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# Wearable Immersive Virtual Reality Device for Promoting Physical Activity in Parkinson's Disease Patients

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## Introduction

Up to 2% of seniors have Parkinson's disease (PD), a neurological condition that typically manifests in the sixth decade of life (65 years and older). By 2040, the prevalence of it is anticipated to double globally. Its therapeutic therapy is intricate and incorporates both pharmaceutical and non-pharmacological treatments, such as physical exercise and interdisciplinary rehabilitative care. As rehabilitation and preservation of physical and functional capacities are key components in these patients, exercise interventions have had positive effects in PD. Physical therapy is primarily an exercise-based strategy used in the management of Parkinson's disease (PD) that targets five key areas: physical fitness, transfers, manual tasks, balance and gait.

## Description

Exergames need active user engagement in order to replicate the effects of conventional PD rehabilitation techniques through motions and physical tasks. Systematic reviews and meta-analyses have proven to have the ability to increase PD populations' levels of satisfaction and adherence while also balancing out their lives and improving their quality of life. Gaming that includes visual and aural feedback takes use of neurophysiological reward processes, such as dopaminergic reward systems, which can boost brain plasticity. Immersive virtual reality (IVR) refers to technologies that build on this favourable response by offering a first-person viewpoint system via a head-mounted display (HMD), enabling users to interact with virtual environments in a natural way.

Despite the fact that applications of exergame-based exercise programmes with HMDs targeting PD are still largely unexplored, they are frequently conducted with systems like the HTC Vive Pro (HTC Corporation, Taoyuan City, Taiwan) that require significant and expensive additional equipment, primarily a high-performance computer, a monitor and a base station system to set up a specific game space. Additionally, they have been tested on small samples and in studies with only a few sessions. Additionally, research on exercise games used with people with Parkinson's disease has concentrated on those that call for performing motor activities, primarily requiring lower and upper limb movement, which is frequently compromised in these individuals.

Our results are intriguing because they demonstrate that boxing exergame sessions may be conducted in conjunction with a wearable, commercial HMD for use in PD. Our research up to this point has utilised VR systems that required extra hardware, making it challenging to move the trials. The approach we utilised in this study enabled us to easily transport our trial to the Vigo Association of Parkinson, in this example, with VR equipment that fits in a tiny backpack. Additionally, no negative effects were noted. This information is crucial and is in line with earlier studies that employed games to accomplish comparable goals but only examined them over a short period of time.

It would be required to confirm that the safety outcomes shown here are maintained in longer immersion sessions because the session periods used in the current investigation were rather brief. The equipment's use was acceptable as well. These outcomes are consistent with earlier research. In any case, the Oculus Quest 2 hand controllers are objectively smaller and lighter and, therefore, more manageable than the HTC Vive Pro hand controllers, which, in our opinion, may have made the virtual tasks easier for these patients, who frequently have symptoms affecting the upper limb in general and eye-hand in particular. Better tremor self-management might result from carrying a device like a controller, however it would be fascinating to see future study that included games with hand-tracking systems.

A higher adherence to future treatments using these virtual tools may also be suggested by the satisfaction views' emphasis on the game's value for the treatment of Parkinson's disease and the respondents' willingness to use it regularly. Numerous participants expressed interest in the potential of purchasing and using the chosen wearable gadget at home due to its usability and favorable reviews. As anticipated, individual performance also increased in the second session, with better scores and a perceived effort level in every single member of the sample. Participants with more severe illness also showed greater performance.

It was possible to train PD patients independently of the disease's stage of progression and the 60 training sessions that were conducted showed a high degree of safety (no side effects). Even though it was not our research's goal, postural instability warrants consideration. This is a crucial symptom in the development of the illness and may affect the selection criteria for the sample in next research, such as the user's standing or sitting posture. In any event, as we have already stated, the most important factor from a clinical standpoint is that all of the patients successfully finished the work without experiencing any negative side effects [1-5].

## Conclusion

For associations of patients with Parkinson's, Alzheimer's, or other related disorders, which frequently have limited resources, demonstrating the viability of exercise programs—designed for patients with neurological conditions—to be undertaken while wearing affordable wearable technological devices could be beneficial. Future versions of these gadgets may serve as beneficial auxiliary aids with a wide range of potential advantages for patients' physical, psychological and social rehabilitation and they may even enable itinerant treatments at homes thanks to their portable nature.

## Conflict of Interest

None.

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