

Effects of Wii Fit Balance Training on Confidence Level & Quality of Life of Subjects of Type 2 Diabetes Mellitus with Neuropathy

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ABSTRACT

Objective: To determine the effects of Wii fit balance training on confidence level during several daily activities and quality of life of individuals of type 2 diabetes mellitus with neuropathy.

Methods: This experimental study was carried out at physical therapy department of Kulsum International Hospital, Islamabad from July to December 2017, on 67 type 2 diabetic subjects who fulfilled the inclusion criteria after taking verbal and written consent. Baseline assessment was done and subjects were provided with 30 minutes Wii Fit gaming twice a week for 12 weeks. After completion of 12 weeks, reassessment was done and data was analyzed by SPSS version 21.0. Six participants were dropped. Berg balance scale (BBS), activity balance confidence (ABC) and Euro 5D 5L were used as outcome measures.

Results: Total 61 subjects were analyzed at the completion of 12 weeks. There were 45 males and 16 females. BBS has improved from 43.33 ± 2.67 to 47.17 ± 2.51 , ABC 85.21 ± 5.10 to 87.49 ± 3.74 with significance of <0.001 . Mobility level changed from 2.63 ± 0.70 to 1.57 ± 0.64 , self-care 2.06 ± 0.65 to 1.31 ± 0.46 , usual activities 2.29 ± 0.61 to 1.29 ± 0.45 , pain/discomfort 1.93 ± 0.57 to 1.32 ± 0.47 , anxiety/depression 2.04 ± 0.56 to 1.34 ± 0.47 while health status improved from 75.98 ± 6.04 to 84.34 ± 6.22 with significance <0.001 .

Conclusion: Wii Fit balance training improves confidence level while performing several activities and quality of life of subjects with type 2 diabetes.

Keywords: Type 2 diabetes, Wii Fit balance training, Activities balance confidence, Berg balance scale, Quality of life

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INTRODUCTION:

Diabetes is a disease that is escalating globally and can cause multiple restrictions from daily functions and social participations¹. Diabetes is a disease that results in either an autoimmune destruction of pancreatic β - cells or any other abnormality that can cause resistance to insulin

activity. Reduced insulin activity is outcome of decreased insulin secretion and/or reduced reaction to insulin at its attachment sites on receptors².

Diabetes being a metabolic disorder may lead to multiple micro and macro-vascular damage that can result in multi-system damage. This multi-system damage can lead to various complications that can hamper individual's confidence, performance and functioning. Diabetic neuropathy and retinopathy are among the major complications that can lead to balance fluctuations³. Diabetes significantly damages peripheral nerves and thus causes neuropathy. Diabetic neuropathy being one of the major complications of diabetes is root of multiple balance problems like lack of physical activity and

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increased incidence of falls in diabetic patients⁴.

Diabetic neuropathy depicts as sensory and proprioceptive loss that reduces a person's reflex activity to manage and resist perturbations. Thus result in poor postural control and improper balance⁵. Hewston et al explained that diabetic patients have less head, neck and trunk control as well⁶. Diabetic individuals are unsteady during walk, high postural sway that increases their risk of falls. The sway is 66% more in diabetic subjects as compared to other individuals with same age. These postural deficits lead to restrictions of individual in participation on daily activities that ultimately turn into reduction in confidence⁷.

Diabetic subjects have sensorimotor deficits that include proprioceptive loss, ankle instability, reduced range of motion and muscular weakness that can lead to poor balance, gait instability and mobility deficits resulting in falls⁸. Loss of vision in the form of reduced visual acuity, sensitivity and depth perception also contribute to incidence of falls in diabetic subjects⁴.

All these complications collectively damage an individual's ability to stand various musculoskeletal perturbations, control postural sway during positional change and balance, which ultimately result in falls. Recurrent falls reduces a person's confidence while performing various activities of daily life. These restrictions make a person less confident and may develop multiple psychological abnormalities as well like anxiety and depression. Other factors that may influence confidence reduction and fear of fall are previous fall experiences and physical strengths⁹.

