

EFFECT OF PROGRESSIVE RESISTANCE TRAINING AND BALANCE TRAINING ON BALANCE PERFORMANCE IN YOUNG OLD ADULTS: RANDOMISED CLINICAL TRAIL

Anil R Muragod ¹, Mana Yeslawath ^{*2}, Yashashree Apte ³, Yulia Gomes ⁴.

¹ Assistant Professor, KLEU Institute of Physiotherapy, Belagavi, Karnataka, India.

^{*2} Lecturer, KLEU Institute of Physiotherapy, Belagavi, Karnataka, India.

^{3,4} BPT Graduates, KLEU Institute of Physiotherapy, Belagavi, Karnataka, India.

ABSTRACT

Introduction: Muscle size and strength decrease with aging. Progressive resistance training also has been proved to be effective to improve the muscle strength and thus in turn reduce the risk of falls.

Materials and Methods: Group A was given progressive resistance training using theraband (n=15), and Group B was given balance training (n=15), for 3 days per week for 8 weeks with duration of 45 minutes per each session. Balance was assessed on the 1st day and after 8 weeks.

Results: After 8 weeks in both progressive resistance training and balance training there was significant increase in Tinetti balance score and the timed get up to go test, scores decreased significantly with p value of 0.001 between Tinetti group showed significant result.

Conclusions: the result reflected that balance training exercises had better improvement than the progressive resistance training which was analysed in terms of balance improvement risk of falls and gait speed.

KEY WORDS: Balance, Balance Training, Progressive Resistance Training, Aging, Falls in Elderly, Timed Up and go Test.

Address for correspondence: Dr. Mana Yeslawath. PT., KLEU Institute of Physiotherapy, JNMC Campus, Nehrunagar, Belagavi, Karnataka-India, 590010. Mobile. No.: 91-8861455090.

E-Mail: manayeslawath@gmail.com

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INTRODUCTION

The Word Aged Is Relative and depending upon society, its culture the time and prevalent conditions. The United Nation has defined an aged person as one who is of sixty years and above. In India people above sixty years are considered as senior citizens. People between 60 to 75 years are categorized as "Young Old" between 75 and 85 years are "Old Old" and people above 85 are classified as "Very Old" or firm [1].

Increased life expectancy is a blessing of modern medicine. As a result we have a large number of elderly persons on our society. Aging is associated with a number of physiological and functional declines that can contribute to increased disability, frailty, and falls. Contributing factors are the loss of muscle mass and strength as age increases, a phenomenon called Sarcopenia. Muscle weakness is associated with reduced walking speed and an increased risk of disability and falls on older people.

The most frequently used approach to this form of exercise is progressive resistance training. Since participants work against an external force that will lead to increased strength [2].

Progressive resistance training is a system dynamic resistance training in which a constant external load is applied to the contracting muscle by a mechanical means and incrementally increased. The repetition maximum (RM) is used as the basis for determining and progressing resistance [3].

Muscular strength can be improved by progressive resisted training exercises these can be given using elastic resistance bands or free weights. Thera-band elastic resistance has been proven to increase strength. Mobility and function as well as reduce joint pain [4].

Thera – Bands and tubing's are low-cost portable and versatile. Made of natural rubber latex, they are easily recognized by the trademark Thera-Band, colors – Yellow, red green, blue , black and silver, as well as our other colors of tan and gold. The least resistive band is yellow, and the next five colors gradually increase in resistive properties. Thera- Band elastic resistance devices have increased in popularity in the rehabilitation setting.

Advancing through the sequential system of progressive resistance provides positive reinforcement and feedback for gauging results. Elastic bands are available in an assortment of grades or thickness's. Tubing comes in graduated diameters and wall thickness that provide progressive levels of resistance. Color coding denotes the thickness of the products and grades of resistance [5]. Balance training can be used to improve static postural control, biomechanical alignment and symmetrical weight distribution. To improve dynamic postural control including musculoskeletal responses necessary for movement and balance, improve adaptation of balance skills for varying task and environmental conditions, to improve sensory function including sensory integration and sensory compensation and to improve safety awareness and compensatory strategies for effective fall prevention [6].

MATERIALS AND METHODS

Ethical clearance was obtained from

Institutional ethical committee of KLE University Institute of Physiotherapy prior to the commencement of the study. A written informed consent was obtained from all the subjects after explaining the purpose of the study. All subjects were screened for inclusion and exclusion criteria aged between 60 to 75 years, individuals with balance impairment with Tinetti score of low to moderate that is 18 to 28 points and with exclusion criteria which excluded individuals with cardiovascular or pulmonary disorders with visual or hearing impairment with diagnosed osteoporosis, post operative cases of less than 6 months. Thirty subjects were randomly allotted with envelope method in to two groups; Group A (Progressive Resistance Training) and Group B (Balance Training.) Tinette performance oriented mobility assessment scale and timed up and go test were noted at the beginning of the study and after 8 weeks of the study as outcome measures. Exercises were given for 45 minutes for 3 days a week for 8 weeks.

