

ORIGINAL ARTICLE

Effects of Exer–Gaming on Balance and Gait in Parkinson’s PatientsSHAHBAZ QAYYUM¹, ZEEST HASHMI², SHOAB WAQAS³, MUHAMMAD TARIQ⁴, MUHAMMAD WAQAS MUGHAL⁵, MOHSIN TANVIR⁶^{1,5,6}Physical Therapist, National Hospital & Medical Center, DHA Lahore²Assistant Professor, Riphah International University, Lahore³Associate Professor, Lahore College of Physical therapy, (LM & DC), Lahore⁴Assistant Professor, Lahore College of Physical therapy, (LM & DC), LahoreCorrespondence to Dr. Shoaib Waqas. Email: shoaib.waqas@lmdc.edu.pk Cell: 0302-4552109**ABSTRACT****Background:** Parkinson’s disease is the most progressive disorder of the nervous system. The four major features of Parkinson’s disease are tremors at rest, rigidity, hypokinesia, and postural instability.**Aim:** To evaluate outcomes of virtual based games in patients suffering from Parkinson disease and their effects on balance and gait training.**Methodology:** It was a 6-month randomized clinical trial study. 16 patients were taken for the study after the sample was calculated through G power analysis software. According to the inclusion criteria, patients between age 40 and 65, both males and females, with stage 1, 2, or 3, patients with gait and balance disorders were taken for study. Patients not fulfilling the criteria were excluded. Group 1 received an exercise gaming treatment plan which included wii perfect ten balances, wii-skiing, and wii-cycling. Patients received three sessions per week for two months. Each treatment session lasted 50 minutes with two minutes of rest between each exercise. Group 2 received a conventional treatment plan which included balance training, gait training, stretching and strengthening exercises. Patients received three sessions per week for two months.**Results:** The mean difference of UPDRS was 87.25 before treatment and 81.12 after treatment in group 1, while it was 86.25 before and 86.00 after treatments. The dynamic gait index was 14.12 before treatment and 19.12 after treatment in group 1. The average group score was 14.12 before treatment and 16.21 after treatment.**Conclusion:** The study concluded that Exer-games have shown a significant impact on the balance and gait of Parkinson’s patients as compared to conventional physical therapy alone.**Keywords:** Gaming, UPDRS, DGI, Parkinson, Postural Instability**INTRODUCTION**

Parkinson’s disease is the most progressive syndrome of the nervous system which affects most of the motor and non-motor features and causes different functional disabilities. The four major symptoms of PD are rigidity, tremors, akinesia, and postural instability in posture, which can be named under the acronym TRAP. Freezing episodes during walking (motor blocks) and flexed posture are included in the classical symptoms of PD¹.

Postural deformities, which are flexed knees, neck, trunk, and elbows, occur mainly with rigidity. Axial rigidity, i.e., neck and trunk rigidity may occur, causing abnormal axial postures. However, abnormal posture appears late in disease. Striated hand can occur in some patients who have ulnar deviation, flexion of the metacarpophalangeal and interphalangeal joints, and proximal interphalangeal joint extension. Freezing during functional activities is a form of akinesia and is the most irritating and disabling symptom of Parkinson’s. Although freezing does not occur in all patients².

Patients with Parkinson’s have many secondary motor symptoms which impact their performance in daily functional activities and driving. Primitive reflexes may reappear due to a problem in the frontal lobe inhibitory mechanism. The other common non-motor symptoms of Parkinson’s disease are autonomic dysfunction, cognitive disorders, sleep disorders, and abnormalities of the sensory system. Patho-physiological studies of poor postural control in Parkinson’s disease have shown that there is dysfunction in the programming of afferent impulses from vestibular, visual, and proprioceptive systems³.

Poor control of posture may be due to atypical postural strategies in response to different stimuli. PI in Parkinson’s disease may cause abnormal changes in anticipatory (feed-forward) and compensatory (feed-back) postural responses⁴. In recent times, there has been an increased interest in PD in the scientific community after the discovery of numerous monogenetic mutations. However, these causative monogenetic mutations can only explain a small proportion of all PD, and about 90% of cases are sporadic. Further work is needed on the non-genetic causes is needed to understand the pathophysiology of the disease and for

the development of effective treatment approaches⁵.

The major symptoms of the progression of the disease are postural instability, gait and balance, difficulty in managing different functional tasks like obstacle crossing, and results in frequent falls⁶. About two thirds of the individuals with Parkinsonism face multiple falls due to tripping over obstacles⁷. Instability in posture is the most common feature of PD, emerging as a serious clinical symptom in the different stages of disease progression⁸. This is a very disturbing disability which is difficult to treat and leads the patients to balance loss and frequently unexpected falls⁸.

Recent studies have shown the effects of specific balance training during functional tasks and rehabilitation programs Daily exercise training under the supervision of a physiotherapist imposes a great economic burden on most of the patients, and patients often feel bored and physically tired, thus losing their motivation and interest⁹.

The main purpose of this study was to evaluate the outcomes of virtual-based games in patients diagnosed with Parkinson’s disease and their effects on balance and gait training. Recent studies have shown positive outcomes of balance training and their effects on the daily lives of patients.

Balance training exercises not only improve coordination in daily living but also give a sense of relaxation and mental satisfaction. Conventional physical treatment is effective, but patients lose interest in exercises after a while. We need to find new ways of treatment that are effective, interesting, and patients can easily do more repetitions.

