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Evaluating the effectiveness of dual task training in improving cognitive and motor functions in stroke patients

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Abstract
Introduction: A dual-task requires subject to perform complex tasks, that involves a cognitive task combined with postural and control. Typically, the concurrent performance of motor and cognitive task in dual- task training affects the performance of one or both tasks.
Aim: Aim of the study is to evaluate the effectiveness of dual task training in improving cognitive and motor functions in stroke patients.
Objectives: To evaluate the effectiveness of dual task training in improving cognitive function in stroke patients by using stroop test, TUG test, Tinetti scale.
Method: Dual-task gait trainings were conducted 30 min per day, 3 days a week for 8 weeks. Assessment of the patients was done on the first day and reassessments done after 2 month.
Result: pre and post test values of all the assessment showed a significant difference with p value less than 0.0001.
Conclusion: Thus the study concludes that, the dual task training programmes are effective in improving cognitive and motor functions in stroke patients.

Keywords: Stroke, TUG test, Tinetti scale, stroop test

Introduction

Cerebrovascular disease-related mortality rates have been increasing, and 1 out of every 4 cerebro vascular disease patients dies within a month after the onset of disease. Among the surviving patients, 15–30% becomes severely handicapped, and 40% are left with functional deficits, resulting in problems with the major components of functional independence: motor, sensory, and cognitive functions.

A dual-task requires subject to perform complex task simultaneously, and emphasizes the role of cognition and concentration using a dual-task method that involves a cognitive task combined with postural and control. Typically, the concurrent performance of motor and cognitive task in dual- task training affects the performance of one or both tasks.

A dual task requires subjects to perform complex tasks simultaneously, and emphasizes the role of cognition and concentration using a dual-task method that involves a cognitive task combined with postural and walking control. Typically, the concurrent performance of motor and cognitive tasks in dual-task training affects the performance of one or both tasks. Various studies on the interaction between cognitive tasks and cognitive characteristics, and between motor tasks and dynamic characteristics are under way.

Thus, the present study aimed to investigate the effects of dual-task training including a cognitive task component on the cognitive and walking abilities of chronic stroke patients using objective measurement equipment and functional evaluation tools.

AIMS

Aim of the study is to evaluate the effectiveness of dual task training in improving cognitive and motor functions in stroke patients

Objectives

To evaluate the effectiveness of dual task training in improving cognitive function in stroke patients by using stroop test.

To evaluate the effectiveness of dual task training in improving motor functions in stroke patients by using Timed Up and Go (TUG) test.

To evaluate the effectiveness of dual task training in improving functional mobility in stroke patients by using Tinetti scale.

Materials and methodology materials

1. Pape
2. Pen
3. Table
4. Chair
5. Questionnaire
6. Chalk
7. Cone

Methodology

Study Design

Experimental study with pre and post study design

Study setting

The study was conducted at the setting approved by the college and guide, under supervision of concerned authority.

Study sample
A total number of samples- 10 students

Sampling technique
Convenient sampling method

Study duration
The study was conducted for a period of 6 months

Inclusion criteria
1. Both female and male patients
2. Subjects who had received a diagnosis of hemi paralysis due to stroke.
3. Age between 40 to 60 years of age
4. Brunstorm stages 3 to 5

Exclusion criteria:
1. Recent fracture
2. Below 40 years
3. Any deformities

Measurement tools
The Stroop test
Instructions

1. Work in groups of 3. Decide who will take on each role and write down their names on the data table:
- **Reader:** reads the test set according to the task instructions
- **Timer:** times how long it takes for the reader to complete the task
- **Checker:** keeps track of how many errors the reader makes Group members should keep the same roles for all of the tasks. If you want to change roles, use a different data table to record the results.

Note: You can also work in pairs. One person will be the reader, and the other will be both the timer and the checker.
2. Determine what your tasks will be and write them down on the data table. You should plan at least one non-conflicting and the starred conflicting task. Examples of tasks include:

Set A: Read the words (non-conflicting)
Set B: Say the colors of the letters (non-conflicting)
Set C: Say the colors of the letters (non-conflicting)
Set D: Read the words (conflicting)
Set D: Say the color of the letters (conflicting)
Set D: Hold chart upside-down and say the color of the letters

Begin. Give the answer key (pages 5-6) to the checker. As the reader completes the task, the checker makes tally marks for each error. If the reader makes more than 3 errors, stop and have them begin again. Record notes and observations below the data table.
3. (Optional) Repeat conflicting trials to see if time and errors improve.
4. (Optional) On a separate page, make a bar graph that compares the time it takes to complete each task. Be sure to use data only from error-free trials. See the example on the right.

