IJBPAS, September, 2013, 2(9): 1769-1776

ISSN: 2277–4998

International Journal of Biology, Pharmacy and Allied Sciences (IJBPAS)

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

A STUDY TO COMPARE THE EFFECT OF COGNITIVE DUAL TASK VERSES MOTOR DUAL TASK ON BALANCE TRAINING IN STROKE PATIENTS

MAZHAR KHAN S[1*], PRATHAP S[2]AND KUMERASAN[3]

1: Saveetha College of Physiotherapy, Saveetha University, Thandalam, Chennai, India

2: Head of Department of Neurological Physiotherapy, Saveetha College of Physiotherapy, Saveetha University, Thandalam, Chennai, India

3: Clinical Incharge, Out Patient Department, College of Physiotherapy, Saveetha University, Thandalam, Chennai, India

***Corresponding Author: E Mail: mammu_khan619@yahoo.co.in; Mob.: +91 9994944492**

ABSTRACT

Stroke is leading cause of serious long term disability in adults. Stroke limits mobility over a long period of time by causing physical and functional disorders, Balance is disturbed following stroke with impairment in steadiness, symmetry and dynamic stability .A dual task activity is two tasks that are carried out simultaneously, Cognitive and motor dual task training has proven more effective in improving dual task performance than single task training The aim of the study is to determine the effects of cognitive dual task training & motor dual task training on balance in stroke patients. Comparative study was used with total 30 Subjects in Stroke patients were selected based on the inclusion and exclusion criteria. The subjects were divided into 2 groups namely Group-A & Group- B with 15 subjects in each group. Group-A-Cognitive dual task training and conventional treatment. Group-B-Motor dual task training and conventional treatment. Berg balance scale was used as a outcome measures in this study. Treatment protocol for both groups- 1 hour/day, 5-days/week, for 1 month. All the values were tabulated and statistically analyzed by using paired and unpaired t-test. Data analysis revealed significant difference between the two

groups for berg balance scale. This study concludes that motor dual task is more effective than the cognitive dual task in improving balance in stroke patients

Keywords: Stroke, Cognitive Dual Task, Motor Dual Task, Berg Balance Scale

INTRODUCTION

Stroke is leading cause of serious long term disability in adults. More than 60 percentages of stroke survivors suffer from persistent neurological deficits that impair activities of daily living **[1]**. Stroke limits mobility over a long period of time by causing physical and functional disorders **[2]**, which results in difficulties in daily living because patient's activities are limited in both community and homes **[3]**.

Balance is ability to maintain center of mass within a proximal area and keep stable posture when moving the body **[1]**. Stroke limits mobility over a long period of time by causing physical and functional disorders **[2]**. Balance is disturbed following stroke with impairment in steadiness, symmetry and dynamic stability **[4-6]**. Following stroke patients loose functions of the motor, sensory and higher brain cognitive faculties to various degrees which lead to diminished balance **[7]**.

The physical therapy treatments that are frequently performed for improving balance and daily living abilities of stroke patients include bobath treatment **[8]**, PNF **[9]**, visual feedback training **[10]** and weight shifting to paretic side **[11]**.

A dual task activity is two tasks that are carried out simultaneously **[15]**. In relation to balance dual tasks consists of postural control tasks and postural control meta tasks, and postural control meta tasks are further divided into cognitive and motor tasks **[16]**. Dual task interference is reduction in performance of two tasks simultaneously **[15]**. Most functional task performed by humans primarily requires balance **[14]** and training in performance of two tasks simultaneously conducted to resolve the problem of impaired balance arising from dual task interference **[16]**. Dual task training provides information regarding restoration of automatism of balance control by influencing the reorganization process of CNS with respect to postural stability **[14]**.

Cognitive and motor dual task training has proven more effective in improving dual task performance than single task training **[15]**. The growing body of literature on motor dual task effects has inspired a few recent investigations of dual task training as a means to improve gait and balance **[17]**. Cognitive dual task training improves body sway during single support balance and center of gravity alignment during double

support dynamic balance **[17]**. Studies show both motor and cognitive dual task training are effective in balance improvement.

Not many studies have investigated which dual task training is more effective for improvement in daily living abilities through balance restoration for stroke patients **[8]**. Therefore present study is undertaken to know which dual task training (motor or cognitive) is more effective in improving balance in stroke patients.

