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Exploring the Application of IoT Technology in Lower Limb Assistive Devices for Rehabilitation during the Golden Period of Stroke Patients with Hemiplegia

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Abstract : Recent years have shown a trend of younger stroke patients and an increase in ischemic strokes with the rise in stroke incidence. This has led to a growing demand for telemedicine, particularly during the COVID-19 pandemic, which has made the need for telemedicine even more urgent. This shift in healthcare is also closely related to advancements in Internet of Things (IoT) technology. Stroke-induced hemiparesis is a significant issue for patients. The medical community believes that if intervention occurs within three to six months of stroke onset, 80% of the residual effects can be restored to normal, a period known as the stroke golden period. During this time, patients undergo treatment and rehabilitation, and neural plasticity is at its best. Lower limb rehabilitation for stroke generally includes exercises such as support standing and walking posture, typically involving the healthy limb to guide the affected limb to achieve rehabilitation goals. Existing gait training aids in hospitals usually involve balance gait, sitting posture training, and precise muscle control, effectively addressing issues of poor gait, insufficient muscle activity, and inability to train independently during recovery. However, home training aids, such as braced and wheeled devices, often rely on the healthy limb to pull the affected limb, leading to lower usage of the affected limb, worsening circular walking, and compensatory movement issues. IoT technology connects devices via the internet to record, receive data, provide feedback, and adjust equipment for intelligent effects. Therefore, this study aims to explore how IoT can be integrated into existing gait training aids to monitor and sensor home rehabilitation movements, improve gait training compensatory issues through real-time feedback, and enable healthcare professionals to quickly understand patient conditions and enhance medical communication. To understand the needs of hemiparetic patients, a review of relevant literature from the past decade will be conducted. From the perspective of user experience, participant observation will be used to explore the use of home training aids by stroke patients and therapists, and interviews with physical therapists will be conducted to obtain professional opinions and practical experiences. Design specifications for home training aids for hemiparetic patients will be summarized. Applying IoT technology to lower limb training aids for stroke hemiparesis can help promote walking function recovery in hemiparetic patients, reduce muscle atrophy, and allow healthcare professionals to immediately grasp patient conditions and adjust gait training plans based on collected and analyzed information. Exploring these potential development directions provides a valuable reference for the further application of IoT technology in the field of medical rehabilitation.

Keywords : stroke, hemiplegia, rehabilitation, gait training, internet of things technology
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