Review Article

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Effect of Balance Training on Foam Platform in Geriatric Population

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Abstract

Objective: The study was done to find out the "Effects of Balance Training on Foam Platform in Geriatric Population". **Methods**: The study was of control design, with 30 subjects, 15 subjects in each, according to the inclusion and exclusion criteria, from Old Age Home, Jai Physiotherapy and Dental Clinic, Residential Care Centre and Physiotherapy O.P.D. of CSS Hospital, Meerut. These subjects were than conveniently divided into 2 groups,(Group A and Group B), Group A consisting of 15 subjects (7 males and 8 females) received the balance training on foam platform, Group B also consisting of 15 subjects (6 males and 9 females) received same balance training on floor. Demographic details of subjects, sex, age, height, and weight was collected following Berg Balance Scale (BBS), Functional Reach Test (FRT). After assessing the initial balance scores, the balance training on foam platform for group A and same balance training on floor, were given for a period of four weeks for each subject in 3 days a week approximately for 30 minutes. Both the groups were assessed on the above mentioned balance scales after four weeks of exercises. The collected data was of mean and standard deviation and has been analyzed using SPSS software. The t-test was used to analyze the difference in the balance improvements in Group A and Group B. Intra group analysis between pre-intervention and post-intervention scores was also done for both the groups. **Results:** The results of my study showed that there is a significant improvements in balance control after receiving short term balance training program that specifically emphasize for experimental group i.e. Group (A). Several balance specific exercises à shifting their body weight from foot to foot, standing on one foot, and standing with the feet in a series of positions, including side by side, and heel to toe, while standing on foam pad. On comparing the BBS at day 30 of group A (mean = 55.26, SD = .96) and of Group B (mean = 52.26, SD = 2.91) and its corresponding P value (0.001) is significant. So, it showed that there is a significant improvement in Group A.

Keywords: Balance; Berg Balance Scale (BBS); Functional Reach Test (FRT); Foam Platform.

Introduction

According to WHO (World Health Organization) those, "aged 60-74 years as geriatric and those older as aged". The elderly are the fastest growing segment of our population. In the coming years, it will become essential for more health care professionals to develop clinical expertise in evaluating and treating the unique health concerns of this group.[1] The ability to maintain balance is essential to nearly all activities associated with daily living. The balance system enables us to sense where we are in space and to maintain our posture and equilibrium while we are still and while we are in movement.[2]

Geriatric people show a decline in ability to maintain balance when faced with the perturbations imposed by functional requirements such as dividing attention between task as is needed to keep balance when walking in a crowd.[3] Balance disturbances frequently cause elderly people to seek medical advice on admission to

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hospital and residential homes.[4] Many cases of the fall in the elderly is a result of inadequate control of balance. Falling has been associated with an increase in morbidity and mortality rate in elderly population.[5] One third of community residing adults aged 65 years and older suffer a fall each year.[6]

Falls are common and serious problem among older – causing, injury, mortality and declines in mobility.[7] A person who falls or almost falls could become fearful or anxious about subsequent falls and serious injury and associated potential consequences. It results in loss of confidence, restriction of activities, social isolation and increased dependence on others.[8] An older person with reduced physical activity after a past fall could subsequently become deconditioned and weak, develop increased joint stiffness and become less attentive on leads to more falls and further mobility restriction.[9]

Identification of significant risk factors is an important step towards fall prevention. Several studies have been performed among both home living and institutionalized population to define risk factors associated with fall. These risk factors have included both patient related or intrinsic factors and extrinsic factors. Intrinsic factors that increase the probability of an individual falling include components such as advanced age, specific disease, muscle weakness, gait disorders[9-11], Extrinsic factors are those environmental hazards that present the opportunity for the occurrence of a fall by an individual such as inadequate lighting or a slippery walking surface.[10-11]

Balance control is the manifestation of concerned interaction between the neuromusculoskeletal, visual, vestibular and proprioceptive information concerning body position, appropriate biomechanical alignment, sufficient muscle strength, and quick, coordinated muscle activation patterns. Impairment in any of these domains will reduce an individual's ability to balance the multiple links of the musculoskeletal system while standing or during ambulating.[12] As age increase the influence of these systems deteriorates, resulting in an increased susceptibility to falling.[14]

