Original Article

Effect of wobble board exercise with mirror feedback on balance and gait training in geriatric population: An experimental study

Gaurav C Mhaske[1*], Sanjiv Kumar[2]

[1]MPT, MGM's Institute of Physiotherapy, Aurangabad, Maharashtra, INDIA.
[2]MPT, PhD Professor, Principal. KLEU's Institute of Physiotherapy, Belgaum, Karnataka, INDIA.
Email: drgaruav.physio4u@gmail.com

Abstract

Introduction: Ageing is a physiological process accompanied by functional, morphological, biochemical and psychological changes. In geriatric populations there is deterioration in balance, postural control and gait due to impaired cognitive function, decline in sensory, visual, vestibular, somatosensory input, motor responses, and musculoskeletal systems that are resulting into postural instability and fall. **Objective:** To study the effect of wobble board exercises with mirror feedback on balance and gait in the geriatric population. **Methods and Material:** 33 healthy individuals above the age of 60 years were recruited. Participants were participated in wobble board with mirror feedback exercise. A 15 minute intervention was given for 12 days in 2 weeks. Outcome measure used were Berg balance scale (BBS), Activities of Balance confidence scale (ABC), timed up and go test (TUG) andDynamic Gait Index (DGI). **Results:** The significant improvement noticedin the outcome measure of BBS, ABC scale, TUG Test and DGI. **Conclusion:** The wobble board exercise with mirror feedback in enhancing balance and gait in the geriatric population.
Keywords: Wobble Board, Balance, Gait, Geriatric, Mirror Feedback.

[*]**Address for Correspondence:**
Dr. Gaurav C. Mhaske, MPT, MGM's Institute of Physiotherapy, Aurangabad, Maharashtra, INDIA.
Email: drgaruav.physio4u@gmail.com
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INTRODUCTION

In the geriatric community, more than one third of the community-dwelling individuals aged 65 and above have tendency of falls at least once a year.[1] The severity of risk of fall increases with ageing and the number of injuries and injurious falls strongly risk of leads to admission in a nursing home.[2] India is the second most populous country in the world for the geriatric population.[3] Due to aging, there are various changes which occurs in the body such as impaired cognitive function, decline in sensory, visual, vestibular, somatosensory input, motor responses and musculoskeletal systems that results in decrease of muscle strength in lower limb that contributes to postural instability and results in the fall.[4] There are various interventions to improve balance and gait in the geriatric population.[5,6]Wobble board exercises are used to improve balance in older people. Wobble board exercise provides information about the motor strategies (i.e., ankle, hip, and stepping strategies) and associated with muscle activation patterns that result when a person is standing on a wobble board surface, that unexpectedly translates or tilts, which stimulates proprioception on the ankle joint strategy.[7] The mirror-feedback technique is useful in the training of upright postural control.[8] Balance training using visual feedback has been used in treating the geriatrics for improving balance.[9] Wobble board exercise training showed significant improvement in standing balance in an elderly population.[11] Studies have been conducted by using wobble board exercises and mirror feedback exercise improve balance. But there is a paucity of literature which compares these treatment options to improve balance and gait in the geriatric population.

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Hence, the aim of the study is "to compare the Effect of wobble board exercise with mirror feedback for balance and gait training in geriatric population."

METHOD AND MATERIALS

In this comparative study the geriatric subject staying at the old age home were recruited. The purpose of the study was explained to the 43 volunteers (Figure I) participated in this study, which was reviewed and approved by the Institutional ethics committee. Before the commencement, participants were informed about the study and the written consent was taken from each of them. Inclusion Criteria - apparently healthy individuals of 60 years and above, able to understand simple commands, walk and perform their ADL's. Exclusion Criteria - lower limb fracture or surgery, the use of a walking aid or foot orthosis, auditory, ocular and vestibular problems, head trauma with or without loss of consciousness and strokes.

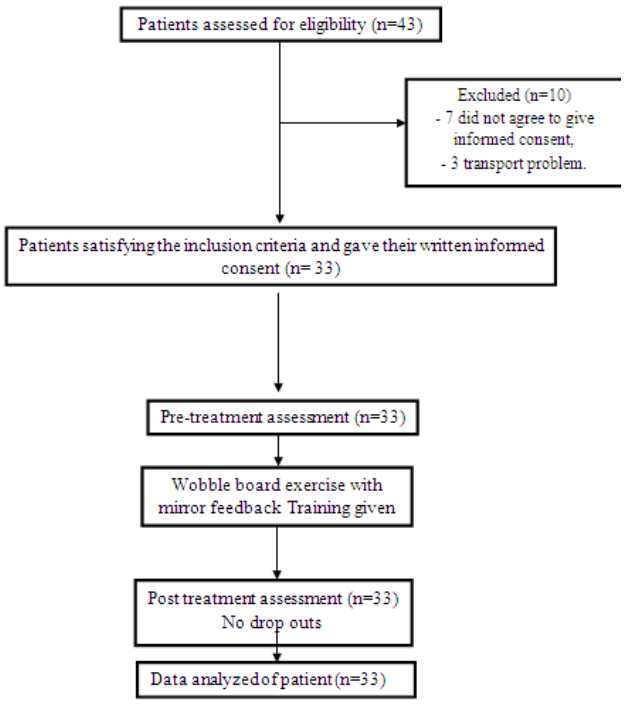

Figure 1: Flow Chart of the study

Material used: Wobble Board, Mirror and Mat.

