

COMPARISON OF DUAL TASK TRAINING ON BALANCE PERFORMANCE AND FUNCTIONAL ACTIVITY BETWEEN MALE AND FEMALE OLDER ADULTS

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ABSTRACT

Balance impairment is a major contributor to falls in adults over 65 years of age and a growing body of evidence has confirmed the importance of cognitive factors to impaired balance among older adults. **Aim and Objective:** To compare the effect of dual task training on balance performance and functional activity between male and female older adults. **Intervention:** Older adult (n=30) 15 males (group 1) and 15 females (group 2) with a mean age of 70.5yr were assigned to dual task training (variable priority). Participants received 45-minute individualized training sessions, 3 times a week for 4 weeks. Balance and functional Activity was measured using Berg Balance Scale, Time Up and Go test and 30 sec chair stand tests at baseline and after training. **Results:** Participants in both the groups improved on the Berg Balance Scale ($p<.01$), Time Up and Go ($p<.01$), 30 Sec Chair Stand ($p<.05$). Participant in group 1 show greater improvement in BBS ($p<.01$), TUG ($P<.01$), 30 Sec Chair Stand Test ($P<.01$) **Conclusion:** Dual task training is effective in improving balance and functional activity in both the groups. Group 1 showed a significantly better improvement in balance and functional activity as compared to Group 2. Dual task training programme has more benefit in males than female.

Key Words: Older adults, Balance, functional activity, Dual Task Training

INTRODUCTION

Balance is defined as 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.¹ It is the ability to control the centre of mass (COM) over the

base of support in a given sensory environment. An even distribution of weight enabling someone or something to remain upright and steady.² Maintaining balance involves sensory detection of postural changes through sensory inputs, integration of sensor motor information within the central

nervous system and execution of appropriate musculoskeletal responses.³ During the natural ageing process there is a decline in the somatosensory, visual and vestibular system that control balance⁴ and is associated with a decline in the integrity of the physiological systems that contribute to the control of balance.⁵ Which result in an impairment of the ability to maintain stance.⁶ As the body ages, the changes in the musculoskeletal, sensory and neural systems (motor control) begin to affect mobility. Such as Muscular strength is needed to maintain postural stability during walking due to the constant dynamic imbalance of the body, while vision is needed to detect external environment factors and help the sensory motor system to react.⁷ The deterioration of these systems with aging can lead to balance impairment and falls³ Falls are a threat to the health and well-being of older adults. Unintentional injuries often result from fall, is the sixth leading cause of death in people age 65 year and older.^{8,9}

Executive function is defined as a set of cognitive skills that are necessary to plan, monitor, and execute a sequence of goal –directed complex actions. Age associated decrements in executive function have been extensively reported.¹⁰

Dual task condition: requires subjects to perform a postural task and a cognitive task simultaneously and has been used to assess the cognitive demands necessary for performing postural task.³ Dual task performance is also known as concurrent performance and involves the execution of primary task which is the major focus of attention and a secondary task performed at the same time¹¹ Since many ADL activities involve the association of cognitive and motor components, a

motor task performed under dual task could provide better index of functional capacity compared to a motor task performed alone.¹² Dual task training under various set of instruction are fixed priority and variable priority. In fixed priority participants were asked to always place the same amount of attention on both tasks, whereas in variable priority participants attention was switched between tasks.¹³

Aim and Objective: To compare the effect of dual task training on balance performance and functional activity between male and female older adults.

Intervention: Older adult (n=30) 15 males (group 1) and 15 females (group 2) with a mean age of 70.5yr were assigned to dual task training (variable priority). Participants received 45-minute minute individualized training sessions, 3 times a week for 4 weeks. Balance and functional Activity was measured using Berg Balance Scale^{14,15}, Time Up and Go test¹⁶ and 30 sec chair stand¹⁷ tests at baseline and after training.

Methodology

A sample of convenience of 30 healthy asymptomatic older adults without visual and auditory impairment, who aged between 65-75 years.^{9,18} MMSE score greater than 24,¹⁹ can ambulate independently 9m without any assistive devices^{20,21} able to understand verbal instruction were included in the study. Subjects having history of fall in last 12 month were excluded from the study.²²

Procedure

Thirty subjects who met the inclusion criteria were recruited an informed consent was taken from the subjects and detailed explanation of the

procedure was given. group 1(males) and group 2(females) with 15 in each group performed a dual task training (variable priority), respectively, A 45 min training session,3 times a week for 4 weeks. That comprises of stance and gait activity such as (semi-tandem eyes open, draw letter with the foot, walk narrow base of support, walk kick a ball and hit the cane with simultaneously performing secondary task such as spell word backward or forward, remember prices).^{13,23} The balance performance and functional activity was assessed and evaluated using berg balance scale, time up and go test, 30 sec chair stand test before and after the training in both the groups.