Efforts to reduce the risk and incidence of falls in older adults are plentiful as evidenced by intervention studies which have appeared in the literature with in the last 2 decades detailing various exercise interventions intended to reduce falls.[15-16] Exercise is effective in lowering falling risk in among elderly.[17-18]

Nelson and Amin reported that 10% - 25% of falls are associated by abnormalities in gait and balance. Thus balance training interventions have an important role in fall prevention. These interventions have emphasized a variety of exercise modes including resistance training[16] flexibility exercises[19] many of this interventions have focused too heavily on simple maneuvers that are easier to quantify but that may not address adequately the varied needs of different individuals.

Aims and Objectives

The study was done to find out the "Effects of Balance Training on Foam Platform in Geriatric Population".

However, because many different types of studies were studied, it was impossible to determine which type was most effective. Keeping this in mind this study was designed with the purpose of improving balance in geriatric population while using foam platform.

Berg Balance Scale[20-21] and the Functional Reach Test[22-23] are used to assess the outcome interventions. The reliability and validity of these scales have been established.

Berg Balance Scale: Berg Balance Scale is an objective measure of static and dynamic balance abilities, this ordinal scale evaluates patient performance on 14 tasks commonly performed in daily life.[18-19]

Functional Reach Test: Functional Reach Test

is defined as the maximal distance one can reach forward beyond arm length while maintaining a fixed base of support in the standing position.[20-21]

Foam Platform Exercise: These exercises improve balance in elderly. These exercises provide subtle changes in balance similar to the challenges experienced in everyday life and they allow the body to learn how to make appropriate responses to maintain balance while standing still.

Operational Definitions

Balance

Balance is a complex process involving the reception and integration of sensory inputs, and the planning and execution of movement, to achieve a goal requiring upright posture. It is the ability to control centre of gravity (COG) over the base of support in a given sensory environment.[24-25]

Hypothesis

Null Hypothesis: There will be no difference in balance in geriatric population after giving balance training on foam platform.

Alternative Hypothesis: There will be significant improvement in balance in geriatric population after giving balance training on foam platform.

Limitation of the Study: A small sample size was one of the major limitations of the study. Also, most the participants belonged to the same community and were leading an active lifestyle. Thus, results obtained cannot be generalized for all population types.

Inclusion Criteria

Age 60- 75 years.

Exclusion Criteria

a. Any Neurological disease – stroke, hemiplegia.
b. Any acute Musculoskeletal injury
c. Acute Congestive heart failure
d. Severe visual deficit.
e. Any cognitive impairment
f. Sensory impairment

Design

An experimental design study. Pre test and post test match subject design.

Instrument and special testing tools:

1. Foam pad – 16"x 9" x2"
2. Berg balance scale
3. Functional test
4. Standard measuring tape

Material Used

Chair of 46 cm. of seating height and a ball.

Protocol

A sample of convenience of 30 older adults took part in this study. These subjects were than conveniently divided into 2 groups, Group A consisting of 15 subjects received balance training on foam platform, Group B also consisting of 15 subjects received same balance training on floor. Demographic details of subjects, sex, age, height, and weight was collected following Berg Balance Scale (BBS) & Functional Reach Test (FRT). After assessing the initial balance scores, the balance training on foam platform for Group A and same balance training on floor for Group B, were given for a period of four weeks for each subject in 3 days a week approximately for 30 minutes. Both the groups were assessed on the above mentioned balance scales after four weeks of exercises.

Procedure

The subjects were invited to participate in the study. A detailed explanation of the procedure was given after which the subjects on informed consent. The subjects were assessed on the two balance scales. The Berg

Fig 3.1: The Subject is Practicing to Semi Tandem Position

Balance Scale (BBS) and the functional reach test (FRT). Subjects of Groups A received the balance training on foam platform, which consists of — Flexibility exercise (3 to 5 repetitions 30 sec. hold)

- Hamstring stretch
- Calves stretch
- Quadriceps stretch

The Balance exercises start with placing the feet in a series of positions that gradually reduce the base of support, holding the stance for 10-30 seconds.

- Semi tandem - Stand on foam with one foot in front of the other in semi tandem position.