Procedure: 43 patients were screened and 33 were recruited from 2 old age homes and geriatric population in and around Belagavi city. The general evaluation was done for all the participants.

Intervention:

The subjects received wobble board exercises with mirror feedback Anterior-posterior cycles, Medial-lateral cycles for 12 sessions for 15 minutes, 6 days a week for 2 weeks. [12](Figure II). The intervention has given at 2 old age homes of Belagavi City.

Figure 1: Participation performing Wobble board Exercise with mirror feedback.

Outcome Measure

The Berg Balance Scale assesses for static and dynamic balance. It is a 14 item scale with a total score of 56, Individual scores: 41-56 has low fall risk, 21-40 medium fall risk and 0 –20 high fall risk.[13] Timed Up and Go test is a tool identify basic mobility skills of frail elderly persons. Scores of ≥ 13.5 seconds predict falls in community-dwelling frail elders, Scores of ≥ 30 seconds correspond with functional dependence in people with pathology.[14] Activities-specific balance confidence scale, measures the functional balance, will also predict over confidence or under confidence about falling. Scoring is done on the Ordinal scale has 16 items (score 0-1600 possible).[15] The Dynamic Gait Index (DGI) was used for predicting likelihood of falls and walking ability in older people. Scoring ranging from 0-3, "0" indicates the lowest level of function and "3" the highest level of function with a total score of 24.[16] The Star Excursion Balance Test (SEBT) is a dynamic balance test that requires strength, flexibility, and proprioception. The direction is measured in Anterior, Anteromedial, Medial, Posteromedial, Posterior, Posterolateral, Lateral, Anterolateral.[17]

Statistical Analysis

The statistical analysis was done by using SPSS 20 Software, various measures such as mean, SD and the test of significance for comparison between age, height, weight and BMI using paired and unpaired 't' test. Pre and post outcomes of BBS, ABC, DGI, TUG and SEBT was done using paired t test and between the groups analysis was done using an unpaired t test.

RESULT

A total of 33 participants were 8 males and 25 females mean age was 74.70 ± 8were recruited in the study (Table-1)

Table 1: Demographic Data of the participants

Variables	Wobble board		Computer Gaming System		t-value	*p*-value
	Mean	Std. Dev.	Mean	Std. Dev.		
Age	74.70	8.91	69.18	6.77	2.8317	0.0062*
Weight	57.24	11.79	66.48	11.27	-3.2549	0.0018*
Height	1.53	0.09	1.62	0.07	-4.3271	0.0001*
BMI	24.55	4.18	25.52	4.43	-0.9102	0.3661

*$p<0.05$

The outcome of berg balance scale, Active-specific balance confidence, Dynamic Gait Index and Star extrusion scalewas statically significant. The improvement was marked in the Berg balance scale in -13.52%, in the Active – specific balance confident scale in group A -33.15%, in the timed up and go test in 30.50% and in the Dynamic gait Index-29.36%.

Table 2: Pre and posttest Comparison for Berg Balance Scale (BBS), Active-specific balance confidence (ABC) and Dynamic Gait Index (DGI)

MEASURE	PRE TEST	POST TEST	DIFFERENCE	PAIRED t test	p Value
BBS	43.03 ± 6.75	48.85 ± 5.23	5.82 ± 3.25	-13.52%	0.0001*
ABC SCALE	54.03 ±18.44	71.94±14.5	17.91±9.44	-33.15%	0.0001*
TUG	17.09±6.39	11.88± 3.95	5.21±3.57	30.50%	0.0001*
DGI	16.00±3.82	20.70±2.80	4.70±1.90	-29.36%	0.0001*

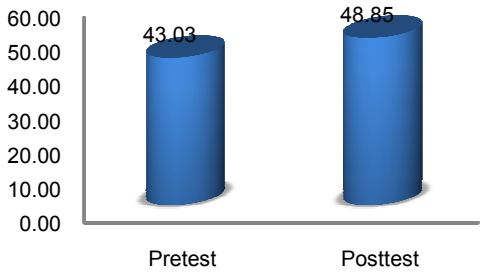

Figure 1: Comparison with respect to pretest and posttest of Berg Balance Scale

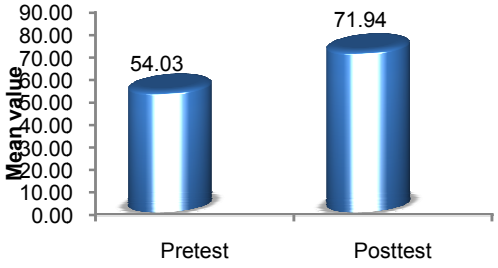

Figure 2: Comparison with respect to pretest and posttest of Active-specific balance confidence scores