Timed Up and Go (TUG) test
The Time Up and Go test, also known as the TUG test, is a simple evaluative test used to measure your functional mobility. It is most often used in physical therapy to give your therapist an idea of how safely you can move around. The TUG test can also used by your health care provider to estimate your risk of falling and your ability to maintain balance while walking.

Purpose of test
The TUG test is frequently used in elderly people as it is easy to administer and can be completed by most older adults. It can be included as part of a more comprehensive Get Up and Go (GUG) test which involves additional task like standing with your eyes closed or sitting in a chair without using the arm rest.

Study procedure
Participants were assessed using the Stroop test, Timed Up and Go (TUG) test, Tinetti test. This is a pre and post experimental study used to assess the cognitive and motor functions of stroke patients.
Assessment of the patients was done on the first day and reassessments done after 2 month.

Study technique
dual-task gait trainings were conducted 30 min per day, 3 days a week, for a total of 8 weeks.

Treadmill workouts
Low-intensity steady state
For those looking for an easy-to-follow exercise, low-intensity steady state (LISS) is an accessible format and a great treadmill work out for beginners who are just starting on their fitness journeys. The goal is to exercise for 30 minutes to an hour at roughly 60 percent of your maximal heart-rate effort. Most treadmills and wearable will monitor heart rate for you, but another way to calculate is to take 220 minus your age to find your maximum heart rate, then multiply that by .60 to find your target LISS heart rate. The best part about doing LISS on a treadmill is that the speed is set for you, so you'll get a great workout in all while streaming a show or listening to a podcast. You'll be done before you know it and feel great afterward.
To do this as a more low-intensity treadmill workout, set your machine to a high incline (9 to 12) at a moderately paced walking speed (around 3 to 4 mph) for 30 minutes.

Treadmill interval workout
Interval training is another effective treadmill running workout, and helps build aerobic endurance within a short window of exercise. The basic format of any interval training is to alternate between periods of exertion, which get your heart rate up, and periods of rest, which allow your body to recover before the next interval. Try the beginner interval treadmill workout below that alternates between running and walking. If the listed speeds are too slow or too fast, modify for what works for your fitness level.

1. 10 minutes of walking at 3 mph
Warm up by walking at an incline of zero and speed of 2 to 3 mph.

2. 3 minutes of jogging at 4 mph
Ramp your speed up to 4 mph for a light jog. Focus on keeping your body upright, your core engaged and your hands loose and off the handrails.

3. 2 minutes of walking at 3 mph
Great job! Your first running interval is complete. Take a sip of water, breathe deeply and roll your shoulders back as you walk.

4. 4 minutes of jogging at 5 mph
Take your speed up to 5 mph and run for 4 minutes. This should be at a moderate pace that is challenging but not exhausting, so if it's too much, take the speed down a few notches.

5. 3 minutes of walking at 3 mph
You're over halfway done—you've got this. Recover your breath and get ready for your last interval.

6. 3 minutes of jogging at 5.5 to 6 mph
This last running interval is meant to burn up the rest of your energy.
At 5.5 to 6mph, it will be the fastest speed of this workout, so give it all you've got for these last three minutes. If the speed feels out of your range, modify to what works for you so you can keep running for this last interval.

7. 5 minute cool down at 2.5 mph
You did it! The hard part is over. Now walk for five minutes to cool your body down before ending your workout with rejuvenating stretches.

The Cooldown
After walking to bring your heart rate down, dismount the treadmill and find a comfortable place to stretch. Check out our article on eight essential stretches for runners that you can do after your treadmill workout. Stay hydrated and eats a substantial protein snack within 30 minutes of exercise to refuel your muscles.
Running is a journey, and every workout is a chance to get better. As a new runner it's important to listen to your body and focus on the basics to build a solid foundation. Once you start to develop endurance, you can work on slowly increasing speed. Check out our article for tips on how to improve mile time.