Data Analysis

Statistics were performed using SPSS software. The inter group analysis using independent t-test was used to compare the difference between the balance performance and functional activity improvement in group 1 and group 2. Intra-group analysis between pre-intervention and post-intervention scores was also done for both the groups using paired t-test. A significance level of $p \leq 0.05$ was fixed.

Results

Demographic data were not significantly different among the groups in terms of age. At the base line, there were no differences in the berg balance score ($p=.631$), time up and go ($p=.061$), 30 sec chair stand tests ($p=.505$) between the groups. At the post training test, the berg balance score ($p=.005$), time up and go ($p=.002$), 30 sec chair stand tests ($p=.032$), shows significant improvement in

both the groups. Group 1 shows greater improvement than Group 2.

Table1. Comparison of Pre and Post value of Berg Balance Scale between Group1 and Group 2

N=15	Group 1	Group 2	t value	p value
Pre intervention score (Mean±S.D)	40.93±0.8	41±0.7	-.485	.631 ^{NS}
Post intervention score (Mean±S.D)	46±1.19	44.86±.83	3.012	.005*

Significant at .01 level

Table2. Comparison of Pre and Post Intervention of TUG(sec) between Group1 and Group2

N=15	Group 1	Group 2	t value	p value
Pre intervention score (Mean±S.D)	16±.845	15.46±.639	1.948	.061 ^{NS}
Post intervention score (Mean±S.D)	11.40±.632	12.53±1.12	-3.4	.002*

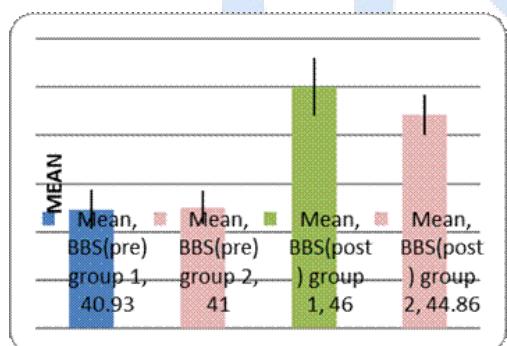
Significant at .01 level

Table 3. Comparison of Pre and Post Intervention of FAM (sec) between Group1 and Group2

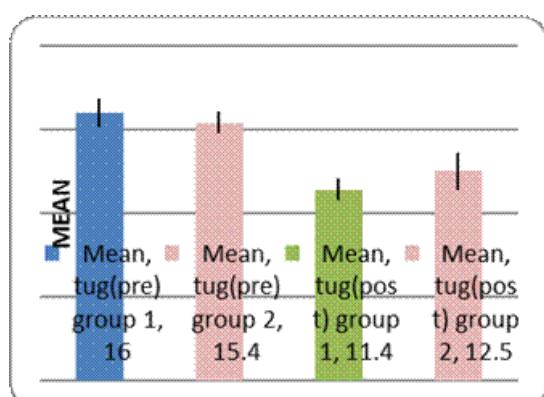
N=15	Group 1	Group 2	t value	p value
Pre intervention score (Mean±S.D)	6±.845	6.2±.774	-.676	.505 ^{NS}
Post intervention score (Mean±S.D)	9.2±.86	8.4±.915	2.25	.032**

Significant at .05 level

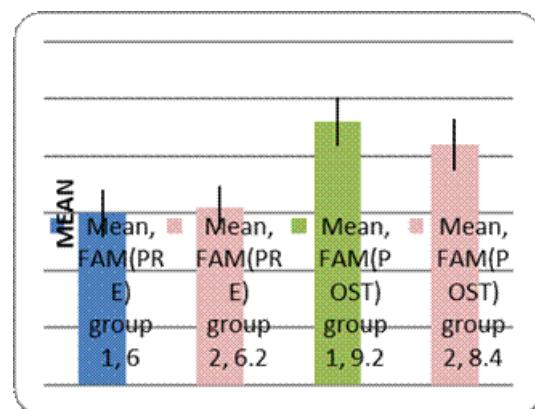
Graph 1. BBS score between Group 1 and Goup2



Graph 2. Comparison of Pre and Post TUG



Graph 3.Comparison of Pre and Post FAM score between Group 1and Group 2



Discussion

Balance impairment is a major contributor to falls in adults over 65 years of age and a growing body of evidence has confirmed the importance of cognitive factors to impaired balance among older adults.¹³

The goal of the study is to compare the dual task training on balance performance and functional activity between male and female older adults. Results indicate that participants in the group 1 and group 2 demonstrated significant improvement in their post intervention score of Berg Balance Scale, Time Up and Go and Functional Activity Measure as compared to their pre intervention score.

