

Effect of Dual Task Cognitive Performance along with Conventional Physiotherapy Treatment on Gait Parameters in Patients with Ischemic Stroke: A Study Protocol of Randomized Clinical Trial

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Abstract

Background: Ambulation is the main problem in the stroke patient due to inadequacy of motor and sensory deficit, which has profound effect on their walking ability and leads to difficulty in performing the dual task cognitive performance simultaneously. Dual task Cognitive performance along with the conventional physiotherapy treatment may cause profound effect on various gait parameters in stroke. **Objective:** To find out the effects of dual task cognitive training in patients with sub-acute ischemic stroke. **Method:** A sample of 40 patients with sub-acute stroke will be recruiting on the basis of inclusion and exclusion criteria. Following baseline intervention, the participants will be randomly allocated into experimental (Dual task cognitive training and conventional physiotherapy treatment) and control group (conventional physiotherapy treatment). Both groups will receive 45 minutes sessions per weeks, 2 or 3 times a day. The primary outcome measure will be DGI (Dynamic Gait Index). Secondary outcome include Gait parameters (Cadence, Step length, Stride length, Gait velocity). **Statistical Analysis:** Data will be screened for normality by using and summarized as descriptive statistics. If data will be normally distributed, Data will be analyzed using independent t -Test and paired t -Test for between group analysis and within group analysis. **Conclusion & Implications:** This study provides evidence to help clinicians make decision about to include in rehabilitation to improve the dual task cognitive performance.

Keywords: Sub Acute Ischemic Stroke; Dual Task Cognitive Training; Gait Parameters; Dynamic Gait Index (DGI).

Introduction

Stroke is defined as a focal neurological inadequacy occurs due to some vascular cause which is incorporated with cerebral infarction, intracerebral hemorrhage (ICH) and subarachnoid hemorrhage which results in injury of CNS. In worldwide the death of the patients occur due to this major reason of impairment [1].

There are 5 million people that die and another 5 million are kept handicapped or disarmed of

worldwide 15 million people suffer that stroke annually from the stroke. Stroke is a primary health issue and leaves the patients with many drawbacks like functionally dependency, cognitive function decrease or impaired dementia, depression and seizures [2].

The estimation of prevalence rate for stroke in India includes 143/100,000 persons. The prevalence rate of stroke increases with advancing age [3].

The ischemic stroke causes are cardio embolic stroke e.g. RHD, Bacterial endocardites, cortical venous thrombosis, arterial dissection, hematological causes, infections, atherosclerotic vascular disease. Other alternative causes are Arterial fibrillation, Acute MI, collapse of Mitral valve, Atrial and Ventricle septal irregularity etc. Causes of hemorrhagic stroke includes Arterio Venue Malformation (AVM), Saccular aneurysms, Moya-moya disorder, Bleeding irregularity, Anticoagulant disorder [4].

Stroke symptoms depend on the type and affected area of the brain. The Signs of ischemic stroke appear

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suddenly, whereas in hemorrhagic stroke appear gradually. It includes numbness or weakness of half side of body, disorientation and difficulty in speaking (conversation), difficulty in perceiving, unable to walk, unsteadiness, problem in co-ordination, headache may be severe due to unknown [2].

The loss of motor function and control, perceptual deficits, tone abnormalities, sensory deficits, gait and balance impairments are silent cause in stroke patient which has an farthest effect on walking ability. 50 – 80 percent of patient have some degree of walking according to repeated figures, but returns to normal [5, 6].

Stroke patient are usually referred to gain the balance control during several synchronous tasks to decrease to the risk of falling. Balance is most generally trained under single task and dual task training. Single task training includes practicing functional task requiring balance (e.g. standing, walking and transfer) in isolation and Dual task training needs participants to perform simultaneously multiple tasks and use to inspect the reaction of cognitive task on postural control and help to improve balance. It is recorded that the postural stability is decreased when stroke Patients performing two or more task simultaneously and this shows increased risk of fall [7].

After stroke, fulfillment of cognitive task results in heavy reduction in gait speed and leading to complementary effect on stride duration, stride length; double limb support time and cadence. Dual task training helps to increase the dual task walking in people with stroke. It is the approach used to explore interaction between the cognitive and motor function [8, 9].

There are number of studies done for the dual task cognitive performance on gait parameter in the stroke patients and concluded that dual task cognitive performance enhance the cognitive function and walking ability of stroke patients [10-13]

This study will increase the knowledge of physiotherapist and contribute towards evidence based practice. The study will also help in determining the best and effective physiotherapy intervention used for the treatment of ischemic stroke patient and help to improve the gait parameter in patient with stroke.

To find out the effects of dual task cognitive training along with conventional physiotherapy on gait parameters in patient with ischemic stroke.

Methodology

Study Design

A Randomized Clinical Trial

Ethical Clearance

The study was sanctioned by the Ethical Research Committee of MMIMSR

Study Location

The study will be conducted at Physiotherapy department of MMIMSR, Mullana (Ambala).

