

## Effect of balance training in older adults using Wii fit plus

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### Abstract

The Nintendo Wii-fit plus is a type of Virtual Reality exergaming with graphical and auditory response system. A case series was conducted at Shifa Tamer-e-Millat University Islamabad from January-July 2016. Sixteen adults more than 60 years age (07 males and 09 females) were recruited through convenient sampling. The specified Wii fit plus training was provided to all patients and the games included the Soccer heading, Ski slalom, table tilt and yoga. Berg balance test, time up and go and functional reach test were used before and after 06 weeks of treatment (4 days / week). Data was analysed by SPSS V-20. The mean age of the sample was  $67.56 \pm 7.29$  years, with 56% female and 44% males were in sample. There was a statistically significant difference in pre and post Berg Balance Score, time up and go test and functional reach. In this case series Wii-fit plus training was effective in improving dynamic balance and mobility in older adults. This should be explored further in large trials.

**Keywords:** Berg Balance Test, Balance, Falls, Virtual reality, Wii fit plus.

### Introduction

Geriatric population, considered to be of age 60 and above is gradually increasing and multiple morbidities are linked with them.<sup>1</sup> Balance dysfunction is one of key impairment which leads to increase number of falls.<sup>1</sup> Nintendo Wii fit plus gaming system have potential to improve balance outcome and enhance the quality of life of the geriatric population. The person above the age of sixty years having any long term disease or impairment which is making them frail and weak for almost one year duration can be included in the category of aged and geriatric population.<sup>1</sup>

The latest researches support this fact that involvement of older adults in rehabilitation programmes can lower the rate of falls and harms associated with falls. These exercises can also prevent dependency on others for activities of daily living as well as long term disabilities.<sup>2</sup>

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Virtual reality (VR) is a computer generated, three-dimensional landscape in which participants experience an increase of their physical and sensory powers; leave their bodies and see them from the outside<sup>3</sup> and dynamically adjust the difficulty of therapy. Additional feedback during therapy and increase patient motivation can now be provided to patients and therapist using VR which is an appealing possibility of research these days.<sup>4</sup> Virtual reality has appeared as a technology that is especially suitable not only for the assessment of body image instabilities but also for its treatment, during the last decade. Certainly, several virtual environment-based software systems have been developed for this purpose.<sup>5</sup>

The Nintendo Wii-fit plus is the latest technology of exergaming which is considered a challenging system to improve the balance. This technology is less expensive and cost effective for balance training in the elderly. The repetition and intensity of exergaming has significant role of enhancing the skills of functional activities. Motivation level for the patient is high because it is also fun to use the games for treatment purposes.<sup>6</sup>

This Nintendo Wii fit technology was developed in 2006 while Wii fit plus and its first game was released in 2009 (Japan).<sup>7</sup> The software developed for Wii- Fit plus and/ or Wii Balance Board have delivered progressively remarkable means of assessment and training the participants balance maintaining capability which is an important tool for the study of balance control. The study was designed to determine the effect of Wii-fit plus on balance outcome in elderly population.<sup>7</sup>

### Case Series

Sixteen adult patients (09 females and 07 males) more than 60 years age, were selected by convenient non-probability sampling technique. Participants read and signed an informed consent form for voluntary participation. Age above 60 years (ideal population with balance problems), Berg balance range from less than 40 points out of 56 were included and Exclusion criteria was based upon mini mental state examination tool, less than 23 points. The study was conducted at the Shifa Tamer-e-Millat University, Islamabad. (January -July 2016) (Figure-1).

The basic equipment used in The Wii fit plus system comprises of gaming-software, a particularly established