MATERIALS AND METHODS

The study was conducted in a hospital and was cleared by institutional ethical committee. Thirty subjects with stroke patients attending outpatient department were selected conveniently and randomly assigned into two groups. Subjects with a single stroke duration greater than one month to lesser than twelve month. Ability to walk ten meters independently without assistance. Mini mental scale examination score greater than twenty four. Ability to understand instructions and follows command were included and the subjects with any other orthopedic and neurological condition that interfere with Study. Cognitive impairment, any visual and auditory impairment are excluded. They were explained about the procedure and informed consent was obtained from all the participants. Subjects were randomly allocated into two groups of 15 subjects in each group. Balance was measured in both groups by berg balance scale pre and post intervention. Group A received Cognitive dual task training and conventional treatment and Group B received Motor dual task training and conventional treatment for 1 hour in a day for five days a week for one month:

Group-A patients performed a postural control task to maintain in standing balance in tandem stance position. While maintaining tandem stance patient performs cognitive tasks Counting backward, Calculating 2 subtractions (100-7,100-13), Calling correct names of objects, Reciting words in reverse order and One back task (the participants hear a sequence of letters, presented one at a time, and responds after each letter: “yes” if it is repeat of the immediately preceding letter or “no if it is not. There will be 60 letters in the sequence) each task was implemented for 3 minutes for total 15 minutes and repeated twice.

Group-B patients performed a postural control task of maintaining standing balance in tandem stance position. While maintaining tandem stance patient performs motor tasks Exchanging a ball, Receiving ball with basket, Bouncing a ball on floor, Holding a glass of water and Exchanging a water glass. Each task was implemented for 3 minutes for total 15 minutes and repeated twice. Both groups receive training 5 days a

week for 4 weeks. Conventional Treatment in both groups patient specific: ROM exercises of affected extremity, Passive stretching of tight muscles, Grip strengthening exercise and task oriented exercise, Strength training using free weights, elastic bandage and Conventional gait training Number of repetitions and intensity of each exercise are increase based upon patients.Berg balance scale Questionnaire was used to measure balance which consists of 56 questions. Each question is scored with a five–point scale ,ranging from 0-4."0" indicates the lowest level of function and "4"the highest level of function. Total score =56

RESULTS

From statistical analysis made with the quantitative data revealed statistically significant difference between the Group A & Group B, and also within the group. The statistical analysis revealed significant difference ($p<0.0001$) between pre test and post test values of BBS in cognitive and motor dual task.

The pre test mean values for cognitive dual task of BBS was 32.53 (SD=1.88). The post test mean values for motor dual task of BBS was 44.07 (SD=1.83). This shows that berg balance scale in Group B were comparatively more than Group A, $P<0.0001$.The post test mean values for cognitive dual task of BBS was 44.20 (SD=2.46). The post test mean values for motor dual task of BBS was 53.13 (SD=2.10). this shows that berg balance scale in Group B were comparatively more than Group A, $P<0.0001$.Statistical Analysis of pre &post test for berg balance scale revealed that there is high statically significant difference seen between group A and group B.

Table 1: With in Group Analysis of Pre Test & Post Test Values

BBS		Mean (%)	SD (%)	t value	p value
Group A	Pre test	32.53	1.88	17.500	<0.0001
	Post test	44.20	2.46		
Group B	Pre test	44.07	1.83	17.115	<0.0001
	Post test	53.13	2.10		

Table 2: Post Test Measurements of Group-A & Group -B

POST TEST		Mean (%)	SD (%)	't' value	p value
BBS	Group A	44.20	2.46	10.7090	<0.0001
	Group B	53.13	2.10		

DISCUSSION

This study was conducted to investigate the changes on balance training in stroke patients. After implementing balance training with various dual task conditions and to examine the relationship between cognitive dual task & motor dual task. Improvements in balance under dual task

conditions varied among groups and depended on training type **[16]**.

Results of the mean scores on Berg Balance scale (BBS) showed significant improvement in both of groups after four weeks of training session i.e. improvement under both types of instructional sets. On comparison between Group A and Group B the mean scores of Berg Balance scale of Group B with motor dual task raining showed more improvement than Group A with Cognitive dual task training.

Significant improvement in balance of both of the groups after training session are in line with the result from the previous studies which shows that older adults may be able to improve their balance under dual task conditions only following specific type of balance training.

The result of the present study have shown that balance component of individual with stroke patients is improving more under motor dual task training as compared to cognitive dual task training.

Thus motor dual task is a physical therapy which can help in stroke patients to improve on balance considering that most daily living task require simultaneous motor & cognitive dual task. According to improvement in two groups after training and comparison among the groups showed that improvement was greater in motor dual task than in the cognitive dual task group **[18]**.

Berg balance scale is representative assessment tool that used to clarify the effects of physical treatment for stroke patients. The changes in balance ability is an important factor that affects the functional restoration of stroke patients during hospitalized rehabilitation treatment and improvement in balance ability influences improvement in daily abilities **[19]**.

Traditionally the focus of interventions for individuals with balance disorders has been on improving motor performance. Results of this study suggest that in interventions aimed at improving balance of stroke patients both motor and cognitive task should be incorporated as dual task training. This method of dual task balance training can be used in a simple rehabilitation set up and is economical. Limitations of this study include smaller sample size Follow-up for a longer period may be investigated which is not analyzed in this study. Effects of training were not investigated in relation to the difficulties to given tasks.

