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The cortical control of cycling exercise in stroke patients: an fNIRS study.

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Abstract

Stroke survivors suffering from deficits in **motor** control typically have limited functional abilities, which could result in poor quality of life. **Cycling** exercise is a common training paradigm for restoring locomotion rhythm in patients. The provision of speed feedback has been used to facilitate the learning of controlled **cycling** performance and the neuromuscular control of the affected leg. However, the central mechanism for **motor** relearning of **active** and **passive** pedaling motions in stroke patients has not been investigated as extensively. The aim of this study was to measure the cortical activation patterns during **active cycling** with and without speed feedback and during **power**-assisted (**passive**) **cycling** in stroke patients. A frequency-domain near-infrared spectroscopy (FD-NIRS) system was used to detect the hemodynamic changes resulting from neuronal activity during the pedaling exercise from the bilateral sensorimotor cortices (SMCs), supplementary **motor** areas (SMAs), and premotor cortices (PMCs). The variation in **cycling** speed and the level of symmetry of muscle activation of bilateral rectus femoris were used to evaluate **cycling** performance. The results showed that **passive cycling** had a similar cortical activation pattern to that observed during **active cycling** without feedback but with a smaller intensity of the SMC of the unaffected hemisphere. Enhanced PMC activation of the unaffected side with improved **cycling** performance was observed during **active cycling** with feedback, with respect to that observed without feedback. This suggests that the speed feedback enhanced the PMC activation and improved **cycling** performance in stroke patients.

KEYWORDS: brain activation; **cycling**; near-infrared spectroscopy; rehabilitation; stroke

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