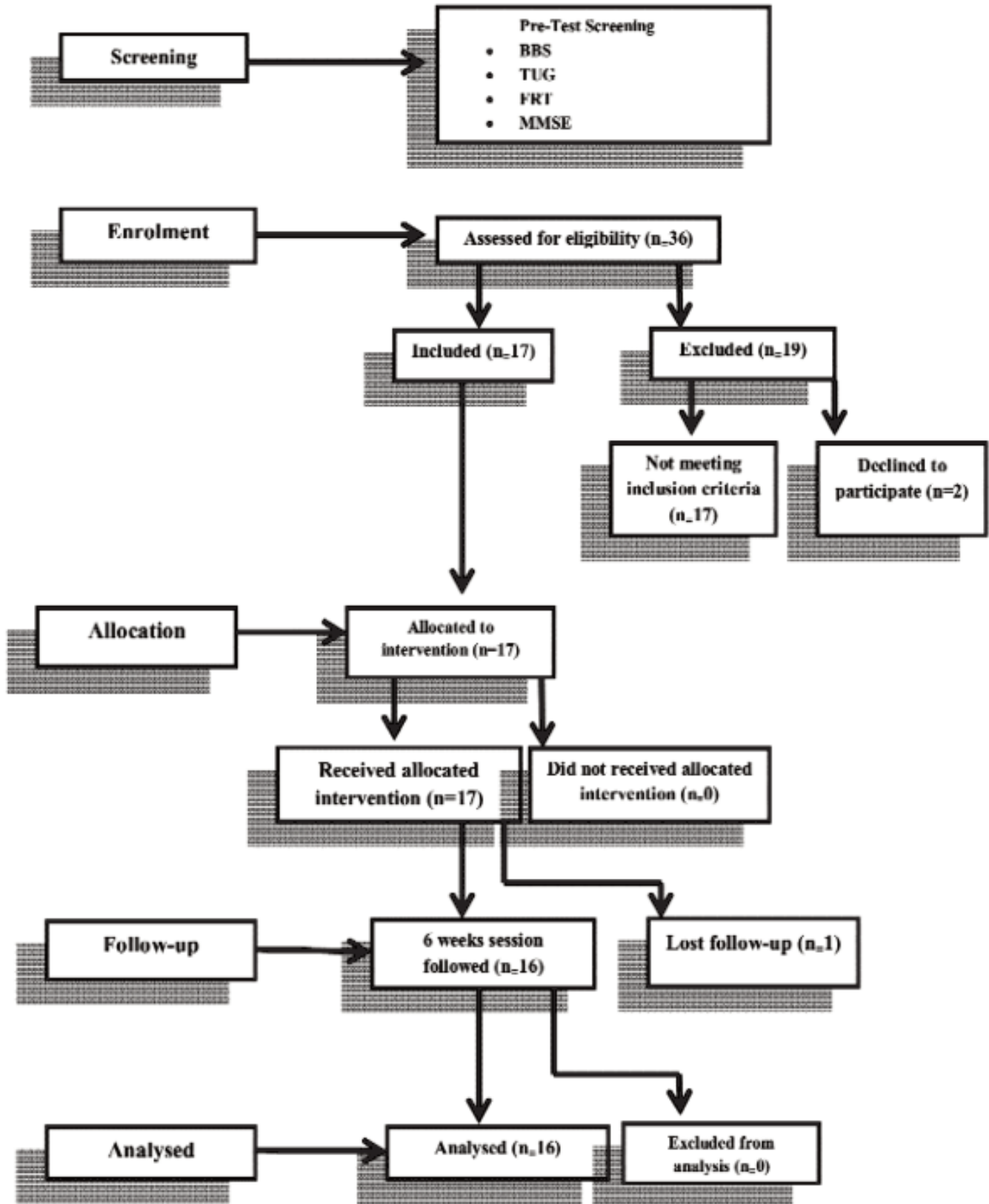


Figure-1: Consort flow diagram.

BBS: Berg balance Score. TUG: Time up and Go. FRT: Functional Reach Test. MMSE: Mini-Mental State Examination.

**Table-1:** Intervention protocol of 7 weeks.

Weeks	Wii Fit Plus balance training	Duration (timing)
Week0	◆ Orientation	30 minutes
Week1	◆ Soccer heading game	30 minutes
Week2	◆ Yoga tree pose (once) ◆ Soccer heading game ◆ Ski slalom	10+ 10+10 minutes
Week3	◆ Yoga tree pose (3times) ◆ Soccer heading ◆ Ski slalom ◆ Table tilt	10+10+10 minutes
Week4	◆ Yoga tree pose (3 times) ◆ Soccer heading ◆ Ski slalom ◆ Table tilt	10+10+10 minutes
Week5	◆ Yoga tree pose (3times) ◆ Soccer heading ◆ Ski slalom ◆ Table tilt	10+10+10 minutes
Week6	◆ Yoga tree pose (3 times) ◆ Soccer heading ◆ Ski slalom ◆ Table tilt ◆ Yoga tree pose (3 times )	10+10+10 minutes

Wii-Balance Board with controller sticks, the console and motion sensor.

