

Technology in Neurological Rehabilitation: A Boon or Bane for Physiotherapists

Sneha Chakraverty*

Assistant Professor, Abhinav Bindra Sports Medicine, and Research Institute, Bhubaneswar, India

*Corresponding Author: Sneha Chakraverty, Assistant Professor, Abhinav Bindra Sports Medicine, and Research Institute, Bhubaneswar, India.

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Rehabilitation is a process of education of the disabled person with the ultimate aim of assisting that individual to cope with family, friends, work, and leisure as independently as possible [1]. Neurological rehabilitation denotes the medical subspecialty in the clinical interface between rehabilitation medicine and neurology [2]. Physiotherapists play a major role in rehabilitation. Neurological rehabilitation demands an interdisciplinary approach and the role of physiotherapists is crucial in that for prognosis and quality of life. Neurological rehabilitation and recovery is a slow and time-taking process and it demands patience from the neurological survivors as well as from the therapist.

With technology dominance, our whole world is revolving around technology. We are dependent upon technology for every single task. Technology has interfered with every section of life and healthcare is one of them. The health sector is also getting digitalized and the practitioners and the survivors are equally getting benefitted from it. In advanced rehabilitation programs, we are having different technology like ProKin for gait and balance rehabilitation, virtual reality, and robotics. These technologies make rehabilitation program more interesting and engaging and it reduces the physical burden of physiotherapists as well.

Robot-mediated neurorehabilitation is a growing field that seeks to incorporate advances in robotics combined with neuroscience and rehabilitation to define new methods for treating problems related to neurological diseases. The idea of incorporating robotics in neuro-rehabilitation started in the late 1980s by researchers worldwide. After that in 2000, the first commercial robotics appeared for neurorehabilitation. The main aim of introducing robots in neurorehabilitation is to assist in upper limb and

lower limb rehabilitation in neurological cases, to support muscle reeducation and motor relearning, to assist in the development of proprioception, cognitive function, and attention, and to decrease the burden of physiotherapist and occupational therapist. Robot-assisted neurorehabilitation has a better prognosis than patients receiving traditional physiotherapy alone [3]. But, the role of robotics is not to lessen the importance of physiotherapy and physiotherapist in neuro-rehabilitation. Robots have been introduced to assist physiotherapists in their work. Traditional neuro-physiotherapy training involves intensive training with long protocols and physiotherapist often finds difficulty in repetitive movements of the spastic upper and lower limb, in transfers, gait re-education, etc. All these lead to the deterioration of their health conditions and they often come up with complaints of low-back pain, neck pain, fatigability, etc. These robots lessen the physical efforts of physiotherapists giving them more time to plan the rehabilitation protocol for patients. With the advancement of technology, there are so many modifications in rehabilitation robot designs. Robotics is taking the attention of scientists, researchers, and engineers from different areas of the field. Currently, for every phase of the disease, there are different rehabilitation robotics: clinical robotics for diagnosis and surgery processes; rehabilitation robotics covering postinjury care, and assistive robotics to provide assistive care to patients like an exoskeleton [4].

Technology-driven rehabilitation programs are bringing researchers, practitioners, engineers, and scientists from different domains to work together, increasing the scope of interdisciplinary research. One such stream is neuro rehabilitation mechatronic. Neuro Rehabilitation Mechatronic (NRM) is an overlap between two areas of applied science: Biomechatronic and Neural Engineer-

ing. NRM is an umbrella terminology that covers diverse existing mechatronic technologies that assist patients to regain their motor functions that are lost due to neural and/or physical damage. Two major categories of NRM technologies include (a) Haptics-enabled Interactive Robotic Neurorehabilitation (HIRN) systems and (b) Assistive Neural Technologies. These systems are known to accelerate brain plasticity and recovery, over time [5].

Virtual reality and augmented reality allows users to interact in various system generated sensory environment and to obtain real-time feedback on their performance in a safer environment [6]. Virtual reality focuses on cognitive aspects of rehabilitation giving the benefit of both physical and cognitive rehabilitation at a lesser time.

The future of neuro-rehabilitation includes an interdisciplinary approach and all these robots and assisted technology is going to be an integral part of neurological rehabilitation in near future. Robots and other assistive technology are a promising opportunity to widen treatment options and improve outcomes for patients with neurological impairments [7]. They will also reduce the physical burden of physiotherapists in early rehabilitation and will help in delivering advanced rehabilitation to provide a better prognosis in a short period of time, which is the need of the hour in neuro-rehabilitation. As technology is taking its' pace there are possibilities in the near future that technology can cut down the manpower of physiotherapists in many clinical settings. So, there is a huge need for physiotherapists to update themselves according to technology demands. According to an online survey done in the United States in an academic institution offering physiotherapy programs, 862 graduate students from 62 schools states that they are having lack of insight into all these technologies because of the non-inclusion of any of these concepts in their curricula [8]. 144 faculty representing 53 schools from the same survey stated that they are having knowledge about these topics but they can't incorporate it due to time and resource constraints and inadequate funding. This indicates there is a need for the upgradation of the curriculum for all physical therapy programs. Also, there is a need to encourage early researchers with adequate funding and independent thinking for conducting interdisciplinary research. Basic technical courses like coding and artificial intelligence should be incorporated into their curricula. Also, this technology increases the scope of interdisciplinary research as well. This will bring more career opportunities for physiotherapists.

Hence, we can conclude that technology can be a boon for physiotherapists if they accept these technologies and upgrade themselves according to current demand.

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