



Correlation between Wii Fit balance and conventional balance in Parkinson

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ABSTRACT

Parkinson disease (PD) is a progressive neurodegenerative movement disorder caused by a lack of dopamine production in the substantianigra. The cardinal features of this disorder include bradykinesia, gait disturbance, rigidity, and tremors. Method: A Randomized control trial was conducted of the patients consulted to SKH & diagnosed with Parkinson's disease. Selection of 120 patients based on the criteria and informed consent was taken from the participants and divided as Experimental group & control group. Pre and Post Evaluation of patient was done with BBS and UPDRS after 2weeks. The mean difference of BBS in conventional group was 3.633 ± 3.16 whereas in Wii Fit group was 5.05 ± 3.16 To compare the mean difference between two groups, Independent t-test was applied and its p-value was obtained. There was statistically significant difference found between these two groups (P value 0.016). The mean difference of UPDRS in conventional group was -2.63 ± 2.66 whereas in Wii Fit group was -4.53 ± 3.33 . To compare the mean difference between two groups, Independent t-test was applied and its p-value was obtained. There was statistically significant difference was found between these two groups (P value 0.001). Both the treatment method were effective in Improving balance in Parkinson's disease but the effect of Wii fit balance training is more in comparison to Conventional balance training.

Keywords: Wii Fit Balance Training, BBS, UPDRS

1. INTRODUCTION

Parkinson disease (PD) is a progressive neurodegenerative movement disorder caused by a lack of dopamine production in the substantianigra. The cardinal features of this disorder include bradykinesia, gait disturbance, rigidity, and tremors [1].

Idiopathic PD is one of the most common chronic diseases in the United States and affects up to 1% of the population older than 50 years. With the population of the United States aging, the prevalence of diseases is only expected to increase [2,3].

Given the trends that indicate an increased prevalence of this disorder, the development of community or home based exercise programs to reduce PD-related impairments and to improve function is of great interest, both from a resource-utilization and a cost perspective, given that, with balance improvements, one can expect falls to occur less often, which leads to an expected increase in safety and decreased costs associated with injury. Impairments of balance and postural stability likely contribute to the increased risk of falls and fractures found in this patients population [4]. In response to perturbations of balance with backward waist pull, individuals with PD demonstrated differences in weight shift, use a modified ankle joint motion before lift-off and land with weight shifted posteriorly compared with healthy age-matched controls [5].

Selected physical and occupational therapy exercise interventions have been shown to reduce impairments associated with PD [6-10]. Outpatient treatment programs in PD have evaluated exercise programs that are task-specific and involve balance or resistance training program [7, 8]. Data on functional rehabilitation in PD has emphasized the usefulness of specific neurorehabilitation interventions in the global management of PD [11].

A more recent study, however, demonstrated a trend toward improved mood and decreased fatigue in patients with PD after participation in exercise program [12]. The high prevalence of mood disorder in PD and the potential for exercise mitigates symptoms suggests that QOL related factors may be important to evaluate in an exercise program for individual with PD.

The Wii Fit video game system (Nintendo of America inc, Redmond, WA) has the potential to serve as a home-based system for exercise and balance training. The Wii Fit uses a novel balance board system that tracks changes in the Centre of Pressure (COP) during exercise games. It is widely available, portable, and far less expensive than typical costs incurred with therapy

interventions, for example, physical therapy. Although a wide range of physical therapy interventions have been found to improve measure of balance and ambulation speed, most interventions occur on the order of months [13], with costs quickly exceeding that of a Nintendo Wii system. A feasibility study found that the Wii balance board appears to be a valid tool for assessing standing balance and thus maybe helpful for both balance tracking as well as training [14].

In addition, a pilot study completed by using the Nintendo Wii in patients with PD has demonstrated decreased rigidity and increased movement in participants when using this game system [15]. Because this system has the potential to improve balance and movement, it could also lead to decreased costs associated with fall-related injury in this population. These characteristics indicate that the Wii Fit may be a promising platform for rehabilitation in the context of PD. The purpose of this study was to assess the effect of exercise training in patients with PD by using Wii Fit, with the ultimate goal of developing a program to improve balance and gait in this patient population.

We hypothesize that, after participation in group-exercise classes when using Wii Fit, the subjects should have improved balance, decreased postural sway and improved QOL. The primary outcome measures in this study were balance and Postural sway, as measured by the Berg Balance Scale (BBS), Unified Parkinson’s Disease Rating Scale (UPDRS).

