

Comparison of Therapist Assisted Balance Training with Balance Master Training on Risk of fall in Young Old Population

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ABSTRACT

Background: There is lacuna of researches which provide us information regarding benefits of balance training to reduce the risk of falls. NeuroCom Balance Master Training is used as intervention to improve balance, transfers and gait. However, not much is known on the effectiveness of NeuroCom Balance Master to improve fall efficacy and reduce falls in elderly.

Introduction: Aging refers to the group of developmental changes that occur in the years later. Changes associated with aging reduce a person's ability to function, maintain survival and have a high quality of life. The decline in physical function leads to reduced physical activity commonly present in elderly. Thus our aim was to improve balance training in elderly who are at risk of fall, either through Therapist Assisted or Balance Master Training.

Methodology & Results: 30 subjects were randomly selected and assigned to Balance Master Training (Group A) & Therapist Assisted Balance Training (Group B), according to inclusion criteria, pre & post outcomes measures were taken. Results showed significant improvement in pre & post measures of BBS($p<0.000$), TUG($p<0.000$) & MFES($p<0.004$) in group A & BBS($p<0.000$), TUG($p<0.000$) & MFES($p<0.03$) in group B.

Conclusion: Thus, there was no significant difference on level of improvement between training on Balance Master and Therapist Assisted training for any of the outcome variables measured.

Keywords: NeuroCom Balance Master, Bergs Balance Scale, Timed Up & Go test, Modified Fall Efficacy Scale.

INTRODUCTION

Age criteria for elderly population differ universally. This research study is pertaining to young old population which consists of age group between 65 years to 75 years. This age group is worth involving in research studies because they have lower level of disabilities and have an average life expectancy of 15 years to 20 years.¹

Age related changes in elderly includes reduction in number of muscle fiber starting about 25 years of age and progressing eventually.¹³ Changes in size of muscle fiber, which is observed in fast twitch type II muscle fibers whereas no changes are observed in slow twitch type I muscle fiber. Lastly ageing decreases number of motor units.¹⁴⁻¹⁵ Ageing reduces mobility, strength, physical activity & elderly becomes more prone to illness.² Ageing affects central

nervous system, loss of sensory and motor neurons leading to debt in balance and gait pattern.¹⁶

Prevalence of fall in India for elderly population is estimated as 14% - 53%. In spite of increased frequency of falls in elderly, few requires medical attention and rest leads to fractures.²³⁻²⁴ Hip fracture or other fracture and injury to related soft tissues may require immediate hospitalization or immobilization. Falls in elderly population may or may not cause emergency. One fall in entire life time affects the well being of elderly individual because a single fall can ruin self confidence to carry out one's task of daily activity and may get dependent on others. Therefore being physically inactive may induce muscle weakness, deconditioning and joint related issues ²⁵ leading to risk of fall.

Risk factors related to falls are history of falls, age more than 80 years, balance deficit, gait deficit, visual deficit, impaired activities of daily living, cognitive impairment, arthritis, use of assistive devices for ambulation, elderly depression, medications, peripheral nerve impairment, cardiovascular deficits, poor light, slippery floor or uneven surface.²⁷

Postural balance in elderly population is extremely important to carry out daily activities, therefore it is important to understand the parameters of balance in elderly individuals.²⁸ Balance refers to an individual's skill in maintaining the equilibrium. Balance is categorized into static balance which means, an ability of elderly individual to maintain a stable position with body at rest and centre of mass over base of support.³²⁻

³³ Another categorization is dynamic balance which means maintaining stable posture with centre of mass over base of support while the body is moving.³³⁻³⁴ Our study aims to improve balance in elderly individual who are at risk of fall, either through therapist assisted balance training or through balance master training. Nevertheless, strength training and withstanding perturbations is given to elderly individuals involved in both the groups (therapist assisted & balance master).

I. METHODOLOGY

This was an experimental study conducted at Dr. D.Y.Patil Medical College, Hospital & Research Centre, Dr. D.Y.Patil College of Ayurved & Research Centre and Dr. D.Y.Patil College of Physiotherapy OPD, Pimpri, Pune. 30 elderly individuals with age group more than 65 years were included by random sampling technique. They were divided into 2 groups: Group A- 15 (Balance Master training) & Group B- 15 (Therapist Assisted training). Inclusion criteria was: Subject of age 65 to 75 years, healthy elderly adults those who can ambulate independently, subjects with impaired BBS score between 40-45. Exclusion criteria was: Use of assistive device recent fractures, neurological impairments, visual impairment, surgery if any, history of fall, medications that interfere with balance, presence of artificial prosthesis. Outcomes measures used were Berg Balance Scale (BBS), Timed up & go test (TUG) and Modified Fall Efficacy Scale (MFES). The procedure, benefits and potential risks of study were explained to the subjects before the test starts. Written Informed consent was taken from the participant meeting the inclusion and exclusion criteria and the willingness to participate. Balance training program were given for 8 weeks (i.e 24 sessions), 3 times a week, each session lasting for about 30-45 minutes. Pre and post tests were taken by using BBS, TUG and MFES, post test was taken at end of 8th week of balance training session.