Soccer heading game was about to hit the soccer balls with head, by avoiding the shoes and panda coming to screen just like soccer ball. The participants have to change or sway their body weight bilaterally to move their character in the screen in both directions.

**Figure-2:** Original picture of participant while playing the soccer heading game.

Ski slalom game was about to come down from the top of the cliff while exploring between the banner entryways. Participants attempt to retain their centre of balance point in the bar to descend the cliff at high pace (Figure-2).

In Table tilt game the participant has to move the board to troll the small balls into the pit holes without dropping these balls from sideways.

Tree is a Yoga position that helps strengthen legs, back and increase the stability in static balance posture (Table-1).

The objective was to improve the balance and reduce the fall risk through these games. The detailed score of each participant is described and the overall mean is also mentioned.

Participant number 5 showed no improvement in Berg Balance Score (BBS) points while all other showed significant improvement and mean was improved from

**Table-2:** Show the Berg balance score (BBS), Timed Up and Go (TUG) test & Functional Reach Test (FRT) pre and post comparison.

Participant	Age (year)	Pre BBS points	Post BBS points	Pre TUG (seconds)	Post TUG (seconds)	Pre FRT (inches)	Post FRT (inches)
1	85	28	35	15	16	4.50	4.90
2	79	27	36	21	18	6.0	6.10
3	63	37	42	27	20	7.0	7.0
4	73	38	45	16	13	7.90	8.0
5	60	39	39	22	18	5.7	5.7
6	60	39	43	15	18	6.0	6.2
7	71	37	45	22	17	4.8	5.0
8	72	32	34	20	18	6.2	6.5
9	68	38	42	16	18	5.30	5.7
10	62	30	35	18	15	5.2	5.2
11	60	40	47	15	16	7.5	7.5
12	68	36	37	22	20	7.0	7.0
13	66	40	46	16	13	6.3	6.5
14	64	39	46	19	17	6.6	7.0
15	70	39	44	20	18	7.2	7.3
16	60	30	32	23	20	5.0	5.2
Mean	67.56 (year)	35.56	40.50	19.18 (seconds)	17.18 (seconds)	6.13 (inches)	6.3 (inches)

35.56 to 40.50. Participant number 1, 6, 9 and 11 showed increase time duration for Timed Up and Go (TUG) test while all other participant showed less time to complete the TUG test over all mean was improved from 19.18 to 17.18 seconds. Participants 3, 5, 10, 11 & 12 showed no change in Functional Reach Test (FRT) while all other showed significant improvement and overall mean for FRT changed from 6.13 to 6.30 inches (Table-2).

## Discussion

In this study the effectiveness of balance training was assessed in the community dwelling older adults using Wii fit plus which is exer-gaming technology of virtual reality. Virtual Reality exer-gaming technology is considered a feasible and reliable equipment for neurological patient to improve the balance scores in different rehabilitation approaches. Ki Hun Cho et al reported that there is substantial upgrading observed in equilibrium and steadiness effect after exercise through gaming tool.<sup>8</sup> However there are many studies<sup>7,8</sup> on balance training in South Asia, not a single study reported any negative effect of Wii fit plus training in balance assessment and most of them reported at least some improvement in balance training quantitatively.<sup>7</sup>

Kate Laver et al reported in their study that the clinical use of Wii fit plus in hospitalized older adults might not be productive or effective. The proper engagement with games is more attractive for community dwelling elderly population. The traditional approaches are widely used for balance training but exer-gaming is not common due to lack of proper awareness.<sup>9</sup>

There are number of limitations in the present study which require careful attention, first of all this was a pilot study with small sample size of only 16 participants through convenient sampling. Another potential limitation is short duration (six months) of the study; because of this limitation randomized controlled trial could not be conducted.

## Conclusion

The Wii fit training improves the balance and reduces the fall risk in older population. In conclusion it appears that

Wii fit plus intervention is entertaining and friendly gaming technology for sense of well-being and balance exercises in geriatric population with high degree of acceptability among them with easy instructions.

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