



EDITORIAL

Trends in Upper Limb Rehab in Stroke

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Stroke rehabilitation has been flourishing over the decades. As the concept of brain plasticity evolved, so has the advent of new and more effective therapeutic techniques. According to the theory, adult brain can rewire in response to experience and training. Also, the trend has shifted from improvement in mere movement to training in functional tasks which helps in improving participation in daily activities as well as social participation.

Recovery from stroke can be divided into three overlapping phases: diachisis reversal (decreased function of remote brain regions due to hypometabolism, neurovascular uncoupling and aberrant neurotransmission), cell genesis and repair; alteration of existing neuronal pathways; and forming new neuronal connections. These changes can be attributed to degrees of spontaneous recovery, exercise-based motor training, increasing involvement of contralateral hemisphere and remodelling of corticospinal system.

Stroke rehabilitation for upper limb was initially based on the principles of neurophysiology that focused on improving the lower level skills (range of motion, strength, muscle tone etc.) as the distribution of brain activity was divided into a hierarchy. The assumption common to these approaches was that only after the lower level skills are achieved can upper level skills be mastered. The approaches following this premise included Brunnstrom's Movement Therapy Approach, Bobath's Neuro Developmental Therapy Approach, Knott and Kabat's Proprioceptive Neuromuscular Facilitation Approach and Rood's Sensorimotor Approach.

However, trend has evolved towards a top-down approach focusing on improving the functional skills of an individual with stroke along with lower level skills. A number of treatment techniques have emerged over the past few decades with emphasis on functional rehabilitation.

Constraint-induced movement therapy (CIMT) has emerged as an evidence-based intervention to improve use of the paretic arm in relatively high-functioning subjects with stroke. This intervention has not yet been proven to benefit low-functioning patients, who present deep non-use of the affected upper limb.

Task-oriented training uses tasks which are meaningful to the patient based on repetition and practice. The goals for the

tasks can be based on the Canadian Occupational performance measure (COPM). The effectiveness of task-oriented approach has been proven for sensory retraining, cognitive neural rehabilitation and motor training of the upper limb. Bilateral arm training in task-oriented approach uses the spatial and temporal parameters of the non-paretic limb for motor and sensory recovery of the paretic limb.

Mirror therapy has gained interest in the past few years. It emphasises the illusion of movement of affected hand by movement of the non-paretic side. It has been proven beneficial in improvement of upper limb motor function and activities of daily living. This has been attributed to positive feedback received by the motor cortex. It also involves the somatosensory cortex therefore may lead to sensory recovery.

Virtual reality or motor imagery delivers task-specific training and multisensory stimulation. It is a computer technology that simulates real-life learning while providing augmented feedback and a high intensity of massed practiced tasks. It provides a safe environment for patients to explore functional capability without interference from their physical or cognitive limitations.

In the field of robot-assisted stroke therapy, there have been three main approaches to promoting patient engagement:

- (1) Assist-as-needed algorithms to provide the minimal robotic assistance necessary for the patient to complete a motion
- (2) Detection of patient intent to move, and
- (3) Virtual reality games for a more immersive experience.

Although rehabilitation is considered critical to the restoration of functional activities after stroke, a paucity of data exists indicating which rehabilitation strategies are more effective than the others in improving upper limb functions in stroke. There appears to be a growing need for research-based evidence rather than instinct or choice guiding the therapists

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towards which treatment strategy to be used in upper limb rehabilitation based on a client-centred approach.

Conflict of interest

None

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