Study Setting

The study will be conducted at outpatient Department of Physiotherapy, MMIMSR, Mullana, Haryana, India.

Sampling Technique

Criteria based purposive sampling will be done.

Sample Size

n= 40

Estimated by the formula:

$$N = \frac{2(Z_{\alpha} + Z_{1-\beta})^2 (\sigma)^2}{(\mu_s - \mu_t - \delta)^2}$$

N = Sample size required.

σ = Standard deviation of the primary outcome variable = 6.35

δ = MDC value of outcome measure = 16.6

Z_{α} = 1.96

Z_{β} = 0.84

$(\mu_s - \mu_t)$ = Assumed effect = 21

$$N = \frac{2(1.96+0.84)^2 (6.35)^2}{(21 - 16.6)^2}$$

N= 38

Therefore the total sample size is 38. Considering 5% dropout rate, the sample size is increased to 40 patients. 20 patients will be randomly allocated for each i.e. Group A and Group B.

Subject Selection Criteria

❖ *Inclusion Criteria*

- ♦ Age (45- 60yrs) of either sex
- ♦ Sub acute Ischemic stroke. (3 to 6 months)
- ♦ MMSE scores > 23.
- ♦ Individual having Burnstrom stage 4 and 5

❖ *Exclusion Criteria*

- ♦ Individual having any assistive device.
- ♦ Individual having any musculoskeletal disorder.
- ♦ Hyper or hypo sensitivity disorder.
- ♦ Individual affected from neurological disorder other than stroke.
- ♦ Individual with psychosomatic disorder.
- ♦ Individual having any cardiac or respiratory disorder affecting gait.
- ♦ Patients with cognitive and perceptual deficits.