To maintain and improve the static and dynamic stability, biofeedback systems have been used widely in research to probe the underlying neural control mechanisms. Force platform is one of the latest equipment, which widely used to assess and improve balance, posture, gait and other parameters of biomechanics but it is difficult to use it in daily routine clinical practice. Nintendo Wii fit balance board (NWBB) is a new device which was introduced (Nintendo, Kyoto, Japan) in 2007 and change the structure of what a force platform can be. By, 2010, it was found that the WBB is a valid and reliable force plate when directly compared to the “gold standard” laboratory grade force plate. It is mainly use to assess and improve balance[10]. There is lack of literature on NWBB usage –the evidence suggesting that this modality is beneficial, especially in terms of body symmetry, but little has been found in abroad, there is scarcity of studies done using NWBB for neurological conditions in India. Hence, a need arises to understand the effectiveness of using NWBB as cost effective and an efficient system to train balance in the patients with Parkinson’s disease. It is used in combination with games.

1.1 Objectives

- To assess the balance in patients with Parkinson’s disease (PD) with Wii fit balance board.
- To assess the balance in patients with Parkinson’s disease (PD) with conventional balance training.
- Comparison between Wii fit balance training and conventional balance training.

2. METHODOLOGY

The sample size for the study was 120. Competent medical person seeking treatment at SKH & its extension centre diagnoses the samples as Parkinson’s disease. The subject has been recruited keeping in mind the inclusive and exclusive criteria and after taking consent to participate voluntarily in the study. Inclusive criteria like patients with pd (age group 30 to 85), score of bbs greater than or equal to 40, ability to understand visual feedback, patient should fall within stage 2.5 to 3 according to modified hoehn and yahr classification., ability to stand with minimal assistance and. exclusive criteria, The subject should not have developed rigidity., The subject should not be mentally unstable., The subject should not have any recent lower limb fracture.

3. PROCEDURE OF STUDY

Consecutive subject who had been diagnosed as Parkinson’s disease by competent medical person seeking treatment at SKH & Extension Centre provided they satisfied inclusion & exclusion criteria.

They would be approached and explained about the details regarding study. Written informed consent form would be taken from each subject and further study would be carried out. [Annexure 1 Annexure 2]

Patients would be randomly allotted into two groups like Control group (Conventional training group) and experimental group (Wii fit training group). On the first sitting they were assessed by emphasizing on balance and functional independence by using Berg Balance Scale (BBS), Unified Parkinson’s disease Rating Scale (UPDRS) Control group would get 30 min of conventional balance training. On the same side experimental group would get 30 min of Wii fit balance training. This session would continue for 2 weeks and after that they would again assessed by BBS, UPDRS.

4. RESULTS

The data were entered in to computer using Microsoft excel sheet. For statistical analysis, STATA-14 software was used. All 120 participants completed 2 weeks of intervention. In both the group equal number of participants were present i.e. conventional group had total 60 participants and in experimental group also 60 participants were presents. In conventional group mean age was 60.33±8.99 year and experimental group mean age was 59.67±8.25 year (Table-1). So, in both the group age difference was almost same. Now comparison with gender distribution out of 120 participants 69 males and 51 females participated in the study. In conventional group out of total 60 participants were 37 male and 23 female while in experimental group out of total 60 participants there were 32 males and 28 females (Table-3)

Table 1: Showing Age of Participants

Age	Group	N	Mean	Std. Deviation
	Conventional	60	60.33	8.997
Wii Fit	60	59.67	8.252	

Table 2: Showing Gender of Participants

	Frequency	Percent
Male	69	57.5
Female	51	42.5
Total	120	100

Table 3: Showing Gender Distribution

Gender Group Distribution	Gender	Conventional	Wii fit	Total
	Male		37	32
Female		23	28	51
Total		60	60	120

Table 4: Showing Within The Group Analysis (Conventional Group)

	N	Mean	P Value
BBS Pre	60	45.63±6.522	<0.0001
BBS Post	60	49.27±4.595	
UPDRS Pre	60	14.88±9.294	<0.0001
UPDRS Post	60	12.25±8.558	

In conventional group, the mean score of BBS Pre is 45.63±6.52 and BBS Post is 49.27±4.59 To compare the score within the groups, paired t-test was applied and its p-value was obtained. Statistically significant difference was found within the group. (P value is < 0.0001)

In conventional group, the mean score of UPDRS Pre is 14.88±9.29 and UPDRS Post is 12.25±8.55 To compare the score within the groups, paired t-test was applied and its p-value was obtained. Statistically significant difference was found within the group. (P value is < 0.0001)

Table 5: Showing Within the Group Analysis (Wii Fit Group)

	N	Mean	P Value
BBS Pre	60	45.13±6.094	<0.0001
BBS Post	60	50.18±4.324	
UPDRS Pre	60	15.80±8.791	<0.0001
UPDRS Post	60	11.27±7.394	

In conventional group, the mean score of BBS Pre is 45.13±6.09 and BBS Post is 50.18±4.32 To compare the score within the groups, paired t-test was applied and its p-value was obtained. Statistically significant difference was found within the group. (P value is < 0.0001)