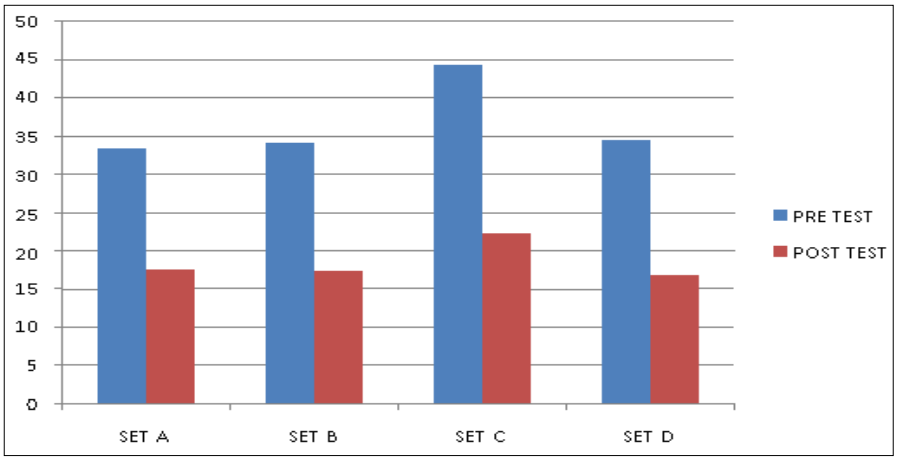
Data analysis

Table 1: Represents the pre test values for the group by using stroop test

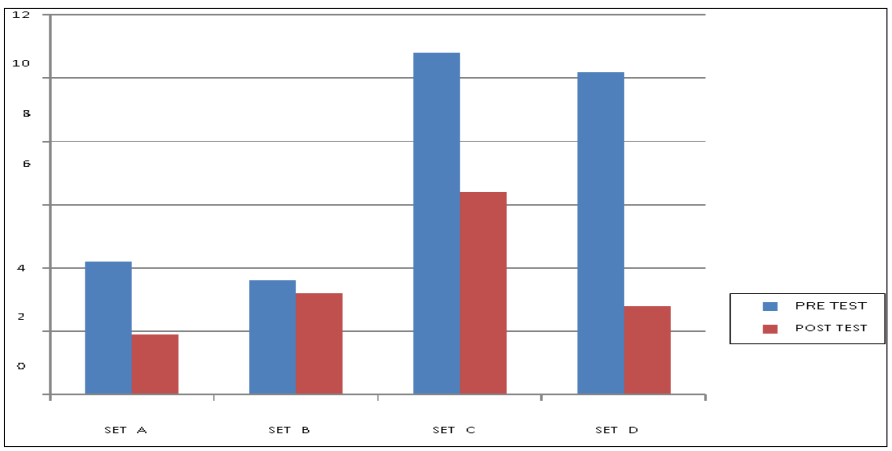
	SET A	SET B	SET C	SET D
Time(sec)	33.3	34.1	44.3	34.5
Errors (count)	4.2	3.6	10.8	10.2

Table 2: Represents the post test values for the group by using stroop test

	SET A	SET B	SET C	SET D
Time (sec)	17.6	17.4	22.2	16.9
Errors (count)	1.9	3.2	6.4	2.8



