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Effect of dual task training for improving balance in people with cerebrovascular accident

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Abstract
Background: Everyday life involves many dual task situations, in which a person needs to do two or more things simultaneously. Without the ability to carry out these types of simultaneous movements the ability to cope with everyday life is severely impaired. Dual task training aims to improve the ability to do two or more things simultaneously and thus reduce the risk of falling. This study was done to evaluate the effect of dual task training to improve balance in stroke patient.
Methodology: 40 hemiplegic patient stroke patient who gave their consent for the study were asked to perform the task. The patient given with balance training. The patient given with primary and secondary task and asked to do simultaneously to the patient. The patient were asses before and after the test.
Result: result shows that there is comparison between group A and group B mean value of group A and group B 45.90 and 50.30 respectively. The t-value were 5.299 and $p<0.0001$.
Conclusion: this study concluded that there is significant improvement in giving dual task training than conventional exercises on balance function in stroke patients.

Keywords: stroke, balance, conventional balance training, dual task training

1. Introduction
The WHO clinically defines stroke as the rapid development of clinical signs and symptoms of a focal neurological disturbance lasting more than 24hr or leading to death with no apparent cause other than vascular origin.
As there is high of incidence middle cerebral artery stroke, upper limb is more affected than the lower extremity about 20 percentage of the individual fail to regain any functional use of upper extremity. Half of all stroke survivors are left with major functional problems in their hands and arms [1].
Balance are disturbed following stroke with impairments in alignment, stability, symmetry, and dynamic balance. A stroke can affect balance system, and the way in which the parts work together. Usually y body can overcome mild problems, but if they are more severe, system will be unable to work effectively will probably feel unsteady balance impairment may exist when reacting to a destabilizing external force and/or during self-initiations. Thus the patient may be unable to maintain stable balance in sitting or standing or to move in posture loss of balance [2].
People with ataxia have difficulty producing movements quickly enough, and in the right order, to avoid losing their balance or to recover from a trip or slip [3].
Everyday life involves many dual task situations, in which a person needs to do two or more things simultaneously: walking while talking to someone, walking through the supermarket and looking for a certain product, carrying a tray with food while walking. Without the ability to carry out these types of simultaneous movements the ability to cope with everyday life is severely impaired. Additionally, it is assumed that the lack of ability to carry out dual tasks is one reason why people stumble and fall. Dual task training aims to improve the ability to do two or more things simultaneously and thus reduce the risk of falling. One can differentiate between Dual task training with a cognitive dual task, and Dual task training with a manual dual task.
Dual task training consists of a primary task and an additional secondary task. The two tasks could be performed independently as a single task and have distinct and separate goals. In a dual task intervention, people practice both tasks simultaneously. The primary task of interest in this review is an exercise intervention that aims to improve gait or balance. Examples of gait tasks are walking with usual or reduced base of support, walking backwards, walking sideways and walking under dim light conditions (Silsupadol 2006). Examples of body stability tasks are standing quietly with usual or reduced base of support, standing with eyes closed, tandem standing, and recovery of standing following manual perturbations and standing on compliant or moving surfaces (Silsupadol 2006). The secondary task could involve a manual task (e.g. walking and carrying a glass of water, walking and carrying a tray with glasses, coin transfer, buttoning, walking and bouncing a ball, catching or throwing a ball while walking). Another possibility of a secondary task is a cognitive task (e.g. word list generation, color classification, counting backwards, counting backwards by threes, verbal response, memorizing a list of words, answering questions, digit retention, repeating days of week backwards, reciting male names or alternating letters) [4].
Dual task interventions are usually provided individually by physiotherapists, physical therapists or sports therapists. Group therapy is possible, but the supervision of the people in a group may be difficult. Under dual task conditions the risk of falling or losing balance is high, so the therapists must be able to protect, catch, or save the person during the whole intervention. Dual task training can be provided indifferent settings: hospital, inpatient rehabilitation,

outpatient practice, nursing home or at the person's homes. Exercise therapies usually take place one to five times a week for two to six weeks [5].

2. Methodology

2.1 Procedure

30 sub-acute stroke patients of age group 40 to 60 was selected and screened through inclusion and exclusion criteria. The inclusion criteria were People with sub-acute stroke, stroke single time occurrence, age group 40 to 60yrs, both male and female, patient who can able to understand and follow simple commands and Patient can able to stand with support. The exclusion criteria were patient who cannot follow simple commands, mental retardation, any other associated orthopedic, neurologic, cardio respiratory conditions that affects the outcome of the study. This study is passed through ethical committee before conducting the study. The patients were assigned through random sampling method. The patient given with balance training. The patients were assessed before and after the test. For the balance we give primary and secondary task and asked to do simultaneously to the patient.

