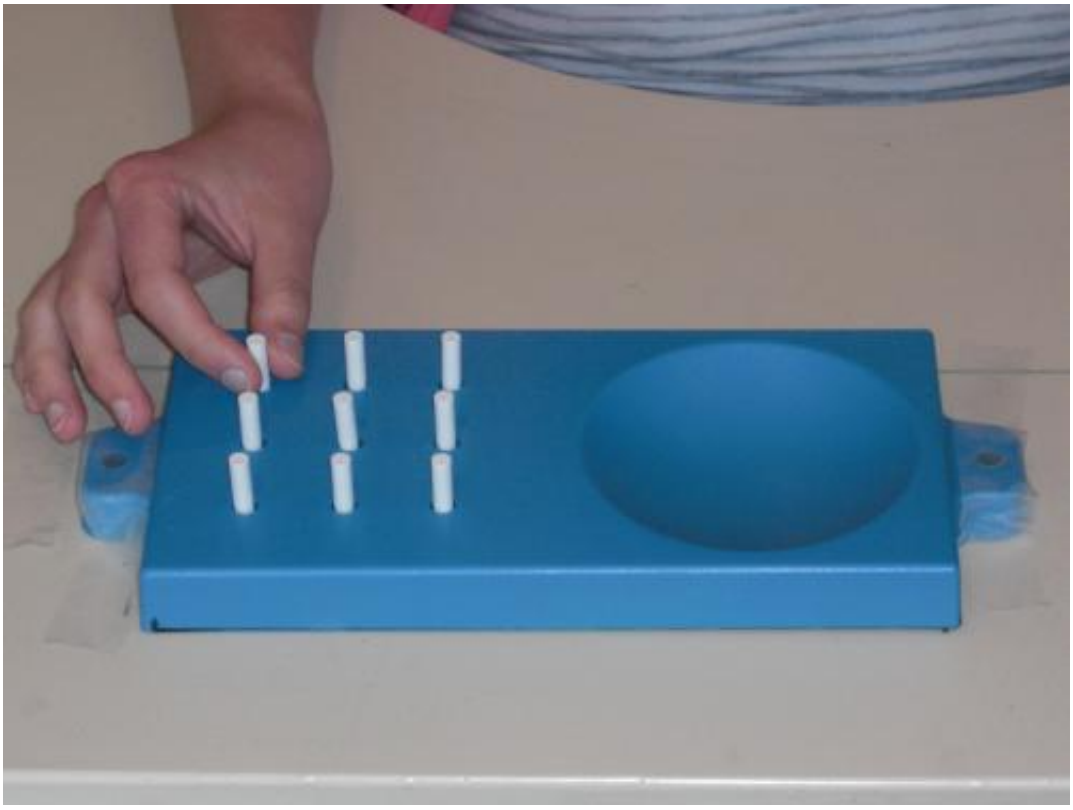
Hand use improved after spinal cord injury with noninvasive stimulation

