

Robotic devices and systems in physiotherapy- A review

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Abstract

Robotics is a term which is used for the combination of multiple terms such as engineering, technology, rehab etc. Even, the term artificial intelligence has proved to be useful in taking robotics ahead. Walking ability is linked to a variety of daily duties, whilst immobility can considerably reduce the standard of living of those suffering from locomotory illnesses. Researchers from all over the world are working to enhance or develop medicines and gadgets that may aid those individuals. By assisting therapists in delivering ongoing instruction over a long period of time and gathering data to monitor improvement robotics-assisted rehabilitation technology has the potential to improve the efficacy and availability of therapy. This review research summarizes the effort that has gone into the implementation and evolution of robotic systems for rehabilitation. Home-based rehabilitation devices, which make use of readily available state-of-the-art technology, are offered as a long-term solution to the current situation. In order to effectively enroll in this therapy for research reasons, efforts are made to discover the appropriate form of treatment, the amount and quantity of training technique, and the patient's features. Robotic therapy should be considered as a therapeutic tool that may be utilized to provide a more complex, controlled multimodal stimulation to the patient, as well as to affect the development of neural pathways through movement. In order to effectively enroll in this therapy for research reasons, efforts are made to discover the appropriate treatment, the length and quantity of training technique, and the patient's features.

Keywords: Robotics, physiotherapy, rehabilitation, mobility, treatment.

INTRODUCTION

Robotics is the study of creating devices that really can take the place of people and mimic their actions. Robotics is the study of the idea, manufacture, control, of the use of robotics(2). Rehab robotics is a discipline of robotics dedicated to the creation of robots that aid in the recovery of persons who have suffered serious physical injuries(3). Robotic technology can help with a variety of tasks in therapeutic rehabilitation(4). Robotics in health care offers a wide range of applications around the world. Some robots can assist in a variety of health-related fields. People with mobility difficulties may get an advantage from the usage of walkers in rehabilitation and their daily lives(5). The ability to move is required to undertake basic daily activities (ADL). Patients with movement difficulties have a lower quality of life(6). The conclusion of such an integrated framework would be critical for post-stroke patients' rehabilitation, improving their quality of life, and, in the long run, decreasing the related costs to the healthcare system(7). Upper-extremity disorders severely impair a person's ability to function independently. Fortunately, there are a number of options for restoring upper-extremity functionality, including Physiotherapy, orthotics, and functional electrical stimulation. The outcome of physical therapy for neurological disorders is greatly reliant on the training's beginning, duration, intensity, and task-orientation, as well as the patient's health, effort, and attention. For therapists supporting patients, continuous repetitions of coordinated motor movements are a considerable stress(6). Movement disorders, in instance, restricts mobility and function, resulting in greater disability and costs. (1). Both because of high expense of long-term therapy treatments and caring, which both need a large number of human resources. While stroke-related motor impairment is one of the most common causes for rehab, deficits produced with cerebral palsy, multiple sclerosis, spinal cord injury, and Parkinson's disease may require comparable techniques to improve motor function. (1). In most cases, the rehabilitative process is separated into four stages. The patient must first be assessed in order to identify the nature and depth of the impairment. Secondly, the therapist must set therapeutic objectives and design a plan to meet them. Thirdly, the treatment must be carried out, which usually involves numerous times of supported repetition of particular actions. Finally, following the therapy, the individual must be evaluated and new objectives created.(1). The very first robotic device designed specifically for rehab has been the

MIT-Manus. It gave the user two degrees of freedom in the horizontal position while directing that patient's arm across a route with varying degrees of stiffness. When compared to conventional treatment, robotics-based rehabilitation has the benefit of allowing for more consistent training at the recommended intensity over a longer period. (1). Various challenges must be overcome in order to make robotic treatments more user-friendly and widely accessible, including cost, safety, effectiveness, and simplicity of use both for the patient and the therapy. In terms of making these devices more approachable, a lot of research has gone into adapting low-cost rehabilitation systems and analyzing their capacity to produce valuable data for remote evaluation. (1). A rehabilitative robot is designed that provides direct assistance to people, offers a wide range of applications in rehabilitation therapy, but it requires a high level of expertise. As a result, it is critical to design improved rehabilitation robots (8). Lower limb rehabilitation robot research is an essential element of rehabilitation robot research for patients with limb mobility problems (8). As technology progresses, robotic upper extremity rehabilitation therapy is gaining momentum in the rehabilitation field. It is used to help therapist with repeated employment manual treatment in order to promote or facilitate healing. Even though robotic devices can assist patients in moving their extremities during exercise, this minimizes therapists' time needs, allowing them to provide more treatment to more patients at the same time. (9). Children with physical impairments frequently perform poorly in day-to-day life, obstructing their physical, social, as well as mental development. As a result, rehabilitation is critical to reducing the negative impacts of many causes of physical disability while also improving functional independence and ADL's. Robots that can assist patients, families, and medical professionals in a variety of activities related to the care of persons with physical limitations are gaining popularity (10).

There are three primary groups of healthcare robots:

Clinical robots, assistive robots, and rehab robots are all examples of robots.

USES:

1] Robotics in stroke patients:

The innovative device can help stroke patients regain muscle mass and improve their posture and mobility, but it does so much more (11).

2] Robotics in upper limb rehabilitation:

In patients, robotic training proved more successful than normal care therapy in diminishing motor dysfunction (12-25)

3] Robotics in lower limb rehabilitation:

Robot for lower extremity gait rehabilitation are primarily intended to aid in the automation of labor-intensive repeated training during neurorehabilitation (26-41).

Clinical robot specialize on supportive treatment and the recovery period in clinical settings, whereas assistance robots' primary responsibility is to aid caregivers or patients directly in a hospital or specialist treatment center (10).

Conclusion:

Robotics in physiotherapy improves the treatment procedure by helping patients getting assisted by robotics. Robotics is getting enhanced by keeping patients engaged with various ways of treatment. As a result, there are a variety of reasons to use robotic devices in therapeutic systems. The study's major goal is for robots to be supplied through low-cost technology in order to successfully cure humans.

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