Children who participated in the studies were assessed before and after locomotor training for sensory and motor function, gross motor skills, ambulation and crawling. Lab-based tests were used to evaluate the integrity of connections between the motor cortex and spinal cord as well as between the subcortical structures and the spinal cord. The recovery of such function may be associated with the integrity of these neural structures and pose a new means of predicting walking recovery in the most severely injured children.

The results suggest locomotor training and walking recovery may be linked to the development of other rhythmic, reciprocal lower extremity tasks that together promote healthy growth and development.

"This doesn't mean all kids with these severe injuries can improve from

this intervention, but there is likely a subpopulation that can regain mobility, whether walking or trunk control," Behrman said. "Our aim is to provide clinicians with a means to identify who may benefit among the population with spinal cord injury and thus predict who will respond."

Researchers say the next step is to expand the study by enrolling more children.

Provided by University of Florida