Fig 3.2: The Subject is Practicing of Stepping in Different Direction

Fig 3.3: The Subject is Picking up an Object from the Floor

- Full tandem – Stand on foam with heel of one foot directly in front of the toes of the other foot.
- Standing up on toes on the foam pad.
- Standing on one foot on foam pad.

Gradually, additional exercise that to the following are introduced.

Add dynamic movements to perturb the center of gravity, such as:

- Leaning or stepping in different direction on foam pad.
- Reaching
- Picking up on object on from the floor on standing on foam pad.
- Five minutes of cool down and relaxation activities.

Breathing exercises for relaxation.

Fig 3.4: The Subject is Performing one of the 14 Items of Berg Balance Scale

Fig 3.5: The Subject is Performing one of the 14 Items of Berg Balance Scale

Subjects of Group B received the same balance training on floor.

Berg Balance Scale

Berg Balance Scale is an objective measure of static and dynamic balance abilities. The scale consists of 14 items that are scored from 0 to 4, where 0 indicates an inability to perform the task and 4 indicates that the tasks were performed correctly and independently. The maximum score of the test is 56. The items range from sitting to standing, standing unsupported, sitting with back unsupported on the floor or on the stool, transfers, standing unsupported eyes closed, standing unsupported with feet together, reaching forward with outstretched arm while standing, picking up an object from the floor in standing position, turning to look behind

Fig 3.6: The Subject is Performing Functional Reach Test

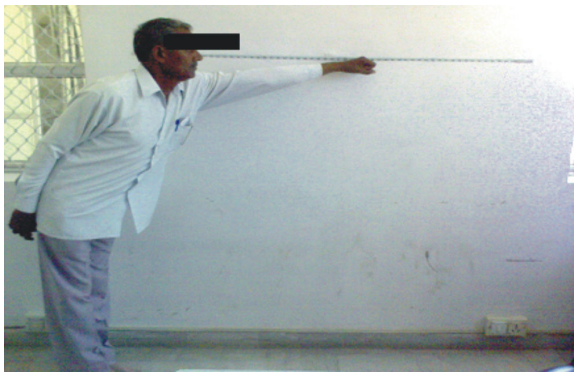


Table 5.1: Mean and SD of Age and Sex of Group A and Group B

	Age (mean ± SD)	No. of male / female	Height	Weight
Group A	68.0 ± 3.92	Male – 7 Female – 8	159.0 ± 7.9	63.8 ± 10.1
Group B	70.5 ± 4.17	Male – 6 Female – 9	159.3 ± 7.0	63.4 ± 6.9

over the left and right shoulders while standing, turning 360°, placing alternate foot on step or stool while standing unsupported with one foot in front and standing on one leg. Scores obtained during the assessment were used in data analysis.

Data Analysis

Statistics were performed using SPSS software. A student's t-test was used to analyze the difference in the balance improvements in Group A and Group B. Intra group analysis between pre-intervention and post – intervention scores was also done for both the groups. A significance level of $p < .05$ was fixed.

Results

The results of the data analysis of the two intervention group scores on the two balance measures.

The group receiving balance training on foam platform (Group A) consisted of 7 males and 8 females with a mean age of 68.6 + 3.92 years while the group B receiving balance training on floor consisted of 6 males and 9 females with a mean age of 78.0 + 4.17. Both

Fig 5.1: Illustrates Mean and S.D. of F.R.T. & B.B.S.

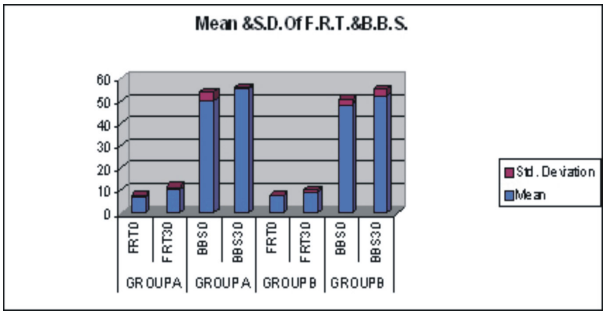
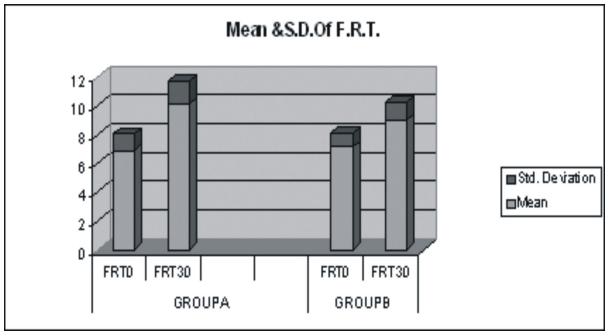


