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Comparison for Effects of Multisensory Exercise on Functional Mobility and Balance between Elderly Male and Female Population

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Abstract: ***Background: This study was done to compare the effects of multisensory exercise on functional mobility and balance between elderly male and female population. Aims and objectives: The purpose of the study is to find is there any significance difference between the effects of multisensory exercise on functional mobility and balance between the genders of elderly population. Methodology: 60 elderly subjects were selected between the age groups of 60 to 75 yrs old divided into two groups, Group A- elderly males and group B- elderly females and their functional mobility and balance were assessed with pre test taken by timed up and go test and guralnik battery test after which multisensory exercise were given for thrice a week for 8 weeks after which a post test were taken with the same tests. Results: At the end of the treatment group-A (elderly male) showed a significance improvement in TUG (10.42 ± 2.12 seconds to 8.11 ± 1.69 sec) (F=95.84, p<0.001). and guralnik test battery (9.00 ± 1.29 to 11.39 ± 0.84)(F=37.50, p<0.001). Conclusion: There is a significant difference between the effects of multisensory exercise on functional mobility and balance between the group-A (elderly males) & group-B (elderly females). However multisensory exercise is effective in both the groups but the group -A (elderly males) showed a better performance than group-B (elderly females).***

Keywords: Multisensory exercise, older adults, functional mobility and balance, timed up and go test, guralnik battery test.

1. Introduction

Aging progressively impairs sight, vestibular input, and somatosensory information,[1,2,3,4] which results in a reduction of environmental perception and precision of movements. On the other hand, aging also impairs functioning of movements by reducing the number of muscle and nerve fibers, which bring a reduction to muscle strength and power.[1]

For these reasons, individuals who are 50 years old may start to experience manifestations of imbalance[5] and body instability[6].Therefore, simple activities like standing up or rising from a chair may become limited or even dangerous, because they are dependent on both gait and balance[2].

Exercise interventions designed to improve balance are defined as those in which participants exercise their muscles against an external force, as a consequence of voluntary movement or in response to an unexpected perturbation/stimulus, in order to maintain the body's center of mass within manageable limits of the base of support, or in transit to a new base of support.[7] A variety of exercises involving gait, balance, coordination, functional tasks, strength-training, stretching, 3D exercise (including tai chi, qi gong, dance, yoga), and multisensory exercises, can enhance muscle strength, balance, and mobility in the elderly, reducing the risk of falls[7,8]

Recent study has proved that multisensory exercise are more efficacious than the strength exercise for improvement of functional mobility and balance in community dwelling elderly males. But there is no studies done to compare the effects of multisensory exercise between the genders of elderly population, there by the aim of my study is to find out which group of the elderly population shows better improvement with multisensory exercise.[9]

Aims and objective:

- To find out the effectiveness of multisensory exercises on functional mobility and balance in elders.
- To compare its effects between elderly males and females.

Methodology:

Sample size- 60 subjects were collected from Santosh hospitals and divided into two groups, group-A (males) and Group-B (females).

Study type: Comparative study.

Sampling: convenient sampling.

Inclusion criteria[9]:

- Subjects aged between 60-75 years old,
- Both males and females,
- Independence to participate in physical activities.

Exclusion criteria [9,10]:

- Subjects who were under any physical therapy training from the last 3 months.
- Any severe clinical and systemic illness or musculoskeletal, neurological impairments,
- cardiac and respiratory problems, recent complaints of dizzinessor falls,
- Age groups above 75 years old.

Material used: chair, stepper, inch tape, cones, different types of mats, stop watch.

Technique: 60 subjects were taken conviniently as sample for this study after they meet up all the criteria's and they were divided into two groups after filling up the consent form. Subjects were informed not to participate in any other physical activity or change their daily habits during the study. Group A - Consists of 30 elderly males subjects &Group B- Consists of 30 elderly female subjects Pre test were measured by timed 'up' and 'go' test and guralnik test battery. Thereafter both groups were taken for multisensory training & conventional therapy which includes mild resistance exercises, balance training & motor coordination given for 8 weeks of duration. And their results were compared.

