

Non-paretic leg movements can facilitate cortical drive to the paretic leg in severe stroke: implications for motor priming

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Abstract

Background: Cross-education, a phenomenon where unilateral strength (or skill) training enhances strength (or skill) in the contralateral untrained limb, has been well studied in able-bodied individuals. However, whether non-paretic leg movements can modulate corticomotor excitability (CME) and improve motor control of the paretic leg in stroke remains unclear. **Objective:** To determine the effects of non-paretic leg movements on corticomotor responses and motor control of the paretic leg in persons with severe stroke. **Methods:** Seventeen post stroke individuals with severe leg motor impairment performed three 20-min motor trainings using their non-paretic ankle: skill (targeted dynamic movements), strength (isometric resistance), and sham (sub-threshold electrical nerve stimulation). Transcranial magnetic stimulation measured CME of the contralateral pathways from the non-lesioned motor cortex (M1) to the non-paretic tibialis anterior (TA) muscle, ipsilateral pathways to the paretic TA, and transcallosal inhibition (TCI) from the non-lesioned to lesioned M1. Paretic ankle motor control was measured using a reaction time paradigm. **Results:** CME of the non-paretic TA increased after skill (23%) and strength (19%) training ($p < 0.01$). Ipsilateral CME of the paretic TA (23%) and TCI (36%) increased after skill ($p < 0.05$) but not strength training. Reaction time of the paretic ankle improved after skill and strength training (~12%; $p < 0.05$) and was sustained at 60 minutes. No changes were observed during the sham condition. **Conclusion:** Our findings may inform future studies for using non-paretic leg movements as a priming modality, especially for those who are contraindicated to other priming paradigms (e.g., brain stimulation) or unable to perform paretic leg movements.

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