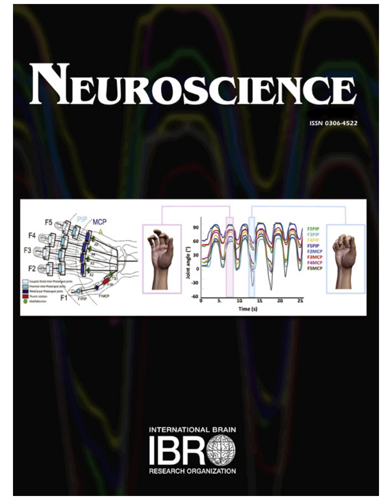

Circuit changes in motor cortex during motor skill learning

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Circuit changes in motor cortex during motor skill learning

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Key words: **cortical circuits, cortical inhibition, motor cortex, motor learning, synaptic plasticity**

Abbreviations: AAV, Adeno-associated virus; M1, primary motor cortex, S1, primary somatosensory cortex, V1, primary visual cortex.

Abstract

Motor cortex is important for motor skill learning, particularly the dexterous skills necessary for our favorite sports and careers. We are especially interested in understanding how plasticity in motor cortex contributes to skill learning. Although human studies have been helpful in understanding the importance of motor cortex in learning skilled tasks, animal models are necessary for achieving a detailed understanding of the circuitry underlying these behaviors and the changes that occur during training. We review data from these models to try to identify sites of plasticity in motor cortex, focusing on rodents as a model system. Rodent neocortex contains well-differentiated motor and sensory regions, as well as neurons expressing similar genetic markers to many of the same circuit components in human cortex. Furthermore, rodents have circuit mapping tools for labeling, targeting, and manipulating these cell types as circuit nodes. Crucially, the projection from rodent primary somatosensory cortex to primary motor cortex is a well-studied corticocortical projection and a model of sensorimotor integration. We first summarize some of the descending pathways involved in making dexterous movements, including reaching. We then describe local and long-range circuitry in mouse motor cortex, summarizing structural and functional changes associated with motor skill acquisition. We then address which specific connections might be responsible for plasticity. For insight into the range