Balance Training Program

Balance training program were similar for elderly individual involved in Group A (Balance Master Training) and Group B (Therapist Assisted balance training). Balance training program was given for 8 weeks (i.e 24 sessions), 3 times a week, each session lasting for about 30-45 minutes. Balance training program included the following exercises:

Weight Shifting Training : Forward weight shifting, Left weight shifting, Right weight shifting, Backward

weight shifting, Mobility Training: Marching in place, Step left, Step right, Step alternate left/right, Four corner stepping, Step Training: Stepping: medium base, Stepping: narrow base, Tandem stepping: heel/toe, Tandem stepping: short, Tandem stepping: medium, Side step left, Side step right, Side step: alternate right /left, Side stepping task, Single cross step left, Single cross step right, Progressive cross stepping left, Progressive cross stepping right. Training using Stepper: Forward step up, Backward step up, Step over forward and backward, Side step up/down, Side step over. Strength Training in standing position with support: Hip flexion, Hip extension, Hip abduction, Hip adduction. Perturbation Training subjects were unaware of directions of perturbation: Perturbation towards right, Perturbation towards left, Perturbation from front, Perturbation from back, Perturbation diagonally.

STATISTICAL ANALYSIS

The data collected was entered in EXCEL sheet and statistical analysis was done using SPSS package and Primer. Parametric testing was used to compare groups since the quantitative dependent variables were reasonably normally distributed.

II. RESULTS

Demographic details of elderly individuals included in the study were shown in table 1. BBS, TUG & MFES before and after the 8 weeks of intervention on Balance Master Training were shown in table 2, similarly pre & post scores of BBS, TUG & MFES in therapist assisted balance training were shown in table 3. All data were expressed as the mean \pm standard deviation. Paired t-test was used to compare quantitative outcomes within group. Independent t-test was used to compare quantitative outcomes between the two independent groups. P value less than 0.05 were considered statistically significant. According to group A and group B, there is significant improvement in mean value of BBS, significant

decrement in TUG score and minor improvement in MFES. On comparing the mean difference of group A and group B, the study reveals that there is major improvement in BBS score in group B, where as minor and similar improvement in mean score of TUG and MFES.

III. DISCUSSION

Balance control is base for our ability to move and function independently. A deterioration of balance function, as a consequence of disease or simply increasing age, will increase the occurrence of clinical balance problems as well as the risk of balance loss and falls. Based on the knowledge, we know that balance control relies on the interaction of several physiological systems, balance loss usually occurs in situations when attention is divided especially observed in older adults. Therefore the benefit of exercise with respect to general health, strength and fitness as well as quality of life is necessary and proves to be important part of older adults.

Effect of Therapist Assisted Balance Training : We found statistically significant improvement in balance outcomes as a result of an eight week therapist assisted balance training program. Therapist assisted balance training demonstrated the feasibility of a group functional balance intervention and safety in elderly at risk for falls. Treating individuals in small groups rather than on a 1:1 basis is also a more economical way of providing treatment. A major advantage of Therapist Assisted balance training intervention is its broad and cost free applicability and sustainability. Elderly individuals included in balance training program were highly motivated from each other, valuable, fun, and enjoyable, which reflected in a high attendance rate. Alexandra Halvarsson et al did a study to provide the rationale and evidence for and a detailed description of a rehabilitation programme of proven effectiveness in improving balance in older adults, which concluded that balance training programme strengthens self-efficacy in balance

control leading to improved fall-related self-efficacy, reduced fear of falling, increased walking speed, and improved physical function. A. Halvarsson also did a study to find out the effect of progressive and specific balance group training programme on fear of falling, step execution, and gait in healthy elderly people with fear of falling and tend to fall, the study revealed that balance training programme is feasible, decreasing the fear of fall, decreasing time for step execution and improving gait in healthy elderly which were performed during dual-task and there was significant increase in velocity during fast walking. Tatjana Bulat et al did a study on effect of group based exercise program on balance in elderly, which revealed that balance training in group was safe effective in improving balance outcomes in elderly with risk of falls. Therefore our study showed improvement in balance and gait training and prevented risk of fall within the same groups as well as between both the groups.