In conventional group, the mean score of UPDRS Pre is 15.80±8.79 and UPDRS Post is 11.27±7.39 To compare the score within the groups, paired t-test was applied and its p-value was obtained. Statistically significant difference was found within the group. (P value is < 0.0001)

Table 6: Between The Group Analysis:

Group		Normal	Mean	P Value Sig
BBS	Conventional	60	3.63±3.17	0.016
	Wii Fit	60	5.05±3.16	
UPDRS	Conventional	60	-2.63±2.67	0.001
	Wii Fit	60	-4.53±3.33	

The mean difference of BBS in conventional group was 3.63±3.16 whereas in Wii Fit group was 5.05±3.16 To compare the mean difference between two groups, Independent t-test was applied and its p-value was obtained. There was statistically significant difference found between these two groups (P value 0.016).

The mean difference of UPDRS in conventional group was -2.63±2.66 whereas in Wii Fit group was -4.53±3.33 To compare the mean difference between two groups, Independent t-test was applied and its p-value was obtained. There was statistically significant difference was found between these two groups (P value 0.001).

4. DISCUSSION

Parkinson is the most common cause of severe disability in adults with persistent physical disability reported in 50% to 60% of persons who survive with Parkinson. Although as many as 70% are able to walk independently after rehabilitation. A quarter to 60% of patients experience freezing of movements usually after several years from onset It appears that only a small percentage of these persons are able to walk functionally in community. This difference may reflect a discrepancy between testing walking in a clinical environment and monitoring usual walking in natural environments as has been suggested by the international classification of functioning, disability and health.

There is a range of clinical tests available to assess walking and Balance after Parkinson, many of which have good psychometric properties and assess wider aspect of gait thought to relate to walking in community environments. Some test involve direct therapist observation of walking of which an aspect is then graded or measured. Example includes BBS.



In the present study, total 120 participants with the Parkinson's disease were included. 60 persons were in experimental group who had received treatment by Wii fit balance board while other 60 persons in control group had received conventional balance training.

Sample of present study consisted 51 females and 69 males. Wii fit balance training group consist 28 female and 32 males and conventional balance training group consist 23 females and 27 males.

In Wii fit balance training group, mean age is 59.67 and in conventional balance training group, mean age is 60.33.

The aim of the study is to assess the effect of Wii fit balance training and Conventional balance training in Parkinson's disease patients. Both the experimental group and the control group demonstrate improvement in balance & mobility. However the inter group analysis revealed minimum statistical difference at the end of 2 weeks of intervention.

The comparison between the two different balance treatments, there is statistically significant difference in BBS and UPDRS in WBT group as compared to CBT group.

A study done in 2010 with 2 individuals with multiple physical disabilities analyzed the capacity to actively adjust standing posture based on visual stimuli. The data demonstrated a significant increase of length of time in maintaining postural control in both participants[16].

A recent study reported that traditional physical therapy can be boring which lowers motivation and reduces adherence to treatments, therapy providing limited benefits to the patients with balance disorder.[17]



So, with Wii exercise, the information displayed on the television screen offers positive reinforcement, facilitating improvement in execution of task.

The findings support that Wii fit balance board has better balance outcome as compare to conventional balance training in patients with Parkinson's disease. There is less study has been done on Wii fit balance board so no evidence to suggest that Wii fit balance board has deleterious effect on balance in patients with Parkinson's disease.

Few studies have investigated the use of the Nintendo Wii Fit gaming system and its effect on balance and posture. The only study that has reported Berg Balance Scale scores following use of the Wii Fit was a case report of an 89-year-old individual with an unspecified balance disorder. Other single case studies using the Wii Fit gaming system did not report Berg Balance Scale scores, but all reported improvements in balance following use of the Wii Fit in the presence of different pathologies.

In a prospective interventional cohort study, we found that Wii Fit balance board game training over a relatively short period of time (8 weeks) improved balance and the ability to modify gait to difference demands, as measured by significant improvements in BBS and UPDRS.

The mean UPDRS motor score for study participants was 18.4; given that the maximum UPDRS motor score is 108, this may indicate that the subjects may have had less advanced disease than subjects in our study, although full comparison with UPDRS scores would be necessary to confirm this theory.

Exercise interventions with the Wii Fit, in comparison, can be taught to subjects and eventually used without supervision in the home setting, as shown by the study by Esculier et al [40] noted above, which ultimately may be more convenient and less costly for individuals to use consistently. Thus, the Wii Fit may be considered a more convenient alternative to other more conventional forms of balance training in the PD population because it can be performed in the home setting.

5. CONCLUSION

We conclude that Wii fit balance training method is effective as that of the conventional balance training for improving balance in Parkinson patients. Since the patients find it interesting, they look forward for more of the sessions. This is a positive motivation for the compliance of the patients for completing the treatment properly and getting maximum benefit of the therapy.

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