Multisensory exercise programmes[10]:
Multisensory intervention emphasized the stimuli to sensory systems.

Warm up exercises- A warm up period before the activity included short walks followed by stretching exercises for Hip, Knee, Ankle. They were performed in Lying, Sitting and Standing position.

Resistance exercise- mild resistance given for dorsiflexors & plantar flexors , squatting & abdominals against gravity to strengthen the lower limb n trunk muscle (3 series of 10 repetitions) to stimulate plantar surface & Dynamic balance (forward, backward, sideways walking with both open and closed eyes with different speeds). Varied ground surfaces mattresses and obstacles like ropes, cones and sticks were used for the training purposes.

Balance training (standing with unipedal or bipedal support with open or closed eyes, challenges lasted for 20-30 min) and motor coordination (alternate movement of upper and lower limbs with different positions of head & neck with & without visual stimuli).

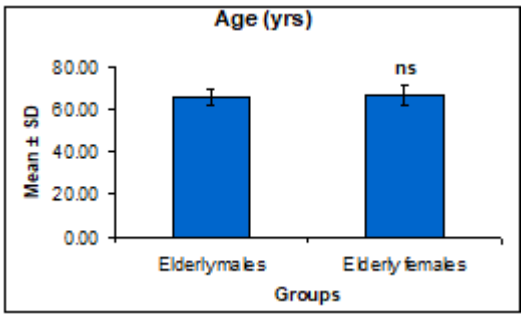
2. Results

The basic characteristics i.e. age of two groups are summarized in Table 7.1 and also shown graphically in graph 7.1. The age of elderly males and females ranged from 60-72 yrs and 60-75 yrs, respectively with mean (± SD) 65.93 ± 3.97 yrs and 66.60 ± 4.90 yrs, respectively. The mean age of elderly females was slightly higher than males. Comparing the mean age of two groups, t test revealed similar age between the two groups (65.93 ± 3.97 vs. 66.60 ± 4.90, t=0.58; p=0.565) i.e. not differed statistically. In other words, subjects of two groups were age matched and comparable and thus, age may also not influence the study outcome measures (i.e. functional mobility and balance).

Table 7.1: Age (Mean ± SD) of two groups

Elderly males (n=30)	Elderly females (n=30)	p value
65.93 ± 3.97	66.60 ± 4.90	0.565
(60 to 72)	(60 to 75)	

Numbers in parenthesis indicates the range (min to max).



Graph.7. 1: Mean age of two groups
p>0.05- as compared to Elderly males

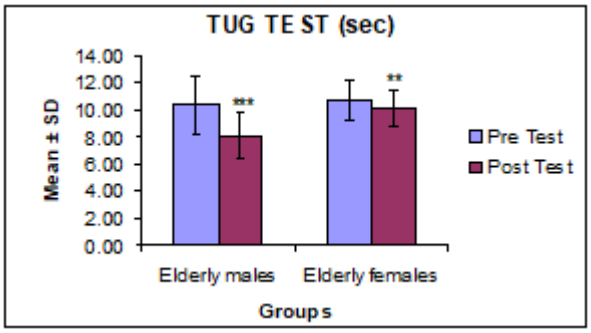
TUG Test

The pre and post (periods) TUG test scores (sec) of two groups (elderly males and elderly females) are summarized in Table 7.2 and also shown graphically in graph.7.2. In both groups, the mean TUG test scores decreased (improved) after the multisensory exercise and the decrease (improvement) was evident higher in elderly males than females.

Comparing the effects of both groups and periods together on TUG test scores (Table 3), ANOVA revealed significant effect of both groups (F=7.52, p=0.008) and periods (F=252.03, p<0.001) on TUG test scores. Further, the interaction (groups x periods) effect of both on TUG test scores was also found significant (F=95.84, p<0.001).

