Combining two techniques to 'rewire' the brain may improve arm and hand movement for stroke survivors

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Used in combination, two innovative rehabilitation approaches can promote better long-term recovery of arm and hand movement function in stroke survivors, suggests a paper in the *American Journal of Physical Medicine & Rehabilitation*, the official journal of the Association of Academic Physiatrists.

Adding peripheral nerve stimulation (PNS) to "constraint-based" therapy enhances recovery of movement in the affected arm and hand—even more than one year after a stroke, according to the study by Dr. Lumy Sawaki and colleagues of University of Kentucky, Lexington.

Adding Nerve Stimulation Improves Results of Constraint-Based Therapy

The preliminary study evaluated the effects of combining two emerging approaches to post-stroke rehabilitation of partial paralysis (hemiparesis). Constraint-induced therapy (CIT) is an approach that forces "intensive, task-oriented use" of the affected hand. This is done by limiting movement of the less-affected hand, forcing the patient to use the partially paralyzed limb.

Peripheral nerve stimulation consists of non-invasive, low-level electrical stimulation applied to the nerves in the paralyzed arm muscles, which in turn increases activity in the brain area that controls the arm. Both CIT

and PNS take advantage of the brain's potential for "neuroplasticity"—the ability to reorganize or "rewire" itself after injury.

The study included 19 stroke survivors who were left with mild to moderate hemiparesis of one upper limb, at least one year after a stroke. All received a modified CIT approach, including wearing a padded mitt on the less-affected hand during therapy sessions. Subjects were also asked to wear the mitt for 90 percent of waking hours during their daily lives.

In addition, subjects received either active or "sham" (inactive) PNS, delivered through electrodes placed on the affected arm. At each session, PNS was applied for two hours, followed by four hours of CIT.

After ten sessions, arm and hand function improved for both groups. But on most measures, improvement was significantly greater for patients who received active PNS added to CIT. Grip strength was the only measure to show no significant added advantage with active PNS.

Significant differences between groups persisted to one-month follow-up. "Compared with the sham PNS group, the active PNS group may have made more extensive use of the affected upper extremity in settings outside the lab, such as in activities of daily living," Dr. Sawaki and coauthors write. However, they caution that further studies are needed to provide conclusive evidence in this regard.

There's a crucial need for treatments to enhance long-term recovery of function after a stroke—particularly after the first year, when most spontaneous improvement occurs. Both CIT and PNS can enhance movement function after stroke. The new study is the first to suggest that combining these two techniques can lead to further improvement in arm and hand movement in stroke survivors with mild-to-moderate chronic

hemiparesis.

"It appears that PNS has enormous promise as a clinical intervention to enhance outcomes of motor training for stroke survivors with mild to moderate hemiparesis," Dr. Sawaki and colleagues conclude. They emphasize the need for further research to maximize the benefits of combined PNS and other rehabilitation techniques—including studies to optimize the PNS sites and settings and the other approaches used.

More information: Patricia Branco Mills et al. Transcutaneous Electrical Nerve Stimulation for Management of Limb Spasticity, *American Journal of Physical Medicine & Rehabilitation* (2016). DOI: 10.1097/PHM.0000000000000437

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