CONCLUSION

The present study concludes that motor dual task is more effective than the cognitive dual task in improving balance in stroke patients. Therefore a Balance training program which focuses on dual task with increasing difficulty and shifting priorities

between two tasks is efficacious in improving balance and functional recovery in stroke patients

ACKNOWLEDGEMENT

Its my privilege and pleasure to express my thanks to my Project Guide, who instilled a love for perfection in every work I did, was also instrumental in showing the right path and rectifying the factual mistakes in the study. I thank him sincerely for his valuable guidance.

I would express my special gratitude & thanks to Principal and my gratitude to my co-guide. Our Staff Members of Saveetha College of Physiotherapy, for their guidance and timely help throughout the project. My special thanks to all the Subjects who participated in this study, without them this project would not have been successful.

Of all I would like to thank my beloved Parents & friends for being with me always in all my endeavors & sincere thanks to all my study subjects for their faithful participation.

REFERENCES

[1] Jongbloed L, Prediction of function after stroke: a critical review, Stroke, 17, 1986, 765-76.

[2] Kelly-Moore JA and Ferraro KF, The black/white disability gap: Persistent inequality in later life? J. Gerontol., 59, 2004, 34-43.

[3] Eich HJ, Mach H, Werner C, *et al*., Aerobic treadmill plus bobath walking training improves walking in subacute stroke: A randomized controlled trial, Clin. Rehabil., 18, 2004, 640-651.

[4] Horak F, Esselman P, Anderson ME and Lynch MK, The effects of movement velocity , mass displaced and task certainty on associated postural adjustments made by normal and hemiplegic individuals, J. Neurol. Neurosurg. Psychiatry., 47, 1984, 1020.

[5] Dickstein R, Nissan M and Pillar T, Foot ground pressure pattern of standing hemiplegic patients : Major characteristics and patterns of movement, Phys. Ther., 64, 1984, 19

[6] Mizrahi J, Solzi P, Ring H and Nisell R, Postural stability in stroke patients: Vectoriaal expression of asymmetry, sway activity, and relative sequence of relative forces, Med. Bio. Engg. Comput., 27, 1989, 181-190

[7] Chunchen I, Pao–Tsai Cheng, Chia-Ling Chen, Shin-Ching Chen, Chia Ying Chung and Tu-Hsueh, Effects of balance training on hemiplegic stroke patients, Chang gung Med. J., 25, 1989, 181

[8] Jin GH, Ki-dong P, Yeong AY, Taesung K, Jusang L and Jooyean KO, Effects of balance training with various dual task conditions on stroke patients, J. Phys. Ther. Sci., 23, 2011, 713-717.

[9] Tyson SF and Selley AB, The effects of perceived adherence to the bobath concept on physiotherapist's choice of intervention used to treat postural control after stroke, Disability Rehabil., 29, 2007, 395-401.

[10] Carson RG and Swinnen SP, Coordination and movement pathology: Models of Structure and function, Acta. Psychologica., 110, 2002,357-364.

[11] Geiger RA, Aller JB and kneefe OJ, Balance and mobility following stroke: Effects of physical therapy interventions with and without biofeedback / forceplate training, Phys. The., 81, 2001,995-1005

[12] Nashner LM and Mecollum G, The organization of human postural movements: A formal basis and experimental synthesis, Behar. Brain sei., 8, 1985, 35.

[13] Morioka S, Hiyamizu M and Yagi F, The effects of an attentional demands task on standing postural control, J. Physiol. Anthropol. Appl. Human Sci., 24, 2005, 215-219.

[14] Shumway CA and Woolacott MH, Motor control: Translating research into clinical practice, 3rd Ed., Philadeiphia : Lippincott Williams and Wilkins, 2006.

[15] Pellecchia GL, Dual task training reduces impact of cognitive task on postural sway, J. Mot. Behav., 37, 2005, 239-246.

[16] Silsupadol P, Shumway CA, Lugade V, *et al*., Effects of single task verses dual task training on balance performance in older adults: A double blinded randomized controlled trial, Arch. Phys. Med. Rehabil., 90, 2009, 381-387

[17] Karen ZHL, Roudaid E, Lussier M, Bherer L, Leroux A, Mckinley PA, Benefits of cognitive dual task training on balance performance in healthy older adults, J. Gerontol., 2010,10-1093.

[18] Makoto H, Koji S, Tomoaki S and Shu M, Effects of dual task balance training on dual task performance in elderly people: a randomized controlled trial, Clinical Rehabilit., 25 (12), 2011.

[19] Sethi V, Parashar D and Ali S, Comparision of effects of dual task

training with two different priority instruction set on balance and motor recovery in chronic middle cerebral artery stroke patients, Indian J. Physiother. and Occupational Therapy, 3 (4), 2009, 50-57.