

Motor Modularity as a Theory of Neuromotor Control and its Relevance to Neuro-rehabilitation

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参加方法 事前申し込みは不要です。直接会場にお越しください。

要旨

The mammalian motor system is a distributed, ultra-complex network that comprises the sensorimotor cortices, basal ganglia, thalamic and brainstem nuclei, cerebellum, and spinal interneuronal circuits. Neuroscientists have approached the “hard problem” of understanding neural control of movement by formulating theories of motor control. For any such theory to be useful, it must facilitate the tackling of the following questions. What are the neurophysiological and developmental origins of the movement control policy in the theory? What is the neural basis of motor skill learning? And how may our neuroscientific knowledge guide the development of neuro-rehabilitation for movement disorders? I argue that the theory of motor modularity – the idea that the motor system constructs movement by combining a limited number of discrete coordination modules called muscle synergies – is a viable theory of motor control relevant to neuro-rehabilitation. Our recent findings obtained from animal models and humans have relied on motor modularity to shed light on all questions above. Specifically, muscle synergies are encoded by spinal interneuronal populations and accessible by the motor cortex, and the plasticity of muscle synergies contributes to changes of motor patterns during motor development and motor learning. Finally, muscle synergies may serve as predictive markers and targets of intervention for personalized rehabilitation for stroke survivors.