Table 5.2: Within Group Analysis for FRT

	FRT 0 (Mean ± SD , N= 15)	FRT 30 (Mean ± SD , N= 30)	T_0 test t	P
Group A	6.9 ± 1.2	10.2 ± 1.5	15.8	.000
Group B	7.13 + 1.0	9.0 + 1.3	5.5	.000

Fig 5.2: Illustrates Mean and S.D. of F.R.T.



the groups were matched in terms of age, height and weight.

A student's t-test was used to compare the performance of subjects of Group A and B on Functional Reach Test (FRT) and Berg Balance Scale (BBS) prior to the intervention programme

Table 5.1 is illustrates in Group A (mean age = 68.0, SD = 3.92) and in Group B (mean age = 70.5, SD = 7.17) and no. of male were 7 and female were 8 in Group A and in Group B no. of males were 6 and no. of females were 9.

The mean height of Group A was 159.0 + 7.9 and mean height of Group B was 159.3 +

Table 5.3: Within Group Analysis for Berg Balance Scale

	BBS 0 (Mean ± SD , N= 15)	BBS 30 (Mean ± SD , N= 30)	T_0 test t	P
Group A	49.9 ± 3.9	55.2 ± 1.0	6.6	.000
Group B	48.4 + 2.6	52.2 + 2.9	6.6	.000

Fig 5.3: Illustrates Mean and S.D. of B.B.S.

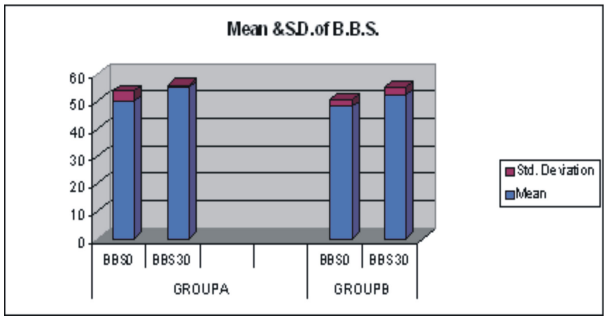


Table 5.4: Between Group Analysis for FRT and BBS

	Group A (Mean ± SD , N= 15)	Group B (Mean ± SD , N= 15)	T_0 test t	P
FRT 0	6.93 ± 1.16	7.13 ± .99	.50	.02
FRT 30	10.2 + 1.52	9.0 + 1.25	2.3	.61
BBS 0	49.9 ± 3.91	48.4 ± 2.64	1.25	.21
BBS 30	55.26 + .96	52.26 + 2.91	3.78	.001

7.0 and mean weight of Group A was 63.8 + 10.1 and mean weight of Group B was 63.4 + 6.9.

This shows that both Groups were matched in terms of age, sex, height and weight.

Table 5.2 illustrates that in experimental Group A Functional Reach Test (FRT) at day 0 was 6.9 + 1.2 and FRT at day 30 was 10.2 + 1.5 with a t value of 15.8 and p = .000

In the control Group B, FRT at day 0 was 7.13 + 1 and FRT at day 30 was 9 + 1.3 with a t value of 5.5 and p = .000. So both in Group A and Group B, FRT there is significant improvement.

Table 5.3 illustrates that in experimental group A Berg Balance Scale (BBS) at day 0 was 49.9 + 3.9 and BBS at day 30 was 55.2 + 1 with a t value of 6.6 and p = .000

In the control group BBS at day 0 was 48.4 + 2.6 and day 30 was 52.2 + 2.9 with a t value of 6.6 and p = .000

So, both in Group A and Group B, BBS, there is significant improvement.

