EFFECTS OF DUAL TASK TRAINING ON BALANCE AND COGNITION IN COMMUNITY DWELLING ELDERLY MALES AND FEMALES LIVING IN KANPUR, U.P.

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ABSTRACT

Introduction: Aging in its broadest sense is the continuous and irreversible decline in the efficiency of various physiological processes1. A decline in all major systems for e.g. cardiovascular, metabolic, respiratory and neuromuscular contributes to weakness, fatigue and slowing of movement that has been the hallmarks of ageing.3Among older adults impairment in control of balance under dual task conditions is a common occurrence.20

Methodology: A total of 30 elderly subjects including males and females participated in the study. After filling the consent form subjects were divided in to two groups i.e. group A and group B having15 males and 15 females for comparison. Prior assessment before giving the training protocol was done by using BBS and MMSE scales to check balance and cognition impairments. Thereby a dual task training of 4 weeks including 3 days a week with 45 minutes daily were given in groups of 4 (including 2 males and 2 females) to each subject and after successful completion of this post training assessment was done by using BBS and MMSE scales to check improvement in balance and cognition via dual task training.

Results: within group analysis shows improvements in BBS and MMSE scores in both the groups after the training protocol with significant difference and reduction in number of missteps. Whereas between groups analysis does not shows any significant difference.

Conclusion: As doing concurrent tasks posses great difficulty in elderly people with balance impairments in day today environment therefore a balance training program which focuses on dual task with increasing difficulties between two tasks is efficacious in improving balance and cognition recovery in elderly persons with balance impairments.

INTRODUCTION

Aging in its broadest sense is the continuous and irreversible decline in the efficiency of various physiological processes [1]. The average life expectancy is around 60 years now and the way health care facilities are expanding with better income levels and access to medicare the life expectancy may rise between 70 &75 by 2008. India has second largest number of elderly (60+) in the world. The size of India's elderly population aged 60 and above is expected to increase from 77 million in 2001 to 179 million in 2031 and further to 301 million in 2051. The proportion is likely to reach 12% in 2031 and 17%in 2051 [2]

A decline in all major systems for e.g. cardiovascular, metabolic, respiratory and neuromuscular contributes to weakness, fatigue and slowing of movement that has been the hallmarks of aging.[3]

Older adults have impaired balance recovery due to age related decline in the ability to rapidly and efficiently contract the muscles of lower extremities. These physiologic changes of normal aging may increase the risk of falls.[4] this led to increase in number of older persons with disability.[5]

Among community dwelling older people over 65 years of age,28-35% fall each year. Of those who are 70 years and older, approximately 32-42% fall each year and 40% of them experienced recurrent falls.[6]

PROBLEMS OF ELDERLY'S DUE TO FALL

One of the most common problems of elderly is fall. They are the cause of accidental death among people over 65yrs of age and accounts for significant mortality and morbidity, including fractures, impaired mobility and decreased quality of life due to fear of falling and death. Around 20% of falls among elderly results in serious injury and at least 2-10% of falls results in fractures. Because mortality

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and morbidity associated with falls, they results in marked costs of health care system and are a major health concern[7]

Age commonly disrupts the balance control leads to difficulty in walking and abnormal gait patterns[8]

Patients with cognitive impairments and dementia are at increased risk of falls due to severe intrinsic and extrinsic factors including postural and neuro-cardiovascular instability, medication use and type of dementia. The lack of benefit may be due to inability of demented patients to learn and remember new information or comply with new exercises regimes. Symptoms of cognitive impairments include poor memory, fall weak, dizziness, headache, palpitation, poor concentration, feel anxious and fell said[9].

PROBLEMS OF ELDERLY'S DUE TO DUAL TASK

In day-to-day living activities with simultaneous walking and talking task old age found difficulty in performing, they used to either stop walking or take a longer time to complete their gait task. Balance performance is influenced by simultaneously performing a cognitive task[13]. Dual task is a common part of daily living activities that routinely elevates the risk of falling. Gait impairments are ubiquitous among the elderly population especially among patients with common neurological diseases[10]

Among older adults, impairment in control of balance under dual task conditions is a common occurrence. Because impaired dual task balance performance predicts adverse effect outcomes such as falls and decline in both cognition and physical function[11].