All these factors together can make a person suffering from diabetes less stable, less confident and reluctant to participate in various physical, social activities as well as deteriorating person's psychological statuses. That's why it is necessary to work on the complications leading to these problems, so designing a management plan that can improve balance and rebuild confidence in diabetic subjects that would ultimately put positive effects on their quality of life. This research work focused on the incorporation of Wii Fit, which is one of the trending equipment to manage balance and mobility problems in diabetic subjects. The Nintendo Wii Fit serves as a mean to improve fitness and physical well-being. It has developed interests in the field of

neuro-rehabilitation as a device to train balance difficulties. Multiple diseases that lead to falls and poor balance are the reason behind its increasing use in the field of rehabilitation. It has shown positive outcomes and has been observed to improve balance problems in individuals with older age and other pathologies¹⁰. Along with its convenient use it is cost effective as well.

METHODS:

An experimental study, in which 90 study subjects with type 2 diabetes were assessed for eligibility and 67 participants were recruited who fulfilled eligibility that was; vitally stable type 2 diabetic subjects between 45-65 years of age with medium fall risk (Berg Balance Scale < 40) without foot ulcers or surgeries. Ethical approval was taken from study setting (Letter Number: KIH-EC-PT-02). Written and verbal informed consent was taken from all participants prior to their enrollment in the study.

The subjects were assessed at baseline. Berg balance scale (BBS), Activity Balance Confidence scale (ABC) and Euro QOL (EQ 5D 5L) were used as outcome measures. The subjects were provided with Wii Fit gaming for 30 minutes twice a week for 12 weeks. After 12 weeks reassessment was done and data was documented. Analysis was done by using SPSS 21. Six subjects dropped out till the completion of 12 weeks.

RESULTS:

Sixty-one participants suffering from type-2 diabetes were analyzed at the end of the study who complete the 12 weeks intervention. There were 45 males and 16 females, the various demographic variables are mentioned in Table I.

Paired sample t-test was applied to compare the outcome measures that included Berg balance scale, activity balance confidence and Euro quality of life scale, before and after the provision of intervention as mentioned in Table II. Significant difference was observed in all outcome measures after completion of 12 weeks intervention.

Table-I: Demographic Statistics of Participants

Variable		Total (n=61)
Gender	Male	45
	Female	16
Congenital Conditions		1
Medical Conditions	Hypertension	18
	GIT	2
	Renal	1
	Cardiac	3
Past Surgeries	Orthopedic	3
	GIT	3
	Others	6
Addictions	Smoking	8
	Alcohol	1
	Pollen	3
	Chemical	1
Paresthesia		14
Proprioception Deficits		7

(N=number of subjects)

Table-II: Pre & Post Intervention effects on the Outcome Measures

	Pre Intervention Mean \pm SD	Post Intervention Mean \pm SD	P Value
BBS	43.33 \pm 2.67	47.17 \pm 2.51	<.001
ABC	85.21 \pm 5.10	87.49 \pm 3.74	<.001
EQ 5D 5L			
Mobility	2.63 \pm 0.70	1.57 \pm 0.64	<.001
Self-Care	2.06 \pm 0.65	1.31 \pm 0.46	<.001
Usual Activities	2.29 \pm 0.61	1.29 \pm 0.45	<.001
Pain/Discomfort	1.93 \pm 0.57	1.32 \pm 0.47	<.001
Anxiety/Depression	2.04 \pm 0.56	1.34 \pm 0.47	.001
VAS	75.98 \pm 6.04	84.34 \pm 6.22	<.001

BBS= Berg balance scale, ABC= Activity Balance Confidence,

VAS= Visual Analogue Scale for Health Status

BBS= Berg balance scale, ABC= Activity Balance Confidence, VAS= Visual Analogue Scale for Health Status

Trends of change can be observed in activities balance confidence and Berg balance scale after provision of intervention as shown in figure I.

