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Robotic-Assisted Gait Training in Stroke Rehabilitation: A Literature Review

Topic: Robotics

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BACKGROUND

Stroke remains the leading cause of disability worldwide, often resulting in significant impairment in mobility, walking ability, and independence in activities of daily living (ADL). Various rehabilitation approaches have been developed to improve functional recovery, among which, Robot-Assisted Gait Rehabilitation (RAGT) has emerged as promising strategy. RAGT enables intensive, repetitive, and task-specific gait rehabilitation, potentially enhancing neuroplasticity and functional outcomes in stroke survivors.

This review aims to examine the effectiveness of robot-assisted gait training in post-stroke rehabilitation and compare its impact to conventional gait training approaches.

METHODS

A literature review was conducted using PubMed and Science Direct database, selecting articles published in English between 2020 and 2025. Keywords included Rehabilitation; Gait; Robot-assisted gait training; Stroke; Walking.

RESULTS

Clinical trials indicate that powered robotic exoskeletons are a safe and effective gait training intervention for stroke rehabilitation. Evidence suggests that:

- In chronic stroke patients, robotic gait training produces outcomes comparable to conventional therapy.
- In subacute stroke patients, RAGT may offer additional benefits, accelerating functional improvements.

Several studies have assessed RAGT using standardized gait evaluation tools, including: 10-Meter Walking Test (10MWT), Six-Minute Walk Test (6MWT), Timed-Up-and-Go (TUG) Test and Five-Meter Walk Test (5MWT)

Findings demonstrate that stroke patients receiving physiotherapy combined with robotic gait training achieve greater improvements compared to those undergoing conventional therapy alone.

Additionally, electromechanical-assisted gait training combined with functional electrical stimulation (FES) yields superior outcomes compared to robotic training alone.

Moreover, emerging research highlights the potential of virtual reality (VR)-enhanced RAGT in improving dual-task gait performance in chronic stroke patients, suggesting a role for VR in enhancing motor learning and cognitive-motor integration.

CONCLUSION

While RAGT has demonstrated effectiveness, further research is needed to optimize clinical applicability, patient selection criteria, and individualized treatment protocols.

Future developments should focus on improving robotic systems, refining rehabilitation protocols, and incorporating innovative technologies such as VR and FES to maximize functional recovery.

Statement of Disclosures

None

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