Simultaneous performance of secondary tasks had a deleterious effect on functional mobility. The effect of secondary task was dependent on the difficulty of postural task. There was significant increase in postural sway when cognitive tasks were performed in the more challenging postural condition. Finally older adults with balance problems and a history of recurrent falls swayed more when performing either secondary task even in the less challenging postural condition. The effect of secondary task in postural control was dependent upon balance abilities of subject, the difficulty of balance task and type of secondary task being performed[12]

Older people with cognitive impairment and dementia are at particular risk of falling and its associated morbidity[13].

Dual task training includes such tasks like walking adjusting T.V. set via remote control, balancing on one leg while reading, walking while carrying a cup of water. Such training is likely to be successful, since seniors dual tasking abilities are known to improve by practice[14]. So, dual tasking is more pronounced among patients who have impaired mobility[15]. The dual task method that requires participants to perform multiple tasks simultaneously has been used to investigate the effects of cognitive tasks on postural control and vice-versa[16].

Dual task training is crucial for the improvement of dual task performance. Dual task condition training is more effective in training both balance and cognitive performance. "To stop walking while talking" may be a good advice for older adults[17].

A group based exercise was the most potent single intervention and the reduction of falls among these groups seems to have associations with improved balance[18]

REVIEW OF LITERATURE

- Patima Silsupadol et al. did a pilot study titled "Training of balance under single- and dual-tasks conditions in older adults with balance impairments" in july,2006 and have suggested that training under dual tasks conditions showed greater effects with balance impairments than training under dual task conditions[19].
- Jeffrey M Hausdorff et al. in their study titled "Dual task decrements in Gait among healthy older adults: Contributing factors" in July 2006 have suggested that usual- walking abilities and cognitive function contribute to the dual task effects on gait. Meeting the everyday challenges of walking while dual tasking apparently relies on multiple factors including a consistent gait pattern[13].
- Patima Silsupadol et al. in their study titled "Effects of Single- task vs. Dual- task training on balance performance in old adults" in July 11, 2006 have concluded that training under Dual tasks conditions showed greater effects with balance impairments than training under Single task conditions[20].

METHODOLOGY:

Design: This study is a quasi experimental design which intends to find the effects of Dual

Task balance training on balance and cognition improvement in community dwelling

Elderly people with balance impairments.

Sample: A sample of 30 normal community dwelling elderly people took part in the study.

INCLUSION CRITERIA

- Normal elderly including males & females from 65years onwards.
- BBS score ≤ 42 suggesting balance impairment.
- Subjects having balance impairments with significant history of ≥ 2 fall.
- Training was given in group of 4 at a time to every subject including 2 males and 2 females.
- Able to understand verbal instructions & completed 8-10years of formal education.
- Able to walk 9 meters without any assistive device.

PROCEDURE

The subjects were introduced to the study followed by signing of consent form, general assessment regarding the socio- demographic data (name, gender, age, educational level, post medical history, personal history and family history were gathered in participants assessment form and subjects were collected from nearby community and were divided into two groups 'A' and 'B' for comparison regarding males and females. The subjects were assigned a number to maintain the confidentiality of the subjects and then the scales were used to assess the scores i.e. pre-treatment assessment through Berg Balance Scale(BBS) and Mini Mental Status examination(MMSE) used to check the performance of balance and cognition respectively and the scores was entered in data collection form. Later on, a Dual task balance training of 4 weeks including 3 days a week training protocol with 45 minutes daily were given to each subject and then after successful completion of this post- treatment assessment was done by the use of both scales such as BBS and MMSE.

EXCLUSION CRITERIA

- Any severe cardiovascular disease such as uncontrolled hypertension or orthopedic problems such as osteoarthritis and osteoporosis etc which affects their day-to-day routine activities.
- Smoking or Alcohol intake.
- Any neurological problems such as Cerebral disorders, stroke, Parkinson's disease, balance disorder, myopathy, myelopathy, etc which can influence ADL's of the subject.
- Significant hearing & visual impairments.
- Any speech deficits interfering the survey.
- Subjects using tranquilizers, heavy drugs.
- Unstable seizure disorders interfering the survey.

