Editorial

Motor Rehabilitation after Stroke

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Stroke is one of the most common conditions in adults that may cause impairment and disability. Motor impairments often persistently affect the daily function and quality of life among stroke survivors. Recently, a few novel interventions to improve motor impairment have evolved that make use of advances in neuroscience and neurobehavioral knowledge. These theory-driven approaches attempt to translate basic science research into novel clinical practice and build on methods to manipulate favorable plasticity changes within the brain in response to task-related training to augment motor recovery.

Developing a new clinical intervention may consist of four phases [1]: consideration of concept, development of concept, demonstration of concept, and proof of concept. The value of a phase I study is to learn how well an intervention can be applied, how patients respond to the intervention, to whom it ought to be given, what outcomes should be measured, and how its safety can be assured. Phase II studies aim to standardize the new treatment, compare efficacy against alternative treatments, and ensure that outcomes can be measured objectively and reliably. Phase III studies aim to optimize the treatment (dosage optimization) and enhance its practicality. Most of the papers published in this special issue are Phase I studies. An increase in Phase II and III studies is needed to improve stroke rehabilitation research and practice.

Among the five Phase I studies presented here, two assessed how well the intervention could be applied in patients with stroke. A. Reinthal and colleagues evaluated the effects of a novel activity-based gaming exercise that involved highly repetitive practice in stroke rehabilitation. S. B. Badia and M. S. Cameirão used 10 healthy individuals to test a neurorehabilitation training toolkit designed for stroke survivors in the home environment.

Three papers in this special issue addressed appropriate treatments for specific types of patients, for example, the degree of impairments or type of symptoms. This information can be used to maximize the benefits of specific interventions. Among these studies, C. Schuster and colleagues' study involved a qualitative, patient-centered study to address where, when, what, how, and why motor imagery can be used for stroke rehabilitation. F. Malouin and colleagues investigated the effect of the side of hemispheric lesion on temporal congruence between real and imagined movements and its link with working memory deficits in persons with chronic stroke. B. Langhammer and B. Lindmark demonstrated immediate and follow-up improvements after functional exercise between groups with high and low baseline functional level for a period of 36 months after stroke.

L. Chuang and colleagues' study of instrument evaluation examined the reliability of Myoton-3 myometer, a tool used

to quantify muscle tone, elasticity, and stiffness in stroke patients. This study provided evidence for the psychometric soundness of myotonometric measurement. Also included in this special issue are two systematic reviews of optimal dosage of stroke motor rehabilitation.

To advance stroke motor rehabilitation, future research may translate concepts from basic sciences to clinical trials and health care of patients with stroke. Issues relevant for study may include, but are not limited to, the following.

- (i) What are the most beneficial interventions for specific types of patients under specific circumstances [2]?
- (ii) What are the factors (e.g., the time for delivering a specific intervention, patient characteristics) that may affect treatment outcomes [3, 4]?
- (iii) What are the fundamental mechanisms (neurophysiologic and biomechanical) that may underlie motor improvements?
- (iv) How can bioengineered or robotic devices be optimally used to effectively manage motor impairment and disabilities?
- (v) What are the optimal dosages for specific rehabilitation regimens [5]?

Continued research on these issues will lead to improved knowledge and practice guidelines for stroke rehabilitation.

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