It has been found that the increased cognitive load induced by dual task activity leads to higher prefrontal cortex activity, which may be useful for preventing cognitive decline. So, appropriately designed dual task training may be a useful for Maintenance of balance and functional ability in older individuals as well as prevent/delay cognitive decline.²⁵

This Significant improvement in both the groups after training session is similar with the result found by makoto hiyamizu et al in 2011 which has shown

that standing postural control in elderly improves with dual task balance training,²⁴ however vivane ribeiro et al in 2012 conclude that dual task performance had no additional value in relation to balance but the result of visual stimulation seems to maintain short term balance variables.¹²

On comparing the post intervention score of Berg Balance Scale, Time Up and Go, Functional Activity Measure between group 1 and group 2, it's found that group 1 perform better than group 2 under dual task training. Thus, indicating that male participants receiving dual task training did better on BBS, TUG, FAM than the female.

Nicholas steel et al in 2004 found that women performed better than men on most of the memory test, while men performed better than women on most of the executive function test which include word finding, letter cancellation, numerical abilities²⁶ it may be because male has right hemisphere dependent.²⁷ Cy Wang et al in 2008 also examined the effect of gender on seven physical performance test in elderly and was found that men outperformed women on all measures examined except for the time up and go, timed chair stand .These differences may be a reflection of racial/cultural and life style in the study population and may be they have stringent criteria were adopted by them to define physical disability.²⁸ John h hollman et al in 2009 did research on gender difference in dual task gait performance in older adults and found out that gait speed increased in both groups during dual task walking, men walked with greater variability during dual task walking than did women²⁹. However, our participant represents the population of relatively healthy older adult

In summary, this is the first study to compare the effect of dual task training on balance performance and functional activity on gender in community dwelling older adults without any physical disability using berg balance scale, time up and go, 30 sec chair sit and stand test.

Limitations of the Study

A small sample size was one of the major limitations of the study. Assessment of depression was not done.

Scope for Future Research

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. The relevance of this study can be increased by taking a larger sample of subjects from different sectors of the society. Study can be done on different patient populations like on frail elderly people. Comparison can be done between home based older adult and institutionalized older adult. Further study can be done to develop a specific balance training for elderly females.

Conclusion

This study thus concludes that although dual task training shows significant improvement on berg balance scales, time up and go, 30 second chair stand test on both the group. Group 1(males) showed a significantly better improvement in balance and functional activity as compared to Group 2(females)

Thus, concluding that a dual task training programme has more beneficial in males than female.