RESULTS

TABLE 2.1: DEMOGRAPHIC DATA

	MEAN		SD		T	p
	FEMALES	MALES	FEMALES	MALES		
AGE	71.94	71.07	6.91	6.66	.350	.729
HEIGHT	151.73	171.87	8.24	14.94	-4.577	.000
WEIGHT	57	65.13	14.60	6.46	-1.973	.058

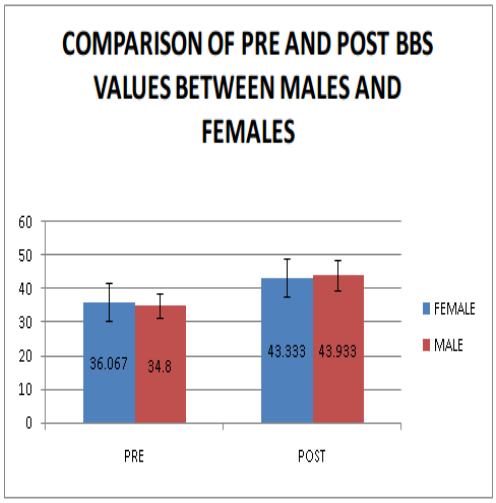

Fig. 2.1: Comparison of Pre and Post BBS values between Males and Females.

Table 2.2: BETWEEN GROUP ANALYSIS FOR BBS

BBS	MEAN		SD		t	p
	FEMALES	MALES	FEMALES	MALES		
PRE	36.067	34.8	5.57033	5.52225	.625	.537
POST	43.333	43.933	3.63449	4.41858	-.406	.688

P value of ≤0.05 is considered statistically significant.

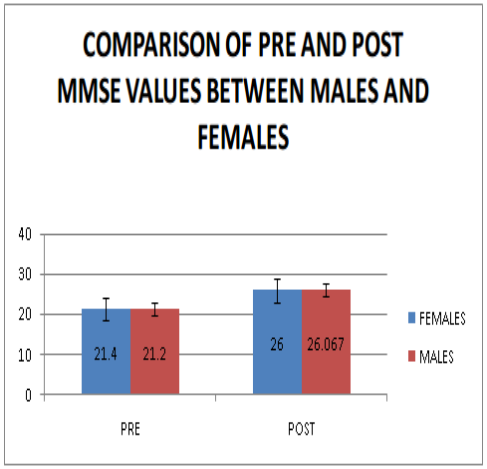

Fig. 2.2: Comparison of Pre and Post MMSE values between Males and Females.

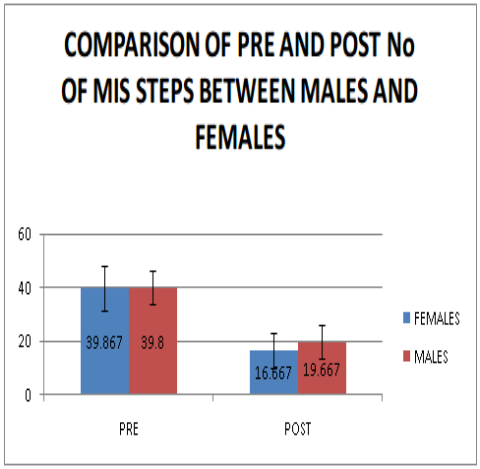

Fig. 2.3: Comparison of Pre and Post no. of missteps between Males and Females.

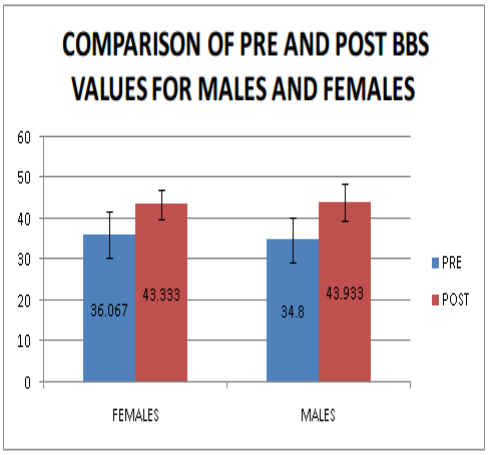

Fig 2.4 comparison of pre and post BBS values for males and females

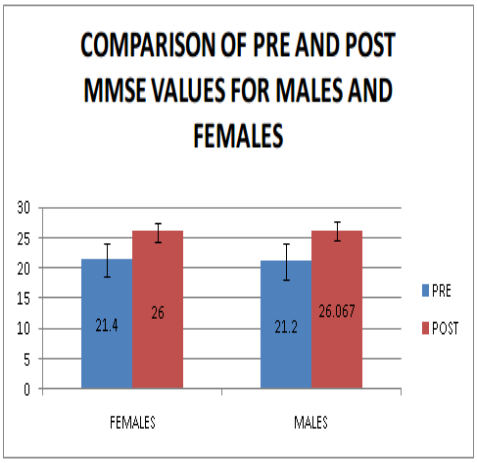

Fig. 2.5: Comparison of Pre and Post MMSE values within Males and Females.