Graph 1a: Represents the pre-test and post-test time values for stroop test

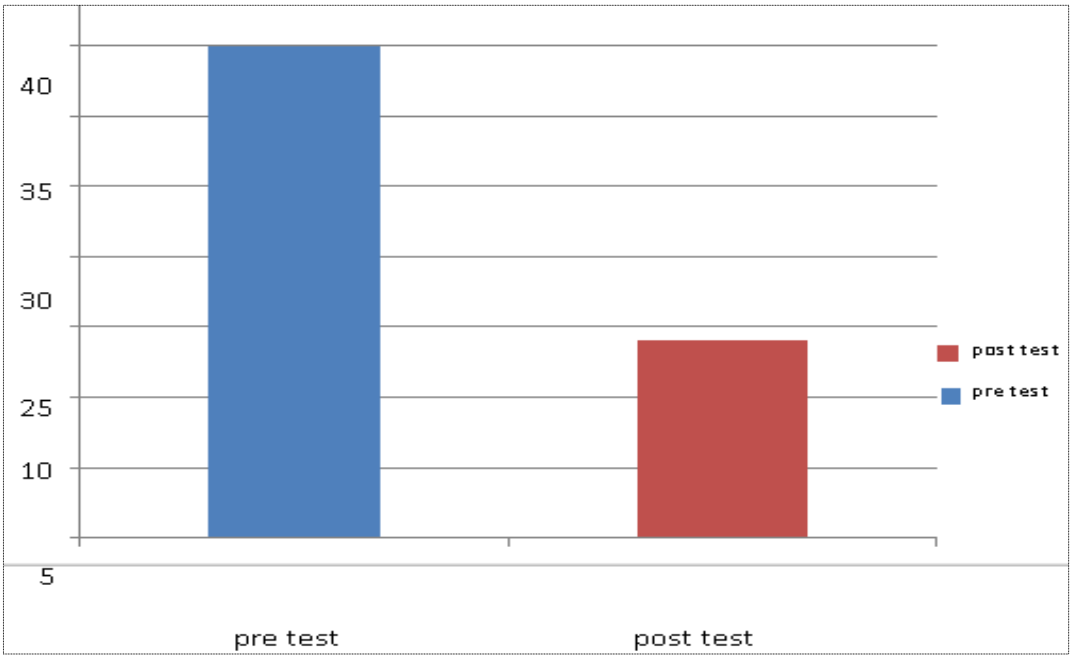


Graph 1b: Represents the pre test and post test error values for stroop test

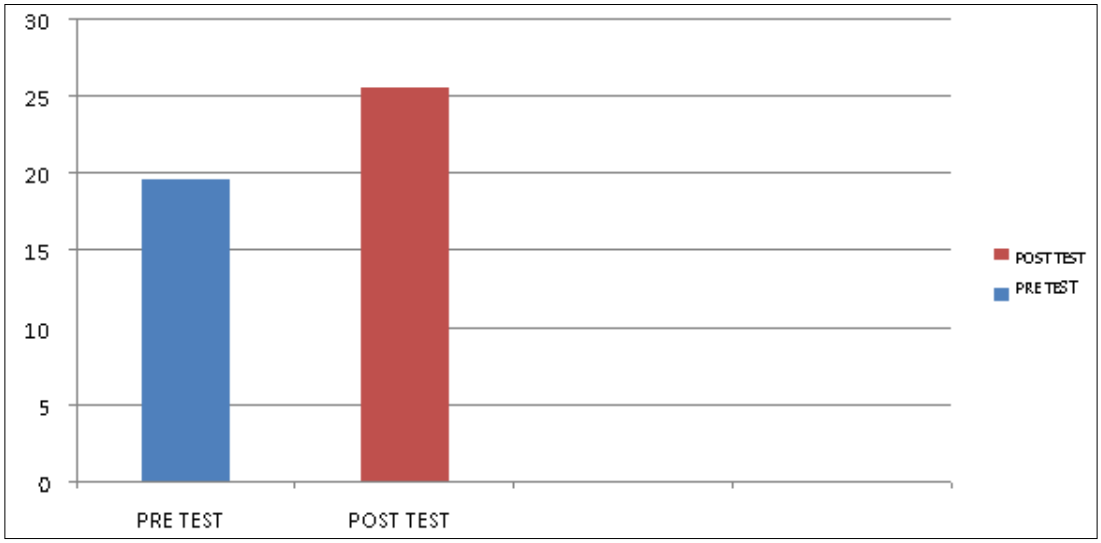
Table 2: Represents the pretest and post test values for the group by using tug test and Tinetti balance and gait scale

N Numbers	TUG Test (SEC)		Tinetti Balance And Gait Scale	
10	PRE	POST	PRE	POST
	349	141	196	255
Mean	34.9	14.1	19.6	25.5
SD	4.61	1.52	2.95	1.58
Mean diff	20.8		9	
T value	16.5		12.2	

P value is less than 0.0001 this difference is considered to be extremely statistically significant.



Graph 2: Represents the pretest and post test values for the group by using tug test



Graph 3: Represents the pretest and post test values for the group by using Tinetti balance and gait scale

Discussion

The present study sought to investigate the effects of 8 weeks of dual-task training including a cognitive task component on cognitive function and walking ability of stroke patients using functional evaluation tools. The evaluation of cognitive function of stroke patients is important for the identification of treatment strategies for functional recovery and their return to daily living.

The Stroop test was used to measure cognitive function in the present study. This test simultaneously reflects reaction time (speed aspect) and accuracy. Here, the effect of different performance levels among the subjects was minimized by specifying the reaction time as the number of items performed within a given time. In addition, accuracy was measured using the number of errors made.

Cognitive function increased with time, and differences were observed in the degree of improvement in the Stroop test according to training group. The DT group displayed greater improvement than the ST group, and these improved

cognitive capacities were sustained at the follow-up, which was performed 2 weeks after the end of the intervention.

Hiyamizu *et al*. divided 45 elderly subjects into dual-task and single- task training groups and studied the effects of dual-task balance training on cognition and concurrent standing postural control. Their results show that the dual-task group had significantly improved performance compared to the single-task group in the Stroop test. That study also showed that balance training for the elderly under dual-task conditions led to improvement in dual-task performance during standing postural control.

Vasques *et al*. conducted a dual-task training combined with aerobic training for depressed elderly subjects. Their data showed improvements in cognitive assessments, including the Stroop test, which led them to suggest that dual-task training is a safe and useful approach for cognitive function training.

Walking is the most basic means of human transport in daily life, and is the movement that is most easily performed concurrently with other tasks, such as conversing with another person or moving an object. Hemiplegia resulting from stroke has serious effects on an individual's walking ability. Even when functional walking is possible, it is different from the walking of a healthy person. Various capacities, including the maintenance of appropriate walking speed, endurance, curved-path walking, and balance while walking, are required for independent walking in daily life.

Cho *et al*. studied the effects of lower extremity circuit training based on a task-oriented training program on the walking ability of stroke patients, and proved that there were significant improvements in straight- line and curved-line walking speed.

The present study was performed to investigate the effects of dual- task training with a cognitive task component on cognition and walking of stroke patients. Dual-task training improved cognition and walking ability.

Conclusion

Thus the study concludes that, the dual task training programmes are effective in improving cognitive and motor functions in stroke patients.

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