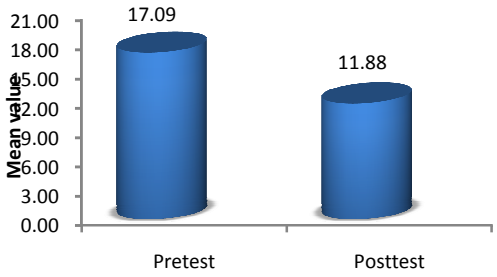

Figure 3: Comparison with respect to pretest and posttest of Timed up and Go Test scores

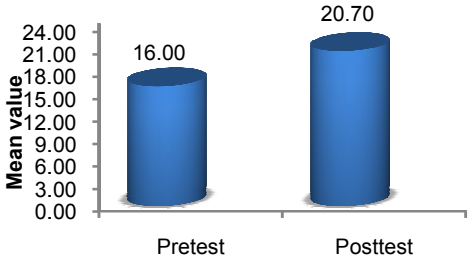

Figure 4: Comparison with respect to pretest and posttest of Dynamic Gait Index scores

DISCUSSION

In this study, the effect of Wobble board exercise with mirror feedback for balance training and gait in Geriatric population was investigated.The berg balance scale is the standard scale to measure balance in Geriatric population. A study conducted on 199 patients aged 60 and older on the effectiveness of an enhanced balance training program in improving mobility and well-being, concluded that Berg Balance Scale (BBS) score of less than 45 has improved mobility and reduce falls in geriatric patients after a 6 weeks enhanced balance training consisting of a series of repetitive tasks of increasing difficulty specific to functional balance.[18] In present study BBS was used and its found that the score improvement in pre to post comparison, score were more and less similar that of the study mention above. The change in the score is due to the improvement occurring in the strength of lower extremity. The effects of wobble-board training on ability to discriminate between different extents of ankle inversion movements on 20 elderly healthy of aged groups 65 to 85 years for 5-week wobble-board exercise intervention was given. They conclude that training with a wobble board provides and improves the ability of movements into ankle inversion on to discriminate different degrees of ankle inversion.[19] Another study conducted on 22 healthy elderly on balance training on the wobble boards which Randomly 11 subjects were allocated in training group and control group. Result after 9 weeks was found that standing time on a wobble board, standing time on a balance mat, and maximum displacement distance of anterior-posterior center of pressure in the training group were significantly greater than those of the control group. The results suggest that wobble board training is effective for geriatric people to improve their standing balance.[20] In the similar study conducted to the present study participant had fear to stand on the wobble board for 2 session, But they showed improvement in balance by standing on the wobble board with balance mat and showed improvement in the balance on the outcome measure. ABC scale measures the functional balance and also assesses confidence level among participants. In present study in group A showed improvement in balance confidence and was found statistically significant. Wobble board training is effective for elderly people to improve their standing balance, by which they frequently control their center of gravity and maintain a standing posture on unstable surface conditions.[21] Timed Up and Go test was used for basic mobility skills of frail elderly persons. In present study, group A showed statistically significant reduction in the Timed Up and Go scores. A comparative done on the effectiveness of conventional balance exercise training program and Swiss ball exercise training program on balance function in the geriatric population. Found that

Timed up and go test showed significant change in balance in both the groups.[22] The improvement in the timed up and go test may attribute to improvement in muscle strength and flexibly among elderly individuals. The Dynamic Gait Index (DGI), with the goal of assessing and documenting the capacity to changes in gait in response to changes in the demands of certain tasks, among in the elderly with balance impairment. In present study in group A the mean pre to post-test showed there was statistically significant improvement. Study conducted on 22 healthy elderly on balance training on the wobble board exercise, they suggested that wobble board training is effective for geriatric people to improve their standing balance.[23] A another study suggest that wobble board exercise improve the strength in lower extremity. This can improve walking comfortable- and fast-speed walking. Mirror feedback is a rehabilitation approaches that provides participant with visual biofeedback through the use of mirror reflected body image. Study shows that Mirror feedback improve postural incapacities.[24,25] Results of our study has shown the improvement by using mirror feedback while doing wobble board exercise. This provides the information about the posture when standing on the wobble board, participated was trying to balance themselves on the wobble board by using Mirror feedback which gives the external feedback to control the posture in the upright standing position on the wobble board. The study suggest that mirror feedback provided to participants for maintaining the body in the upright position and it also increases the effectiveness of postural control in geriatric persons in the Mediolateral direction and lower risk of falling.[26] The study was several limitations. The follow up done was for a short duration due to unwillingness of subjects to participate in the study. The participants were also dependent on others for transportation. Hence, the participants were reluctant for a longer follow-up.

CONCLUSION

The wobble board exercise with mirror feedback in enhancing balance and gait in the geriatric population. A long term follow up can be carried out with a similar type of study. The transport issues can be rectified by conducting a Community Base Study.

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