November 29 2012



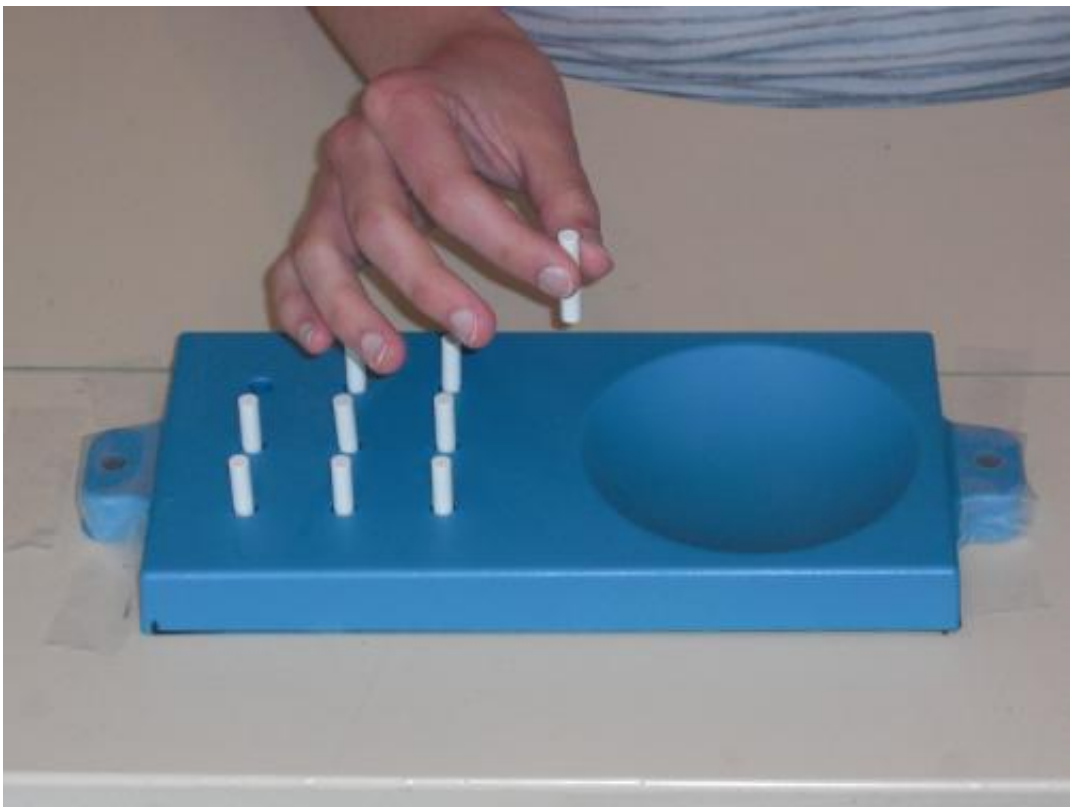
After non-invasive stimulation, people with spinal cord injuries showed greater manual dexterity when asked to grasp and manipulate small pegs with their index fingers and thumbs. Credit: Bunday et al., *Current Biology*

By using noninvasive stimulation, researchers were able to temporarily improve the ability of people with spinal cord injuries to use their hands. The findings, reported on November 29th in *Current Biology*, a Cell

Press publication, hold promise in treating thousands of people in the United States alone who are partially paralyzed due to spinal cord injury.

"This approach builds on earlier work and highlights the importance of the corticospinal tract—which conducts impulses from the brain's motor cortex to the spinal cord and is a major pathway contributing to voluntary movement—as an important target for intervention after spinal cord injury," said Monica Perez of the University of Pittsburgh.

The researchers tested the new method in 19 people with chronic cervical spinal cord injury and 14 uninjured people. The treatment was customized to each individual and paired transcranial magnetic stimulation delivered to a specific part of the motor cortex with electrical stimulation to peripheral nerves found in the wrist.



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manual dexterity when asked to grasp and manipulate small pegs with their index fingers and thumbs. Credit: Bunday et al., *Current Biology*

One hundred paired pulses were delivered every 10 seconds for a period of around 20 minutes to produce volleys of neural activity. The timing of arrival of those volleys in the spinal cord was absolutely essential to the treatment's success, the report shows.

"This short, noninvasive stimulation protocol has the potential to be used within a clinic setting as part of a rehabilitation technique," said study coauthor Karen Bunday, also of the University of Pittsburgh. "When pulses from the motor cortex were precisely timed to arrive at the spinal cord one or two milliseconds before pulses from the peripheral nerve, we observed an increase in spinal cord transmission and voluntary motor output for up to 80 minutes."

After the noninvasive treatment, the majority of the participants in the study could exert more force with their hand muscles. Those effects translated into greater manual dexterity when participants were asked to grasp and manipulate small pegs with their index fingers and thumbs.

More prolonged use of the technique or its combination with other rehabilitation strategies may well improve its therapeutic benefits, the researchers say. The protocol might also be used in the treatment of other kinds of motor disorders involving damage to the corticospinal tract.

"Human electrophysiology can be a powerful tool for developing therapies," Perez concluded. "We need to explore new targets to improve rehabilitation strategies by taking advantage of our knowledge in human physiology and their mechanisms."

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