

Appraisal

Critically appraised papers: Cyclical electrical stimulation improves muscle strength and activity after stroke

Synopsis

Summary of: Scrivener K, Ada L, Glinsky JV, Dorsch S, Jamieson S, Brighton-Hall SM, et al. Electrical stimulation of the motor system after stroke. *Cochrane Database Syst Rev*. 2025;12:CD015338.

Objective: To determine whether cyclical electrical stimulation (CES) improves strength and activity after stroke. Note: the Cochrane review also evaluated functional electrical stimulation for stroke, but this synopsis only focuses on CES. **Data sources:** CENTRAL, Medline, Embase, AMED, CINAHL, PEDro and Web of Science were searched up to December 2024, alongside two trial registries. The search was supplemented by searching reference lists of relevant articles and forward citation tracking. **Study selection:** Randomised controlled trials involving adults following a stroke were included if they compared CES with no intervention or sham, or CES with other strengthening interventions, and assessed voluntary strength (objective measures such as direct force or torque were preferred over self-reported measures such as motor function scales) or activity performance (eg, walking or reaching). Two reviewers independently selected eligible studies, resolving disagreements by discussion or consulting a third reviewer. **Data extraction:** Data extraction, risk of bias assessment (using the Cochrane Risk of Bias 1 tool) and grading evidence certainty (using GRADE) were performed independently by two reviewers, with disagreements resolved by discussion or a third reviewer. **Data synthesis:** Eighty-nine trials were included. Compared with no intervention or sham, CES increased voluntary strength immediately post-intervention (mean of 5 weeks post-randomisation; SMD 0.47, 95% CI

0.32 to 0.61; $I^2 = 0\%$, 23 trials, 741 participants; high-certainty evidence) and at a mean of 10 weeks post-randomisation (SMD 0.48, 95% CI 0.28 to 0.69; $I^2 = 0\%$, 11 trials, 384 participants; moderate-certainty evidence). It also increased activity performance immediately post-intervention (SMD 0.50, 95% CI 0.34 to 0.65; $I^2 = 7\%$, 20 trials, 662 patients; high-certainty evidence) and at a mean of 10 weeks post-randomisation (SMD 0.57, 95% CI 0.37 to 0.78, $I^2 = 26\%$, 11 trials, 385 patients; moderate-certainty evidence). Compared with other strengthening interventions, one trial (38 participants) found very low-certainty evidence of no effect of CES on voluntary strength (SMD -0.07 , 95% CI -0.70 to 0.57) or activity performance (SMD 0.47 , 95% CI -0.18 to 1.11) immediately post-intervention. **Conclusion:** CES produces moderate improvements in voluntary strength and activity performance after stroke compared with sham or no intervention, with improvements maintained beyond treatment. Comparative effectiveness of CES against conventional strengthening remains unclear.

Provenance: Invited. Not peer reviewed.

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Commentary

Muscle weakness is a key impairment limiting activity and participation after stroke, yet many individuals are unable to generate sufficient voluntary muscle activation to engage in conventional strengthening exercise. Cyclical electrical stimulation (CES) is a feasible strengthening intervention that enables muscle loading and activation of the motor system in individuals who might otherwise receive limited strength-focused interventions, particularly among those early post-stroke or with severe paresis. As voluntary control improves, electrical stimulation is most appropriately applied in a task-specific manner aligned with functional goals such as walking or upper limb use.

As an intervention, CES provides a practical way to enable individuals with significant weakness to engage with strength training and potentially undertake this independently. The Clinical Guidelines for Stroke Management¹ recommend maximising scheduled therapy and encouraging active practice outside formal therapy sessions. However, for individuals with significant weakness, independent practice is often not possible without some means of activating the muscle. CES may offer a pragmatic strategy to increase overall therapy exposure, enabling practice that some patients can undertake independently or with family support.

At 6 months post-stroke, 50% of stroke survivors have ongoing functional impairments that impact participation and quality of life.² Implementation of effective interventions is essential, particularly in

the early phases of stroke recovery where most neuroplastic changes and functional gains occur. This review indicates that CES provides an opportunity to improve strength and activity following stroke. However, it should be noted that most trials were small (mean of 32 participants per trial) with inconsistent blinding and limited follow-up, which may influence the interpretation of these findings. Further research is required to establish the long-term impact on participation and quality of life for stroke survivors.

Provenance: Invited. Not peer reviewed.

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References

1. Stroke Foundation. Clinical Guidelines for Stroke Management 2026. Viewed 1 May 2026, from <https://informme.org.au/guidelines/living-clinical-guidelines-for-stroke-management>.
2. Masel BE, et al. *Brain Inj*. 2026;40:61–68.