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# Effectiveness of Robotic Hand Therapy in Enhancing Functional Recovery of Hemiplegic Hands after Stroke: A Narrative Review Study

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## ABSTRACT

**Introduction:** Stroke is one of the leading causes of long-term disability, often resulting in hemiplegia that impairs motor function and the ability to perform daily activities. The recovery of hand function in stroke patients is crucial for improving quality of life and independence. Robotic hand therapy has been explored as an innovative rehabilitation technique to promote motor recovery in post-stroke hemiplegia. This technology leverages robotic devices to provide repetitive, task-specific training that enhances motor control and fosters neuroplasticity.

**Aim:** This narrative review aims to assess the effectiveness of robotic hand therapy in enhancing functional recovery of hemiplegic hands following stroke by analysing articles that examine various robotic devices and their impact on motor function, hand dexterity, and activities of daily living (ADLs).

**Materials and Methods:** A comprehensive search of the literature was conducted using electronic databases, including PubMed, Scopus, and Google Scholar. Studies published from 2010 to 2024 were screened for relevance. Key search terms included "robotic hand therapy," "hemiplegia," "stroke rehabilitation," "motor recovery," "functional recovery," and "neuroplasticity." Articles were selected based on the following inclusion criteria: (1) studies using robotic devices for hand rehabilitation, (2) trials measuring motor recovery or improvement in ADLs, and (3) studies that provided outcomes related to the effectiveness of robotic interventions.

Exclusion criteria included studies not focussed on stroke rehabilitation, non peer-reviewed articles, and those without relevant outcome data. After screening, a total of 12 articles were included in the review.

**Results:** The review identified consistent positive outcomes in studies investigating robotic hand therapy. Robotic devices such as exoskeletons, glove-based systems, and wearable robotic suits were found to improve hand function, grip strength, and fine motor skills. Several studies reported enhanced performance in ADLs and increased independence. The therapy was shown to facilitate neuroplasticity, with patients exhibiting improvements in motor coordination and functional abilities through repetitive, task specific movements.

**Conclusion:** Robotic hand therapy appears to be an effective intervention for improving the functional recovery of hemiplegic hands following stroke. The reviewed studies consistently demonstrated positive outcomes in terms of motor function and ADLs.

**Keywords:** Activities of daily living, Hemiplegia, Motor function, Neuroplasticity, Stroke rehabilitation.