Table 7.2: Pre and post TUG test scores (Mean ± SD, n=30) of two groups

Groups	Pre	Post	p value
Elderly males	10.42 ± 2.12	8.11 ± 1.69	<0.001
Elderly females	10.70 ± 1.44	10.15 ± 1.35	0.001
p value	0.915	<0.001	-



Graph 7.3: For each group, mean TUG test scores between the periods.
p<0.01 or ***p<0.001- as compared to Pre test

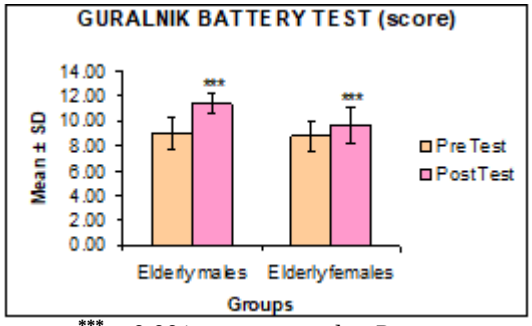
Guralnik battery test
The functional mobility and balance was evaluated by Guralnik battery test. The pre and post Guralnik battery test scores of two groups are summarized in Table 7.4 and also shown graphically in graph.7.5. In both groups, the mean Guralnik battery test scores increased (improved) after the multisensory exercise and the increase (improvement) was evident higher in elderly males than females.

Comparing the effects of both groups and periods together on Guralnik battery test scores (Table 7.5), ANOVA revealed significant effect of both groups (F=11.54, p=0.001) and periods (F=170.55, p<0.001) on Guralnik battery test scores. Further, the interaction (groups x periods) effect of both on Guralnik battery test scores was also found significant (F=37.50, p<0.001).

Table 7.4: Pre and post Guralnik battery test scores

Groups	Pre	Post	p value
Elderly males	9.00 ± 1.29	11.39 ± 0.84	<0.001
Elderly females	8.77 ± 1.17	9.63 ± 1.54	<0.001
p value	0.888	<0.001	-

(Mean ± SD, n=30) of two groups



***p<0.001- as compared to Pre test

Graph.7.6: For each group, mean Guralnik battery test scores between the periods

Table 7.5: Comparison of effect of groups and periods on Guralnik battery test scores by ANOVA.

Source of variation (SV)	Sum of squares (SS)	Degrees of freedom (DF)	Mean sum of squares (MSS)	F value	p value
Groups	29.71	1	29.71	11.54	0.001
Error	149.35	58	2.57		
Periods	79.89	1	79.89	170.55	<0.001
Groups x Periods	17.56	1	17.56	37.5	<0.001
Error	27.17	58	0.47		

3. Discussion

This study was done to compare the effects of multisensory exercise on functional mobility and balance between elderly males and females, from the result shows that group-B (elderly females) had little influence in functional activities, as assessed by the Timed up and go test(TUG) and Guralnik tests. These results show that the regular practice of physical exercises can positively impact on balance and functional mobility in elderly.

Fabio macron Alfieri et al (2010) concluded that the benefits of two exercise regimens on postural control of healthy elderly subjects. Although both intervention groups showed statistically significant improvements in many parameters, and they did somewhat better in the multisensory approach, the differences between the groups were statistically significant. Improvement of muscle action is the first to be used for maintaining balance, can be a contributing factor in the prevention of falls among the elderly. Although the results for the two groups were statistically different, study shows that only the Multisensory group significantly improved the work of the muscles, which are important for the maintenance of static posture. This result showed that the intensity, duration, and frequency of the strengthening exercises performed by the subjects in this study were not adequate to promote changes in the muscular action of the body.[9]

Anne Shumway cook et al (2000) concluded that the timed up and go test is a sensitive and specific indicator of whether falls occur in community dwelling older adults. Thus, the timed up and go test is a relatively simple screening test that takes only minutes to complete, and contend that it appears to be a valid method for screening for both level of functional mobility and risk for falls in community-dwelling elderlypeople.[10]

The age of elderly males and females ranged from 60-72 yrs and 60-75 yrs, respectively with mean (± SD) 65.93 ± 3.97 yrs and 66.60 ± 4.90 yrs, respectively. Comparing the mean age of two groups, t test revealed similar age between the two groups (65.93 ± 3.97 vs. 66.60 ± 4.90, t=0.58; p=0.565) i.e. not differed statistically. In other words, subjects of two groups were age matched and comparable and thus, age may also not influence the study outcome measures (i.e. functional mobility and balance).