The patients were divided into two groups. Group A given with conventional balance training and group B given with dual task training. The duration was 40 min per day, 5 days a week for total six weeks.

The primary task are standing quietly with usual or reduced base of support, standing with eyes closed, tandem standing, recovery of standing following manual perturbations, standing on compliant or moving surfaces. The secondary task are word list generation, color classification, counting backwards, counting backwards by threes, verbal response, memorizing a list of words, answering questions and digit retention.

2.2 Statistical Analysis

Comparison of pretest and posttest group A

Table 1

	Mean	SD	T-test	P value
pre test	36.25	1.97	10.076	<0.0001
post test	45.9	3.18		

Comparison of pre test and post test group B

Table 2

	Mean	Sd	T-test	P-value
pre test	35.1	3.3	16.689	<0.0001
post test	50.3	1.92		

Comparison of Group A and Group B

Table 3

	Mean	SD	T-test	P value
pre test	45.9	3.18	5.299	<0.0001
post test	50.3	1.92		

3. Results

Table -1result shows that there were significant difference between pre test and post test in group A. mean value of pre treatment BBS of pre test and post test are 36.25 and 45.90 respectively. The t-value was 10.076 and p <0.0001 these values suggest there is significant difference in giving conventional exercises in improving balance in stroke patient.

The table -2 result shows that there were significant difference between pre test and post test in group A. mean value of pre treatment BBS of pre test and post test are 35.10 and 50.30 respectively. The t-value was 16.689and p<0.0001 these values suggest there is significant difference in giving dual task training to improve balance in stroke patient.

The table-3 result shows that there is comparison between group A and group B mean value of group A and group B 45.90 and 50.30 respectively. The t-value were 5.299 and p<0.0001. these value suggest that there is significant difference in giving dual task training than conventional exercises to improve balance in stroke patients.

4. Discussion

The functional recovery of stroke patients is more effective when their therapies including high-intensity training and appropriate practices that allow voluntary use of specific motions and functions that are similar to actual tasks [14].

Furthermore, adjusting the patient's pelvic movement is critical because dynamic balance is controlled by the harmonious movement between the pelvis and the upper body as well as by the muscles around the hip joint; the weights of the head, upper limbs, and trunk is transferred to the lower limbs through the pelvis [15].

The various conventional exercises are balance board exercise, aquatic therapy, Bobath therapy, force platform or mechanical balance training devices, multisensory training, perceptual exercises, task-specific exercises, trunk exercises, vibration therapy and virtual reality. Although a majority of the studies demonstrated a positive benefit of balance training in stroke patient [16].

After a stroke, you may have balance problems that require you to concentrate a great deal to do simple things, such as putting on your socks, or standing at a sink to brush your teeth. Even people who experience only small problems with balance may have difficulty when walking outside on uneven ground or when crossing the street [17].

As a therapeutic method for restoration of this function, dual-task training is very popular, and active research is being conducted on the performance of dual tasks that reduce postural sway and improve postural stability.

Soo-Chan Bae *et al*. [18] Reported that significant improvements in postural sway and left and right weight support rates appeared after balance exercise on an unstable surface in stroke patients. Balance exercises on an unstable surface sensitizes muscle spindles through the gamma motor neurons, resulting in the improvement of motor output, which influences the stiffness of joints [19].

The results of this study are supported by the previous study of Dennis *et al*., [20] who reported that the test results for standing up and walking (of the experimental group) improved compared with the control group as a result of circulation and gait tasks (including dual tasks performed by chronic stroke patients).

A study by Kramer *et al*. [21] reported that when different balance control training programs were applied to three groups, the balance of the group that performed dual tasks improved, which also supports the findings of this study. These previous studies' results were brought about by formation of the ability to integrate multiple exercise tasks in the complex environment of daily living by performing

an exercise task while already performing another task.

The most fundamental goal of treatment in stroke patients is to return the patients to society. For this reason, the recovery of balance ability in stroke patients has been a very important goal of physical therapy and has been regarded as having a high research value. Furthermore, enhancement of the balance ability of patients through dual tasks has clinical significance in several areas. As patients show diverse reactions to the level of dual tasks, assessment of dual tasks can be very important for stroke patients and can contribute to the individual therapy plans of patients.

5. Conclusion

40 hemiparetic stroke patients undergone treatment with dual task training and conventional exercises in improving balance.The statistical analysis of our study confirms that there is significant improvement in giving dual task training than conventional balance exercises in improving balance in stroke patient.

So this study concluded that there is significant improvement in giving dual task training than conventional exercises on balance function in stroke patients.

Conflict of interest

There is no conflict of interest between the authors.

Source of Funding

Nil

Ethical Clearance

This research study is given clearance under Ethical committee headed by Principal, Maharashtra Institute of Physiotherapy, Latur.

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