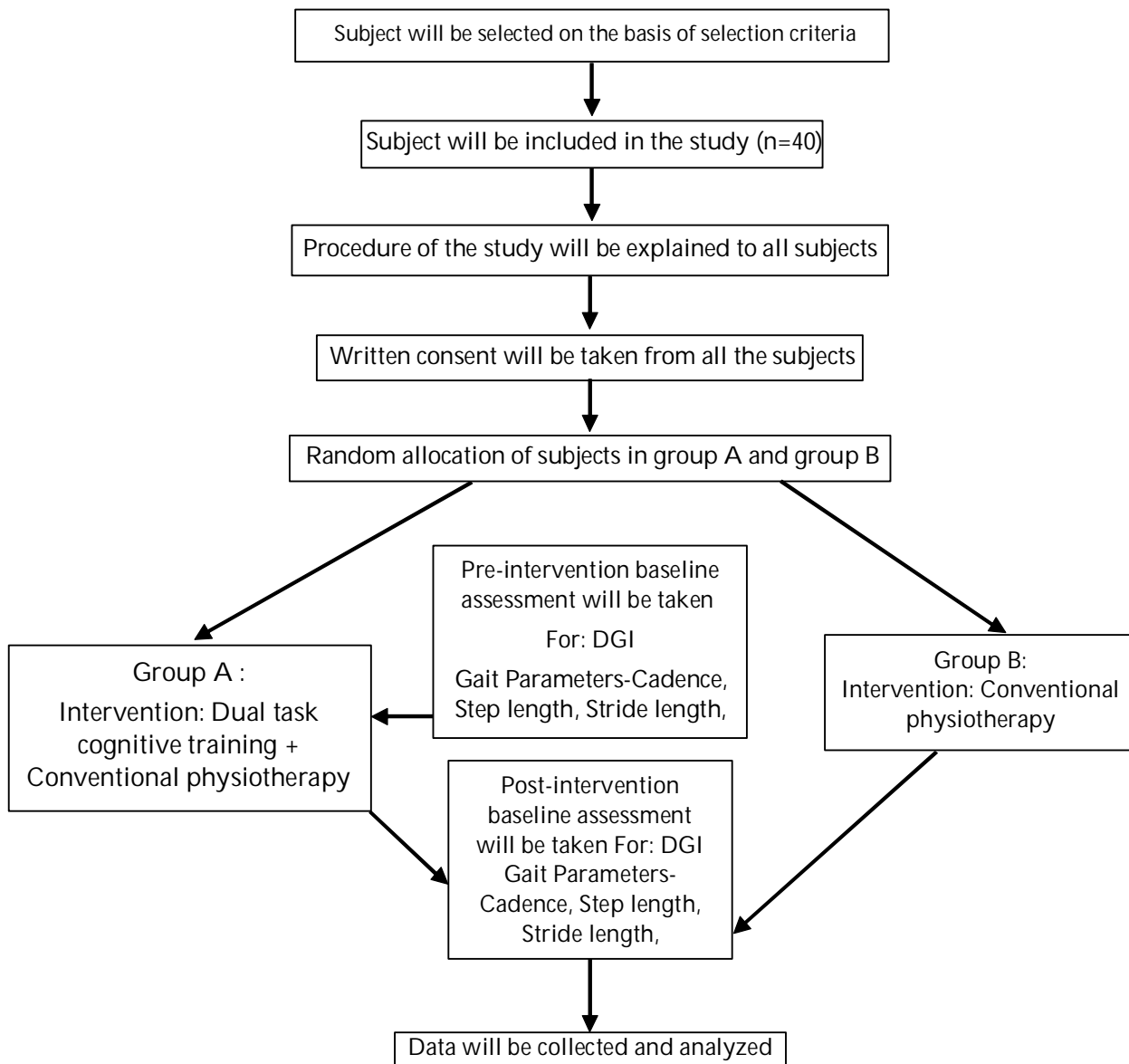


Fig. 1: Protocol

- ◆ Individual affected from any Systemic diseases.
- ◆ Individual having any visual and vestibular defect.
- ◆ Non cooperative individuals.

Variables

- ❖ *Independent Variable.*
 - ◆ Dual task cognitive training.
- ❖ *Dependent Variable.*
 - ◆ Dynamic Gait Index (DGI), Gait Parameters: Cadence, Step length, Stride length., Gait velocity

Instrumentation for Data Collection

- ❖ *For Evaluation:* Chair/ stool, Ink / colour, Standard measuring tape / ruler, Stop watch, 10 meter walkway, Shoe box.
- ❖ *For outcome measures: in DGI Scale:* Paper, Pencil, ruler / Measuring tape, Chair/ stool, Shoe box, Watch, 10meterwalkway *For Intervention* Couch/ Mat, Ball, Chalk, Walkway

Study Protocol: Dual task cognitive training

Balance Activities	Secondary Tasks
1. Eye open, arm alteration with semi-tandem walking	Spell word forward
2. Eye closed, arm alteration with semi-tandem walking	Spell word backward
3. Draw a clockwise and anticlockwise circle with right foot with right foot	Tell any word start with letter A-K
4. Draw a clockwise and anticlockwise circle with right foot with left foot	Tell any word start with letter A-K
5. Perturbation in standing with holding a ball in right hand	Remember contact numbers of family
6. Perturbed in standing with holding a ball in left hand	Remember number of perturbations
Transitional Activities	
Gait Activities	
7. Walk with small base of support	Calculate backward number of steps
8. Walk with small base of support	Calculate forward number of steps
9. Walk with close base of support, step sides- ways, backwards avoiding the obstacles	Remember words
10. Walk and kick a ball	Spell the opposite of words
11. Walk and reach and trunk twisting	Visual imaginary task (imagine ant situation)

walk on a paper sheet or chart from one end of walkway to the end. The ink foot print from the sole of the foot will be taken on the paper as produced by the walk of the patient and the measurement of the gait parameters will be taken.

Outcome Measure

- ❖ *Primary outcome measure:* DGI (Dynamic Gait Index)

Procedure

The study protocol includes a sample of 40 patients with sub-acute ischemic stroke will be participating in this study during the month April 2015-March 2016. Then patients will be randomly allocated into 2 groups: dual task cognitive training and conventional physiotherapy treatment (experimental group) and conventional physiotherapy treatment (control group) and protocol adopted by *silsupadol p [11]* and modified for this study. The ethical clearance will be obtained from institutional research ethics committee of physiotherapy and rehabilitation Mullana, Ambala. Study will be done by the guide lines laid by ICMR and Helsinki Declaration (Revised 2013). Prior to data collection, the purposes and procedure were fully explained to patients and informant consents were obtained from subjects. Each subject will be evaluated individually and the baseline data were recorded from DGI and Gait Parameters including Cadence, Step length, Stride length, Gait velocity according to the standard protocol. To measure the gait parameters by ink footprint method the subject were walk 10meter with a plane sheet of paper on the surface. Patient were informed to step on an inkpad and asked to

- ❖ *Secondary outcome measure:* Gait parameters (Cadence, Step length, Stride length, Gait velocity).

Data Analysis

The data will be analysed by using statistical package for the social sciences (SPSS) 16 version software. Results will be expressed as mean \pm standard deviation (SD). Data will be screened for normality by using and summarized as descriptive

statistics. If data will be normally distributed, Data will be analyzed using independent t -Test and paired t -Test for between group analysis and within group analysis. Level of significance will be set as 5 percent ($p < 0.05$).

Discussion

This study showed that dual task cognitive training effective to improve the gait parameters and relative improvement in functional abilities in patients with sub-acute ischemic stroke.

The studied by AN et al [12] stated that the effect of various dual task training methods with gait on the balance and gait of patients with chronic stroke and concluded cognitive dual task gait training was more effective in improving the balance and gait abilities of chronic stroke patients than either the motor dual task gait training or the cognitive dual task gait training along performed for 30 minutes per day, three times a week, for eight weeks.

Kim et al [13] studied effect of dual-task training with cognitive tasks on cognitive and motor function after stroke and they concluded that Dual task training improves cognitive and walking abilities of patients with stroke performed for 4 weeks, 3 days a week.

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Conflict of Interest

Not identified and/or declared

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