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The Use of Artificial Intelligence in Physiotherapy

Bengisu Tüfekçi[1*]

[1]*Gaziantep Islam Science and Technology University, Vocational School of Health Services, Department of Physiotherapy and Rehabilitation, Gaziantep, Turkey.*

Dear Editor,

The active role that technology has taken in the field of health with the progress it has made in recent years has not only provided many temporal, spatial and financial benefits in health services, but also increased quality and efficiency.

The ability to interpret the data collected from individuals with technological systems through models created by simulating human neural networks, to produce information on the targeted subject, to make analysis and to organize all these is called the concept of 'Artificial Intelligence' (1). As artificial intelligence is used in many areas of healthcare, it is also used in physiotherapy and rehabilitation in many stages such as diagnosis, evaluation, shaping rehabilitation practices with the results obtained and monitoring the clinical development of the patient. At the same time, it offers significant advantages by contributing greatly to the collection of data that can be used to determine the level of disease and treatment efficacy in the clinical decision process (2, 3).

Among physiotherapy and rehabilitation treatment approaches; robot-assisted therapy, brain-computer interface (BCI), orthosis-prosthesis technologies, wearable technologies, tele-rehabilitation applications, mobile application-based technologies, virtual reality applications, video-based rehabilitation systems are artificial intelligence-based treatments.

Robot-assisted therapy is an innovative treatment approach in physiotherapy that allows high repetition numbers, customization, modulation and measurable results. With this system, electrical stimulations can be generated in paretic muscles as well as assisted movement in accordance with the amount of dysfunction (4). Brain-computer interface (BCI) is a computer-based system that receives brain signals, analyzes and translates them into commands that can be transmitted to an engineered output device in order to elicit movement in weakened muscle in neurological patients such as cerebrovascular events and Amyotrophic Lateral Sclerosis.

*__Corresponding author:__ Bengisu Tüfekçi, E-mail: bengsuu@gmail.com, ORCID ID: 0000-0002-3042-6083

It is an important technology that facilitates daily life adaptation in these individuals with functional loss (5). Orthoses are artificial devices used to support the functionality of the existing limb, while prostheses are artificial devices used to replace the function of the missing limb. When orthosis, prosthesis technology and wearable technologies are combined with artificial intelligence, devices that adapt to the tissue and physiological structure of the individual, can be customized, are much more functional and aesthetically preferable (6).

Although its widespread use is still limited in terms of cost, the acceleration of the development of artificial intelligence integrated orthoses, prostheses and wearable devices will be very valuable for patients who need orthoses and prostheses within the scope of physiotherapy to lead a better quality of life, to adapt to daily life activities and to be emotionally self-confident.

Tele-rehabilitation is the integration of artificial intelligence technology and telecommunication systems to provide consultancy, preventive approaches, diagnosis and treatment services to patients in physiotherapy and rehabilitation through the interaction of two or more people. The most important advantage of tele-rehabilitation is that it provides a solution to transportation problems for individuals to receive physiotherapy services (7). Mobile application-based technologies, which are referred to as the M-Health concept in the literature, enable physiotherapy services to be provided through various applications on smartphones in the field of physiotherapy and rehabilitation in many subjects such as joint range of motion assessment, postural assessments, exercise training and follow-up. It also enables health-related data transfer and health-related interaction over long distances (8). Unlike classical physiotherapy approaches, virtual reality applications and video-based applications are current rehabilitation methods that take place in a virtual environment with the help of artificial intelligence. Virtual reality and video-based applications are methods that offer motor, sensory and cognitive gains through fun and task-based applications that provide many repetitions, feedback, active participation, guidance and motivation, which are the basic requirements of motor learning (9).

In conclusion, the disadvantages of artificial intelligence-based smart technologies include being expensive, not replacing manual physiotherapy approaches, difficulty in adapting to some advanced musculoskeletal limitations such as spasticity, which causes an increase in muscle tone, especially in robotic applications, and the individual's cognitive inadequacy. Despite all these, it offers many opportunities such as facilitating access to rehabilitation, intensifying the amount of rehabilitation by saving time for the patient and physiotherapist, ensuring the continuity of treatments in the home environment in cases with the risk of transmission such as covid, which we have recently experienced, and reducing health expenditures by increasing the

number of patients treated from a single center. Also, providing a preventive treatment approach by providing feedback with easily accessible devices such as smart watches and phones developed with artificial intelligence, providing simultaneous feedback from the monitor with video-based applications, and allowing the measurements made for evaluation to be objective and re-accessible are among the important advantages. Considering the advantages such as customizing parameters such as time, intensity, difficulty, speed suitable for the patient level, enriching treatment programs, reducing the possible burnout of the patient and therapist during the rehabilitation process, and increasing motivation, artificial intelligence within the scope of physiotherapy rehabilitation services will increase the quality of rehabilitation services and provide cost-effective results in the long term.

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