Multisensory exercises are performed on a variety of surfaces, with different textures and densities, as well as with activities, which stimulate balance.[56]The fact that this sort of training brings stimuli to visual, vestibular and somato sensory systems is likely the reason for the improvement in both the groups after the intervention. Examples of this are the massage of plantar soles with tennis balls and walking on different surfaces, which are shown to generate an important proprioceptive input for maintenance of attitudes of body parts between each other.[11]

Comparing the mean TUG test scores between the groups, Tukey test revealed similar (p>0.05) TUG test scores between the two group at pre (Table 2 and Fig. 4), indicating TUG test scores comparable between the two groups. However, at post, it differed significantly between the two groups and was significantly (p<0.001) higher in elderly females than males. In other words, The functional mobility and balance was evaluated by Guralnik battery test. In both groups, the mean Guralnik battery test scores increased (improved) after the multisensory exercise and the increase (improvement) was evident higher in elderly males than females. Thus functional mobility and balance improved 4.3 fold (17.1%) more in elderly males (22.2%) than females (5.1%).

Thus statistical analysis shows that Group A (elderly males) individuals who were given Multisensory exercises showed more improvement in mobility and balance compared to Group B (elderly females). Multisensory exercise can be added as interventions for improving functional mobility and balance in elderly. The elderly population (aged 60 years or above) account for 7.4% of total population. For males it was marginally lower at 7.1%, while for females it was 7.8%.About 65 per cent of the aged had to depend on others for their day-to-day maintenance. Less than 20% of elderly

women but majority of elderly men was economically independent. About 64 per thousand elderly persons in rural areas and 55 per thousand in urban areas suffer from one or more disabilities. Most common disability among the aged persons was loco motor disability as 3% of them suffer from it.[12]

According to Suzan. E gender differences in the prevalence of disability are due to a combination of higher incidence and longer duration of disability among older women,. Gender differences in incidence of and recovery from mild ADL disability can be explained by differences persist despite adjustment for multiple factors.[13]

In a study by Susan E he found that the higher prevalence of disability in older women as compared with men, is attributable to both a higher incidence and a longer duration of disability, resulting from lower rates of recovery and death among disabled older women. While the gender differences in transitions between no disability and mild disability were explained by gender differences in physical activity and gait speed, the differences in transitions to death were not explained by a large array of potential mediators.[65]

A study of alumini of the University of Pennsylavia found that gender differences in disability were attributable to differences in chronic health conditions, but not in age, sociodemographic factors, or health behaviours.[14]

4. Future Research

This study can also be done in younger age group below 60 years to improve the balance. Future studies should have a larger sample size. Future studies are recommended to have a longer course of more than 8 weeks with a period of follow up after the completion of the intervention. Interventions should be given with frequent rest intervals.

Relevance to clinical practice

This study shows that multisensory exercise is effective in improving functional mobility and balance in elderly. Hence multisensory exercise can be prescribed for elderly with poor functional mobility and balance. Elderly females showed poor performance than elderly males. Hence for clinical practice elderly females has to be treated under therapist supervision with additional care. Not only multisensory exercise, other exercises has to be included for the improvement of functional mobility and elderly balance in females.

5. Conclusion

This study was done to compare the effects of multisensory exercise on functional mobility and balance between elderly males and females. The results of the study shows a significant difference between the effects of multisensory exercise on functional mobility and balance between the group-A (elderly males) & group-B (elderly females). However multisensory exercise is effective in both the groups but the group -A (elderly males) showed a better performance than group-B (elderly females).

6. Limitations

a) Study was done in the age group of 60 -75.
b) This study consisted of a short course of intervention over a mean period of 8 weeks.

7. Acknowledgement

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