REFERENCES

1. Snehal Bhupendra Shah, Smita Jayavant. Study of Balance Training in Ambulatory Hemiplegics. The Indian Journal Of Occupational Therapy. 2006 April-July; 8(1).
2. Susan B 'O' Sullivan, Thomas J Schmitz: Physical Rehabilitation, Fifth Edition.
3. Patimasilupadol. Effects Of Single Vs. Dual Task Training on Balance Performance Under Dual Task Conditions in Older Adults with Balance Impairment: A Randomized, Controlled Trial; Journal of Human Physiology; September 6,2008.
4. Salmas.S, Hernancez, Flavia G.M. Coelho, Florindo Stella, Sebastian o gobbi; Effects of Physical Activity on Cognitive Functions, Balance and Risk of Falls in Dementia. Journal Of Physical Therapy, 2010; Jan-Feb: 14.
5. R.S Himam, K.L Bennell, B.R. Metcalf .Balance Impairments in Individuals with Symptomatic Knee Osteoarthritis. A Comparison with Matched Control Using Clinical Test. British Society for Rheumatology 2002; 14: 1388-1394.
6. D. Abraham ova, F. Lavaca. Age Related Changes of Human Balance during Quiet Stance. Physiological Research, 2008; 57:957-964.
7. Sarah Clary, Cathleen Barnes, Debra Bemben, Allen Knehans and Michael Bemben. Effects Of Ballets, Step Aerobics, And Walking on Balance in Women Aged 50-75 Years. Journal of Sports Science and Medicine, 2006; May: 390-399.
8. William p. Berg, Helainem. Alessio, Eugenia M. Mills, Chen Tong. Circumstances Of Falls in Independent Community Dwelling Older Adults. Journal of Motor Behaviour. December 1996.
9. Mathy do valmezey, Louise Hartnett Raukhorst, Shirleeann Stokes. Health Assessment of Older Individual. Fourth Edition.
10. Antoniak.Coppin,
Anneshumwaycook,Kushangv.Patel,Janes.Saczynski,Luigifrrucci. Association of Executive Function and Performance of Dual Task Physical Tests among Older Adults. Analyses from the In Chi Anti Study; Age Ageing. 2006: November.
11. Vanshika Sethi and Ravi Raja. Effects of Dual Task Training on Balance and Activities of Daily Living (Adls) In Patients with Parkinsonism. Journal of Biomedical Science. 2012; 3; (1): 1359-1364.
12. Viviane Ribera Targino, Aline Do Nascimento, Ricardo Oliveira Guerra. Effects of Dual Task Training on Dynamic and Static Balance Control of Pre-Frail Elderly. A Pilot Study .June 2012.
13. Patimasilupadol Anne Shumway-Cook, Ka-Chunsiu. Training Of Balance under Single and Dual-Task Conditions in Older Adults with Balance Impairments. Journal of Physical Therapy. 2006; 86(2): 69-281.
14. Dunning, K. (2011). Berg Balance Scale. In: Kreutzer, J.S., DeLuca, J., Caplan, B. (eds) Encyclopedia of Clinical Neuropsychology. Springer, New York, NY.
15. Berg, K., Wood-Dauphinee, S. L., Williams, J. I., & Gayton, D. (1989). *Berg Balance Scale (BBS)* [Database record]. APA PsycTests.
16. Timed Up and Go (TUG)
Evidence Reviewed as of before: 19-08-2008.
Lisa Zeltzer, MSc OT; Geneva Zaino Bsc PT . Nicol Korner-Bitensky, PhD OT; Elissa Sitcoff, BA BSc

17. Accuracy of modified 30-s chair-stand test for predicting falls in older adults
Author links open overlay panelNarintip Roongbenjawan, Akkradate Siriphorn
18. Jermy D, Walston. Frailty in Older Adults: Insights and Intervention. *Journal of Clinical Medicine*. 2005 December; 72(12).
19. Hyun Gu Kung, Madelna D. Costa, Attila A. Priplata. Frailty and the Degradation of Complex Balance Dynamics during a Dual-Task Protocol. *J Gerontology A Biol Sci Med Sci*. 2009 December; 64A (12): 1304–1311.
20. Olga Theo and Danielle Hernandez. An Investigation of The Discriminative Validity of The 30 Ft Walk Test as A Function of Age and Gender. *Journal of Active Ageing*; 2008; 6.
21. Shawna L. Patterson, Mary M Rodgers, Richard F. Macko. Effect Of Treadmill Exercise Training on Spatial and Temporal Gait Parameters In Subjects With Chronic Stroke: A Preliminary Report. *Journal of Rehabilitation*. 2008; 45 (2): 221-228.
22. Teasdale, M. Simonies. Attentional Demands for Postural Control. The Effects of Aging and Sensory Reintegration. *Gait and Posture*. 2001; Vol- 14; 203-210.
23. Syamala Buragadda, Asmaa Alyaemni, Ganeswara Rao Melam and Mohammed Abdulrahman Alghamdi. Effect of Dual-Task Training (Fixed Priority-Versus-Variable Priority) For Improving Balance in Older Adults. *World Applied Sciences Journal*.2012; 20(6): 884-888.
- 24.Makoto Hiyamizu, Shu Morioka, and Koji Shomoto: Effects of Dual Task Balance Training on Dual Task Performance in Elderly People. A Randomized Controlled Trial: Clinically Rehabilitation; 2012; 26-58.
25. Hironori Ohsugi, Shohei Ohgi, Kenta Shigemori.Differences in dual task performance and prefrontal cortex activation between younger and older adults. *BMC neuroscience*; 2013 January; 14.
26. Nicholas Steel, Felicia A. Huppert, Brenda Mc Williams. Physical and Cognitive Function. 2004.
- 27.Toni Bush. Gender Difference in Cognitive Functioning: A Literature Review. *The Journal of Sport Marketing*.
28. Cy Wang, SL Olson, Cj Yeh. Effects of Age and Gender on Mobility-Related Physical Performance in Taiwanese Community-Dwelling Older Adults without Physical Disability. *Asian Journal of Gerontology*. 2008;3:75-83.
29. Gender Differences in Dual Task Gait Performance in Older Adults
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