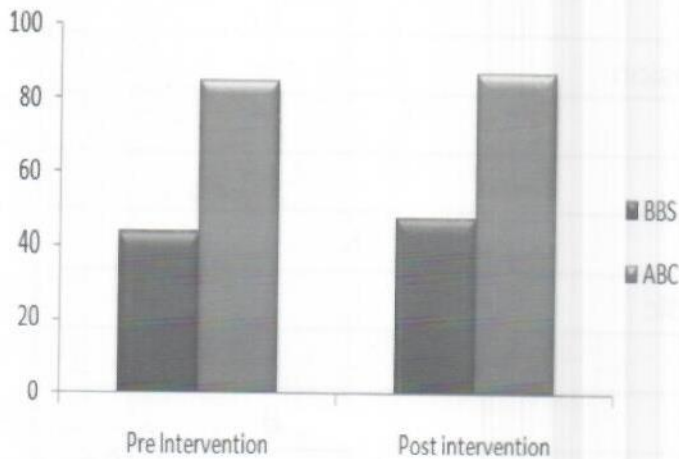


Figure I: Activities Balance Confidence and Berg balance scale before and after intervention

The pre and post intervention quality of life scale also show gross improvement by observing various parameters like mobility, self-care, usual activities, pain/discomfort and anxiety/depression as shown in figure II.

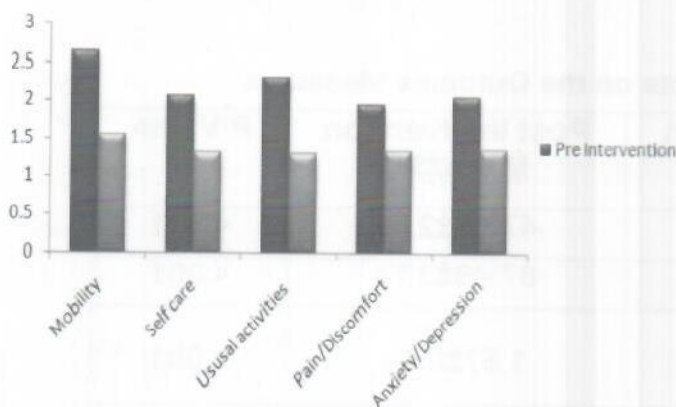


Figure II: Euro 5D 5L - Pre and Post Intervention Scores

The pre and post intervention quality of life scale also show gross improvement by observing various parameters like mobility, self-care, usual activities, pain/discomfort and anxiety/depression as shown in figure II.

DISCUSSION:

Diabetic subjects experience simultaneous impaired proprioception and postural instability frequently that can be a cause of reduced confidence in daily functioning of the individual. The study has shown that Wii Fit training can improve balance and hence contribute to development of confidence in type 2 diabetic patients. A study conducted by Grewal et al showed that balance rehabilitation strategy based on virtual reality technology improves the balance and confidence level of type 2 diabetic subjects by improving joint proprioception and motor learning¹¹.

Morrison et al in their trial on older individuals with type 2 diabetes found out that they had poor balance, reduced reaction time and high risk of falls, which can be enhanced by a properly designed balance training program and hence functional level and quality of life of subjects, can be improved¹². Current study signifies that Wii Fit is an integrated management technology that can improve individual's balance and confidence for activity participation.

A systematic review by Laufer et al indicated that Wii Fit based training can be more efficient in improving the balance and reduction in fall risk in subjects with type 2 diabetes. Current study has also shown that Wii fit improves the balance, confidence and quality of life of subjects suffering from type 2 diabetes¹³.

Another randomized controlled trial conducted by Grewal et al in 2015 inferred that subjects with diabetic neuropathy can have their balance and confidence improved by using sensor based feedback technology¹⁴. Current study also supports this study as feedback mechanism provided by Wii fit integrated with joint movements is beneficial for the improvement in proprioception and balance, leading towards high quality of life in diabetic subjects.

Randomized control trial by Lee et al on use of virtual reality exercise program in type 2 diabetic individuals suggested the feasibility and effectiveness of this program for improvement in balance and fall risk reduction that can be helpful for the subjects to have less stress regarding losing balance while performing daily activities¹⁵. Present study also supports the findings of study

conducted by Akbari et al that concluded that balance training can improve the stability in diabetic patients with neuropathy¹⁶.

CONCLUSION:

The study concluded that Wii Fit gaming can reduce fall risk and, enhance balance, confidence and quality of life of individuals with type-2 diabetes.

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