MATERIAL & METHODS

The study design was randomized clinical trial with simple random sampling. 16 patients were taken for the study after the sample was calculated through G power analysis software. Patients were allocated in two groups by flip a coin method. According to the inclusion criteria, patients between age 40 and 65, both males and females, with stage 1, 2, or 3, patients with gait and balance disorders were taken for study. Patients not fulfilling the criteria were excluded. Group 1 received an exercise gaming treatment plan which included wii perfect ten balances, wii skiing, and wii-cycling. Patients received three sessions per week for two months. Each treatment session lasted 50 minutes with two minutes of rest between each exercise. Group 2 received a

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conventional treatment plan which included balance training, gait training, stretching and strengthening **exercises**. Patients received three sessions per week for two months. Each treatment session lasted 50 minutes with a 2 minute rest period between each exercise. Windows software SPSS version 21 was used for the analysis of the data by using a statistical significance value of $p = 0.05$. The Shapiro-Wilk test was used to assess the normality of data. The Shapiro-Wilk test value was greater than 0.05, which shows that the data was normal. Parametric tests were used for the analysis.

RESULTS

Groups have a mean age of 52.50 and a standard deviation of 5.610. The participants in this study included 12 men and 4 women. Of those, 14 of them were married, and 2 of them were unmarried. Group 1 has 5 patients having an onset of 5 years, 3 with a history of 10 years, and no patient with a history of 15 years. Group 2 includes 4 from 5 years, 2 from 10 and 15 years respectively. The mean score of the UPDRS among group 1 before treatment was 87 and it was 81 after treatment, while group 2 values were 88 before treatment and after treatment were 86. Results show the equality and mean score of the dynamic gait index before and after treatment of the patients. Group 1 has a

DISCUSSION

Conventional physical treatment is effective, but patients lose interest in exercises after a while. We need to find new ways of treatment that are effective, interesting, and patients can easily do more repetitions. Many of the research workers have explored different therapeutic approaches that can decrease the risk of falls and improve the movement in people with Parkinson's disease¹⁰.

Dance, particularly the Argentine Tango, with rhythmic rocking and alternate weight shifts, reduces freezing and improves ADL performance. In addition to the tango, the foxtrot, and the waltz improved the Berg Balance Scale scores in patients with Parkinson's disease¹¹. Most of the rehabilitation research on PD focuses on the treatment of bradykinesia¹¹. Only a few recent studies¹² have looked at the evidence-based effects of balance rehabilitation programs in Parkinson's disease patients.

A study was conducted on Wii and Parkinson's gait development; with the result that the Nintendo Wii Fit may be an important and effective alternative to independent exercises for people with idiopathic PD. The results of this study support the above arguments¹³. This not only improved balance but also decreased depression and mood swings. A study conducted on the effects of balance training on PI in patients with idiopathic Parkinson's disease has the conclusion that balance training can improve postural instability in patients with Parkinson's disease¹⁰.

Many of the research workers have explored different therapeutic approaches that can decrease the risk of falls and improve the movement in people with Parkinson's disease. Dance, particularly the Argentine Tango, with rhythmic rocking and alternate weight shifts, reduces freezing and improves ADL performance. In addition to the tango, the foxtrot, and the waltz all improved the Berg Balance Scale scores in patients with Parkinson's disease. Most of the rehabilitation research on PD focuses on the treatment of bradykinesia. Only a few recent studies have examined the evidence-based effects of balance rehabilitation programs in PD patients¹.

Exer-gaming was found to be more effective than exercises in improving various gait components in the elderly in a randomised controlled trial conducted from July to October 2018 at Kulsum International Hospital in Islamabad, Pakistan. The study's participants were physically independent participants 60 years of age and older who were randomly assigned to experimental and control groups using the concealed envelope method as proven in this study¹⁰.

mean of 14 before treatment and 19 after treatment. In group 2, values were 16 at the start and 16 at the end of the treatment.

The mean score among group 1 before treatment was 87 and it was 81 after treatment while group 2 values were 88 before treatment and after treatment were 86.

The mean score among group 1 before treatment was 14.62 and it was 19.12 after treatment while group 2 values were 14.87 before treatment and after treatment were 16.37.

Independent t-test for UPDRS

Rx Groups	Study groups	N	Mean	Std. Deviation	P value
UPDRS before Rx	Exer-training group	8	87.2500	1.28174	0.91
	Conventional PT group	8	88.2500	.88641	
UPDRS after treatment	Exer-training group	8	81.8750	1.24642	.001
	Conventional PT group	8	86.0000	.53452	

Independent t-test for DYNAMIC GAIT INDEX

Rx Groups	Study groups	N	Mean	Std. Deviation	P value
DGI before Rx	Exer-training group	8	14.6250	1.06066	.609
	Conventional PT group	8	14.8750	.83452	
DGI after Rx	Exer-training group	8	19.1250	.83452	.001
	Conventional PT group	8	16.3750	.74402	

The study had limitations such as patient cooperation, time management, dealing with the patient attendant, and a small sample size. The sample size was reduced due to the COVID-19 pandemic. Such studies will help investigators or therapists to employ different techniques when dealing with patients with such complications.

CONCLUSION

The study concluded that Exer-games have shown a significant impact on the balance and gait of Parkinson's patients as compared to conventional physical therapy alone.

Conflict of interest: Nil

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