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Editorial

Virtual Reality Based Therapy and Parkinson's Disease

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Parkinson's disease (PD) is one of the most common neurodegenerative disorders worldwide. It is mainly associated with a loss of dopaminergic neurons in the substantia nigra pars compacta [1,2].

Bradykinesia, Rigidity, Rest tremor, and Postural instability are the hallmark features of the disease and have a negative impact on movement quality, gait, and balance performance, and fall risk (Canning 2014; Jankovic 2008).

In addition, non-motor features such as cognitive decline, fatigue, apathy, and depression are common and substantially affect patient functioning and quality of life [3].

Multidisciplinary input is increasingly recognized as important in PD management [4]. Physiotherapy is now encouraged as an additional treatment to the well-established pharmacological and surgical interventions from early disease stages on (Fox 2011).

Considering the progressive nature of the disease, sustained exercise is considered essential to obtain optimal performance and maintain independence in daily life activities.

Virtual reality (VR) technology is a promising new rehabilitation tool with a wide range of applications.

Within the context of physiotherapy, VR technology is recommended to optimize motor learning in a safe environment and may be a worthy alternative to conventional approaches.

By offering augmented feedback about performance, enabling the individualized repetitive practice of motor function, and stimulating both motor and cognitive processes simultaneously, VR offers opportunities to learn new motor strategies and to relearn motor abilities that were lost as a result of injury or disease [5-7].

VR technology has been proposed as a tool to engage users in long-term exercise, since it provides training in a challenging and motivating environment, replicating real-life scenarios, VR technology provides greater potential for transfer to functional activities of daily living.

For example, a person with Parkinson's and akinesia will have trouble initiating a step but will be able to step over an object that appears in their path. Using this concept, VR can overlay objects in a patient's visual field, encouraging the initiation of a step, and improving function in these patients.

VR technologies focus on improving more broad symptoms of Parkinson's, such as being able to increase stride length and improve balance, in safe, controlled environments.

Conventional physiotherapy aims to maximize functional ability and minimize secondary complications through movement rehabilitation. However, exercise effects decreased Rer followup periods without training, illustrating the importance of sustained effort. engaging patients in long-term regular exercise programs is challenging.

Technology-based exercise interventions may improve adherence by stimulating users to exercise in a personalized, motivating, fun, and engaging manner.

While VR technology may be beneficial, it also creates additional challenges. By providing distractions in the virtual environment and introducing motor-cognitive dual-tasking, VR technology can create a cognitive overload.

Commercial VR Vs VR for Rehabilitation

VR intervention is "a computerized simulation which allows users to interact with images and virtual objects that appear in the virtual environment in real-time through multiple sensory modalities" [8].

- A user-computer interface.
- Interaction in the virtual environment.
- Feedback on performance; and
- A focus on motor rehabilitation

The Nintendo Wii and Xbox Kinect have been used as VR tools in addressing symptoms of Parkinson's.

Advantages of using virtual reality

- **Enhance motivation/repetition:** to learn a motor skill, patients require sufficient motivation to drive their repetitive practice of a skull. VR may be a novel technology to most people, and with the variations in environment and tasks possible with simulated virtual environments, patients are less likely to experience boredom. Patients can tolerate the extensive practice period by the variety provided by video games.
- **Provide precise feedback:** There is extensive evidence that proprioceptive and exteroceptive feedback can induce profound cortical and subcortical changes associated with motor performance. With the use of VR, the feedback is augmented through different settings. This can tailor and further enhance the physiological changes in patients with Parkinson's.
- **Transferability:** One may be concerned that the motor skills learned from VR may not translate to real-world environments. However, there is a fair amount of evidence suggesting that patients have the ability to not only learn motor skills but also translate them to the real world.
- **Early stage learning:** Patients with severe Parkinson's may have problems learning a new motor skill, especially when it comes to the performance of complex motor skills. With VR, patients can benefit from simplifying the task to its key components. In contrast, in a real-world environment, many distractions could occur and may slow down learning as the patients attempt to distinguish the key aspects of the task.

Limitations of Virtual Reality for Parkinson's

- Possibility of cognitive overload,
- Cyber-sickness, or
- An inappropriate level and content of exercises for the rehabilitation of Parkinson's.
- Patients may use compensatory movements to increase game performance.

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