Table 5.4 illustrates that on comparing the FRT at day 30 of Group A (mean = 10.2, SD = 1.52) and Group B (mean = 9.0, SD = 1.25) and its corresponding P value (.61) is significant. So, it shows that there is significant improvement in group A.

On comparing the BBS at day 30 of Group A (mean = 55.26, SD = .96) and of Group B (mean = 52.26, SD = 2.91) and its corresponding P value (0.001) is significant. So, it shows that there is significant improvement in group A.

*P < 0.05 , P < 0.001 Significant.By applying student 't' test, at 5% and 1% level of significance, A significant difference was observed for FRT 30 and BBS 30 between the

two Groups i.e. $P < 0.05$, $P < 0.001$.

Discussion

This chapter deals with the discussion of the results, future research and its clinical implication.

The study has proved to improve balance while giving balance training on foam platform in geriatric.

As age increases there is deterioration of the physiologic systems controlling balance resulting in an increased susceptibility to falling.

Efforts to reduce the risk and incidence of falls in older adults are plentiful, as evidenced by intervention studies which have appeared in the literature within the last 2 decades detailing various exercise interventions intended to reduce falls.

The obvious importance of being able to improve balance has resulted in a number of balance intervention studies. Which initially focused on task specific exercises and every day activities such as getting in an out of a chair, or stepping up and from one level to another (Harada *et al*, 1995, Judge, 2003; Lord *et al*, 2003, Nelson *et al*, 2004, Nitz and Choy, 2004, Steadman *et al*, 2003). These studies demonstrated that balance could be improved greatly, especially in rehabilitation and nursing home environments. Researchers than began to examine the effects of task specific exercise in combination to strength training (Binder *et al*, 2002; Harada *et al*, 1995, Shaw and snow, 1998). They found that not only did the combination of the two exercises improve balance, but strength training along also improved balance (Barrett and Smerdely, 2002, Becker *et al*, 2003, Brill *et al*, 1998).

The findings of my study show that significant improvements in balance control can be realized following this short term balance training program that specifically emphasises. Several balance specific exercises à shifting their body weight from foot to foot, standing on one foot, and standing with the feet in a series of positions, including side by side, and heel to toe, while standing on foam pad.

These exercises provide subtle changes in balance similar to the challenges experienced in every day life and they allow the body to learn how to make appropriate response to maintain balance while standing still.

As a result of intervention program, limits of stability improved. This could have resulted in more efficient movement in the improved functional ability to balance.

James, W. Bellew has shown effect of balance training (Medial – lateral and anterior posterior movement and bilateral partial squats (while standing on semi compressible foam roller devices in older women. He observed significant increase in balance trained Groups.

Based on the findings of the FICSIT study and others, the specific inclusion of balance activities is warranted in exercise interventions with goals of improving balance. However, many programs reported in the literature are of significantly greater duration and frequent and require more specialized equipment, staff and facilities than the program reported in this study. Because of these traits, many balance programs may not be available to those who benefit from such activities.

The need for a simplistic, concise, short term balance training program that provide improvement in control of balance in elderly while at same time minimizing frequency, duration and expense.

This balance training program is short term, could be performed independently and requires no expensive equipment. This program provides a simple effective and enjoyable opportunity for elderly to participate in exercises that are promising in terms of preventing falls and keeping elderly more active for a longer period of time.

Clinical Implications

These data suggest that the balance training on foam platform is more effective in

improving balance in geriatric population as compared to the balance training on floor. This helps us to choose a better balance training program in geriatric population above 60 years in order to improve balance significantly even in a short time duration.

The ultimate effect of this study is to improve balance with the aim of reducing injurious falls in elderly population.

Future Research

This study was conducted for a short period only. Future research involving a longer time period and comparing the effects of the two intervention programs is possible. Also the research can be oriented towards finding out the reduction in falls following balance training in either group. This can be done by maintaining a follow up for few months to years. This study uses only a small sample of subjects. The relevance of this study can be increased by taking a larger sample of subjects.

Conclusion

This study thus concludes that although both balance training on floor and balance training on foam platform show significant improvement. On balance outcome scales, the subjects who participated in the balance training on foam platform showed a significantly improvement in balance as compared to Group B. Thus, concluding that balance training on foam platform is superior to balance training on floor.

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