Fig. 1: Showing the Hip Extension.



Fig. 2: Showing the Hip Flexion.

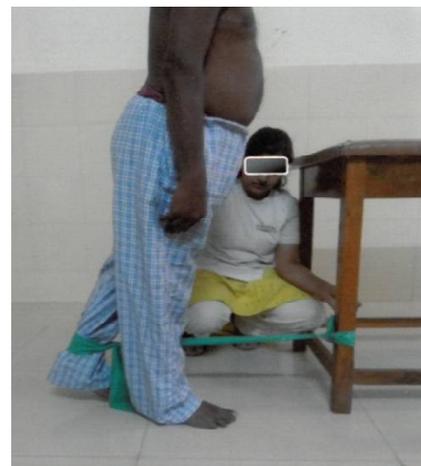


Fig. 3: Showing the Walking on Heels.



Fig. 4: Showing the Walking on Heels.



Group A; Progressive Resistance Training Exercises Include:

1. Hip flexion (standing)
2. Hip extension (standing)
3. Hip abduction (standing)
4. Hip adduction (standing)
5. Knee flexion (prone)
6. Knee extension (high sitting)
7. Ankle Dorsiflexion (high sitting)

Group B: Balance Training Exercises Include:

1. Tandem standing
2. Tandem walking
3. One legged stand
4. Heel stand
5. Toe standing
6. Standing with eyes closed

RESULTS

Statistical Analysis: Statistical analysis for the present study was done manually as well as using statistical package of social sciences

(SPSS) version 14 so as to verify the results obtained. For this purpose the data was entered measures an excel spreadsheet, tabulated and subjected to statistical analysis. Various statistical measures such as mean, standard deviation, and test of significance such as paired and unpaired test and p value were used. Nominal data from subject's demographic data like age and sex were analyzed using on square and paired test. The mean age of participants in group A was 65.1 years 63.95. The mean age of participants in group B was 67.7 years * 5.13. The p value by paired test was found to be 0.122 which is not significant Sex distributions: Table 1

Table 1: Sex ratio and age in Group A and Group B.

	Female	Male	Total	Mean age
Group A	9	6	15	65.1*3.95
Group B	10	5	15	67.7 *5.13
X ² 1	0.144			----
P	0.705			0.122
T	----			1.594

In the present study there were 6 males and 9 males in group A. in group B there were 5 males and 10 females. The p value calculated using chi square test is 0.705 which is not significant.

Tinetti performance oriented mobility assessment: Table 2

Table 2: Comparison of Tinetti scores within and between group A and B.

	Per-treatment	Post-treatment	Difference	P test	P
	Mean	Mean	Mean		
Group A	20.6+1.24	21.4+1.45	0.8+0.56	5.527	<0.001
Group B	20.9+1.45	24.1+1.33	3.4+1.14	10.84	<0.001
T	0.539	50233	7.284		
P	0.594	<0.001	<0.001		

Tinetti performance oriented mobility assessment scale was used to assess the risk of falls in elderly and more the score less is the risk of falls. There was improvement in balance in both the groups.

In group A the mean Tinetti score per treatment was 20.6+1.24 and post treatment score after 8 weeks was 21.4 + 1.45. The mean difference in pre and post scores was 0.8= 0.56. The p value calculated by paired t test < 0.001 which is highly significant.

In group B the mean Tinetti score per treatment was 20.9 + 1.45 and post treatment score after 8 weeks 24.1 + 1.33. The mean difference in pre and post scores is 3.4+1.14. The p value done by paired t test <0.001 which is highly significant. For comparison of Tinetti scores in both the groups. Unpaired t test was used. The p value found out was statistically significant.

When the comparison in between the group was done, the value calculated by unpaired t test was < 0.001.

Timed up and go test: Table 3

Table 3: Comparison of timed up and go test within and between Group A and B.

	Pre-treatment	Post-treatment	difference	Paired t test	p
	Mean SD	Mean SD	Mean SD		
Group A	14.8+1.18	13.8+1.37	1+0.88	5.527	<0.001
Group B	14.7+1.20	12.4+1.24	2.3+0.89	10.044	<0.001
T	0.248	2.928	3.89	-	-
P	0.806	0.007	<0.001	-	-

Timed up and go test was used to assess the risk of falls and balance in elderly. The less the time taken less balance is affected. There was improvement in balance in both the groups.