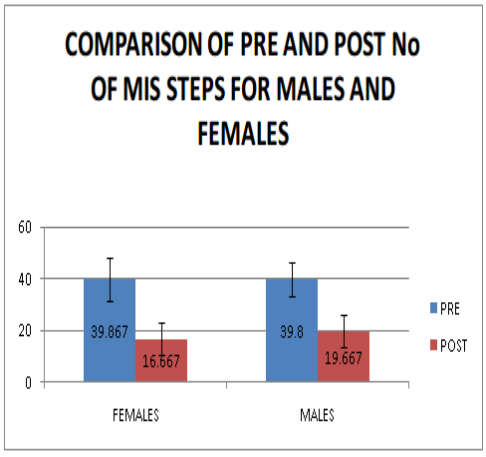

Fig. 2.6: Comparison of Pre and Post no. of missteps between Males and Females.

TABLE 2.3: BETWEEN GROUP ANALYSIS FOR MMSE

MMSE	MEAN		SD		t	P
	FEMALES	MALES	FEMALES	MALES		
PRE	21.4	21.2	2.83347	3.01899	.187	.853
POST	26	26.067	1.53375	1.55839	-.118	.907

Value of p is ≤0.05 which is statistically significant.

TABLE 2.4: BETWEEN GROUP ANALYSIS FOR No. OF MISTEPS

NOM	MEAN		SD		t	P
	FEMALES	MALES	FEMALES	MALES		
PRE	39.867	39.8	8.50378	6.62103	.024	.981
POST	16.667	19.667	6.30948	6.33208	-1.300	.204

Value of p is ≤0.05 which is statistically significant.

TABLE 2.5: WITHIN GROUP ANALYSIS OF BBS

BBS	MEAN		SD		T	P
	PRE	POST	PRE	POST		
FEMALES	36.067	43.333	5.57033	3.63449	-13.07	.000
MALES	34.8	43.933	5.52225	4.41858	-12.75	.000

Value of p is ≤0.05 which is statistically significant.

TABLE 2.6: WITHIN GROUP ANALYSIS FOR MMSE

MMSE	MEAN		SD		T	P
	PRE	POST	PRE	POST		
FEMALES	21.4	26	2.83347	1.53375	-8.635	.000
MALES	21.2	26.067	3.01899	1.55839	-12.52	.000

Value of p is ≤0.05 which is statistically significant.

DISCUSSION

It has been shown that human gait deteriorates with ageing[21]. Walking speed and stability of walking pattern decreases and incidence of falls increases dramatically in community dwelling elderly people. Since balance impairments is a major contributor to falls in adults over 65 years of age and have a great impact on cognition while performing concurrent tasks at the same time[20].

Such interventions found by this study that participants who received dual task training showed greater improvements in balance and cognition thereby number of missteps were reduced so, number of falls were also reduced these findings are supported by a study done by Patima silsupadol etal. in 2006 [20].

Women showed greater improvements in balance in our study than men ,these findings are supported by a study done by Christopher M Powers et al. in 2002.[17]

This study shows that improvement on dual task performance might be the result of both automization of an individual task and the development of task co-ordination skills. Participants may have learned to efficiently co-ordinate performance between two tasks (task integration) as they improved performance on each task (task atomization)[22].

Relevance to clinical practice

This research study may serve as a basis for development and implementation of new rehabilitation programs to improve daily living skills of subjects by improving their balance by which further their level of dependency can be reduced and hence their balance can be improved by doing two tasks together.

FUTURE RESEARCH:

- ✓ As the long term sustenance effects of training were not assessed so follow up may further be done in future.
- ✓ Training of Dual task can also be performed in different instructional sets which include fixed priority and variable- priority instruction sets.
- ✓ Duration of training program may be extended.
- ✓ Effects on improvement of Activities of daily livings may be assessed in future.
- ✓ A study with large sample size may be conducted in future to generalize the results of the study

CONCLUSION:

As doing concurrent tasks posses great difficulty in elderly people with balance impairments in day today environment therefore a Balance training program which focuses on dual task with increasing difficulties between two tasks is efficacious in improving balance and cognition recovery in elderly persons with balance impairments.

It is economic in both time and money and can be easily implemented in various rehabilitation set ups.

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