

Safety and efficacy of transcranial direct current stimulation in addition to constraint-induced movement therapy for post-stroke motor recovery (TRANSPORT2): a phase 2, multicentre, randomised, sham-controlled triple-blind trial

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Why We Did This Study

After a stroke, many people are left with weakness in their arm or hand. One treatment called constraint-induced movement therapy (CIMT), invented by Dr. Edward Taub, has been shown to help selected stroke survivors. It involves restraining the unaffected arm so the affected (or weaker) arm is forced to practice. Researchers wanted to know if adding weak electrical brain stimulation (called transcranial direct current stimulation, or tDCS) to this therapy would lead to even greater arm recovery.

Who Participated in This Study?

129 adults who had their first ischemic stroke (having clot in the brain) between 1 and 6 months earlier took part. All had some remaining arm weakness. About 42% were women and 53% were White. Participants were enrolled at 15 medical centers across the US between September 2019 and June 2024. They were split into three equal groups of 43. One group received sham stimulation, one group received low dose of stimulation at 2 mA level, and the third group received high dose of stimulation at 4 mA.

What Were the Results?

Adding brain stimulation (at 2 mA or 4 mA) to the CIMT therapy did not significantly improve arm movement more than the arm therapy alone. All three groups showed similar improvement after the 2-week treatment and the gain lasted to 3 months after treatment period. No serious safety concerns or deaths were reported. Most participants (98%) completed the full program.

What Do These Results Mean?

Adding weak electrical brain stimulation to intensive arm therapy, such as CIMT, was safe and well tolerated. But it did not significantly boost recovery beyond what arm therapy alone could achieve. The arm therapy is very intensive — about 2 hours per session for 10 sessions over two weeks. The intensity is ~ 4-5 times that of traditional rehabilitation therapy stroke patients receive in real-world practice. This high level of therapy may explain why adding stimulation made no extra meaningful difference. Future studies may test the additive effect of higher dose of stimulation.

The study results have been published in the Lancet Neurology in 2025 (PMID: 40157380; PMCID: [PMC12758568](#) and DOI: [10.1016/S1474-4422\(25\)00044-4](#)).