Effect of Balance Training on Balance Master: The purpose of our study was to determine the effect of using NeuroCom Balance Master Training protocol as intervention to improve balance, transfers and gait in elderly individuals with risk of fall. Following eight weeks of physical therapy intervention using NeuroCom Balance Master training protocol outcome indicates that elderly population showed improvement in balance, gait and transfers. The advantage of using balance master is that it requires low supervision and allows interactive functional training exercise using visual feedback, coupled with sensitive, real time monitoring of movements, motivates elderly to achieve greater balance control. While working on balance master, elderly did get disappointed when they did not score well during the training protocols; however the visual feedback allowed individuals to correct themselves. Rebecca A.L.Liston et al did a study to determine the test-retest reliability and validity of measures obtained from stroke patients using the Balance Master, the

findings suggested that in stroke patients the test-retest reliability of data obtained using the balance master is greatest for complex tests of balance and that dynamic rather than static balance measures are valid indicators of functional balance performance. Ruth Ann Geiger et al did a study to investigate whether the addition of visual biofeedback or force-plate training would enhance the effects of other physical therapy interventions on balance and mobility following stroke. However, a comparison of mean changes revealed no differences between groups, the results indicated that there was no benefit of Balance Master training when administered in combination with other physical therapy interventions, compared with physical therapy alone. McKeough DM et al's purpose was to examine the effects of balance training using the NeuroCom Balance Master and Nintendo Wii- Fit with independent, community- dwelling older adults, the study concluded that there was no significant difference on level of improvement between the two training techniques for any of the outcome variables measured. Thus a computerized balance assessment and training tool demonstrated improvement in gait pattern, gait speed, distance ambulated and confidence in balance training, on comparing the pre-test and post-test in balance master training.

Effect of Strength Training in Elderly: The elderly need strength training more and more as they grow older to stay mobile for their everyday activities. The goal of strength training was to reduce the loss of muscle mass and resulting loss of motor functions. Frank Mayer et al did a study on intensity and side effects of strength training in elderly which recommended that healthy elderly individual should be trained 3 to 4 times weekly for the best results. The result of our study indicated improved strength which can be identified from BBS scores, MFES and improve TUG scores. Nancy K.Latham et al's purpose was to quantify the effectiveness of progressive resistance strength training (PRT) to reduce physical disability

in older people, PRT results showed improvements in muscle strength and some aspects of functional limitation, such as gait speed in elderly. David M. Buchner et al did a study to determine the effect of strength and endurance training on gait, balance, physical health status, fall risk, and health services use in older adults. Exercise groups included strength training using weight machines, endurance training using bicycles and strength and endurance training. The study concluded that exercise may have beneficial effects on fall rates in community-living adults with mainly mild impairments in gait, balance, and physical health status, short-term exercise may not have a restorative effect on these impairments. Therefore strength training program is efficient to increase loss of skeletal muscle mass and retain motor function. Strength training resulted in improving the acquisition, frequency and synchronization of motor units. Thus strength training of intramuscular coordination should be done in elderly individuals.

Effect of Perturbations in Elderly: Perturbation in elderly proved to be helpful in improving balance reaction time and prevent future risk of fall. Perturbation based training program showed reduction of fear of fall in multistep directions, there was reduced hand support system which was required earlier. Avril Mansfield et al did a study to estimate the effect of perturbation- based balance training among older adults or individuals with neurological conditions, the study revealed that perturbation-based balance training appears to reduce fall risk among older adults and individuals with Parkinson disease. Kathleen A. Bieryla et al did a study to investigate the efficacy of perturbation-based balance training (PBBT) on time to stabilization (TTS) after a nonstepping response to a postural perturbation in older adults at a high risk for falls, PBBT involved 1 month program with 3 sessions a week for 4 weeks, the study concluded that PBBT improved TTS after a postural perturbation in older adults at a high risk for falls, and these improvements were retained for 1

month. Therefore perturbation showed to be effective intervention to improve the ability of elderly individuals to prevent themselves from fall when they lose their balance. It seems to be less expensive method for improving balance reaction time in elderly individuals.

IV. CONCLUSION

From our study we concluded that there was no significant difference on level of improvement between the two training techniques for any of the outcome variables measured. Training on Balance Master and Therapist Assisted training showed improvement in balance within each group. Thus it is suggested that elderly individual with balance problem can opt for any of the treatment according to their convenience because both the treatment shows similar effect by improving balance, gait speed, activities of daily living and reducing risk of falls.

V. REFERENCES

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APPENDIX

Table 1. Representation Of Demographic Data

Mean Age	Group A : 67.38 Group B : 66.71
No. of Participants in Group A & Group B	Total Participants : 27 Females : 15 Males : 12

Table 2. Pre & Post Comparison of Bbs, Tug & Mfes In Group A

Scale	Group A		Difference	“P” Value & “t” Value
	PRE	POST		
BBS	43.15±1.772	53.54±1.198	10.35	t = -16.078 p< 0.001
UG	15.86±3.32	11.37±1.66	4.4	t= 6.025 p<0.001
MFES	9.208±0.6304	9.754±0.2933	0.6	t= -3.599 p<0.004

Table 3. Pre & Post Comparison of Bbs, Tug & Mfes In Group B

Scale	Group B		Difference	“P” Value & “t” Value
	PRE	POST		
BBS	42.29±1.729	53.29±1.939	11.02	t = -21.880 p< 0.001
UG	13.5±1.919	10.31±1.36	3.2	t= 7.190 p<0.001
MFES	9.257±0.1834	9.886±0.9683	0.6	t= -2.429 p<0.03