In group A the mean timed up and go test score pre treatment was 14.8 ± 1.18 and post treatment score after 8 weeks was 13.8 ± 1.37. The mean difference in pre and post scores of group A is 1.0 ± 0.88. The value done by paired t test <0.001 which is highly significant.

In group B the mean timed up and go test score pre treatment was 14.7 + 1.20 post treatment score after 8 weeks was 12.4 + 1.24 by the end of treatment. The mean difference in pre and post score of group B is 2.3 + 0.89. The value done by paired t test was <0.001 which is highly significant.

When the comparison in between the groups was done, the p value calculated by unpaired t test was highly significant with a p value of <0.001.

DISCUSSION

The present clinical trial compares progressive resistance training and balance training on balance performance in young old adults aged between 60 to 75 years. The demographic data

obtained from the participants belonging to both group showed homogeneity in their age and sex. The results of this study were focused on improvement of balance and decrease the risk of falls. It was noticed that both the experimental groups showed improvement when compared to baseline values but balance training group showed statistically significant improvement when compared to progressive resistance training. A Japanese national survey showed that the annual frequency of falls was greater than 20% in subjects aged over 65 years; approximately 10% of these falls resulted in fractures[7]. Over 80% of femoral neck fractures in the elderly are caused by falls, and usually require long term hospitalization. Proposed methods of preventing fractures include increasing bone mineral density, preventing falls and using appliances. Bone mineral density may be increased by either pharmacotherapy or exercise. However, most reports suggest that, in practice it is difficult to use exercise for fracture prevention[8]. On the hand many agree that by strengthening the muscles and improving balance, exercise training can prevent falls[9].

A study done by Lisa M Cipriany –dacko et al, on Inter-rater reliability of the Tinetti Balance Scores in Novice and Experienced Physical Therapy Clinicians suggests that scale gives reliable scores to novices as well as experienced clinicians [10]. Another study done by Mathias S on Balance in elderly patients; the “get up and go” test. Proved that timed get up and go test gave a satisfactory and reliable measure of balance in elderly population [11]. Hence in this present study outcome measures used were Tinetti performance oriented assessment scale and timed get up and go test. Balance problems have been evident in most of the geriatric subjects making them dependent. The lower extremity musculature plays an important role in maintaining balance. Another study done by pei Fang Tang on Inefficient Postural Responses to Unexpected Slips During Walking in Older Adults [12].

A study done by Marguerite Elizabeth daubney on Lower- extremity muscle force and balance performance in adults. Aged 65 years and older suggests that the force generating capability of

distal musculature i.e. Lower extremity musculature is important in maintaining balance in older adults[13].

Shumway-Cook et al. conducted a study on the effect of multidimensional exercises on balance, mobility and fall risk in 105 community dwelling older adults for a non equivalent period of time in three study groups. The study showed that exercises can improve balance and mobility function and reduce the risk of falling among community dwelling older adults. In the present study as well, the balance and functional exercises performed in both the groups lead to the improvement in terms of balance in the older adults which showed that regular exercise and physical activity can improve the balance in this particular geriatric age group even though this age group suffers from decline in physical activity decrease in mobility and are at a greater risk of falling[14]. In a study conducted by Clemson L. et al showed that LiFF program consisting of strategies to improve balance and strength was a good approach to improve both balance and strength. Since this study was based on only balance improvement in older adults, they selected components of exercises in sitting and standing positions. The results of the present study as which was in consent with the above cited study [15]. Hence in this present study balance training was given to one group.

Another study was conducted involving aerobic and strengthening exercises of a high intensity on 14 male nursing home residents for a 12 week program where the improvement was seen in balance mobility and in the gait parameters. The present study as well showed a good improvement in the male subjects in both the groups. This study also utilized a highly aerobic and strengthening exercise program which may have lead to the increase in the outcome measures in terms of balance[16]. In a study done by J.Schlicht et al showed the effects of intense strength training on standing balance, walking speed and sit-to stand performance in older adults. The study showed a better significance in all the training group subjects and also there was an increase in the muscle strength in the selected few muscles[17].

Previous studies have found that exercise can improve muscle strength many of these trials have employed heavy resistance training requiring either weights or equipments[18],[19]. The findings of the current study show that structured general exercises can also improve lower limb muscle strength significantly.

Hence in this present study strengthening was given to improve muscle strength of lower extremity using progressive resistance training and balance training to improve proprioception and postural responses.

Conflicts of interest: None

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