

# Effectiveness of Task Oriented Training and Swiss Ball Exercise on Balance among Middle Cerebral Artery Stroke Patients: A Comparative Study

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## Abstract

**Background:** This study was developed to determine the effectiveness of task oriented training and swiss ball exercise on balance among middle cerebral artery stroke patients.

**Purpose:** To compare the effectiveness of task oriented training and swiss ball exercise on balance among middle cerebral artery stroke patients.

**Materials and Methods:** This research is an experimental study. The 30 subjects obtained from SaiCharan Physio Centre were split into two distinct groups as Group A (15 Subjects) and Group B (15 subjects). All the 30 subjects were assessed with Trunk Impairment Scale as a pre test and the same test was performed for post test at the end of 4 weeks following the intervention protocol. Group A received task oriented training and Group B received Swiss ball exercise along with convention therapy given for both the groups. Exercise were given for 4 weeks, 5 days per week, 10 repetition \* 3 sets. Pre test and post test values were calculated and tabulated. The entire period was performed from November 2022 to March 2023.

**Result:** Statistical analysis of Trunk Impairment Scale Examination post values revealed the constantly significant differences, With the P value of <0.0001.

**Conclusion:** Task oriented training with conventional therapy is more effective on enhancing the trunk balance among MCA Stroke patients than either using Swiss ball exercise with conventional therapy.

**Key Words:** MCA Stroke, Trunk balance, Task oriented training, Swiss ball exercise, Trunk ImpairmentScale.

## Introduction

Stroke results from the rapid demise of some brain cells from a lack of oxygen, when the blood flow to the brain is cut off by a blocked or ruptured artery.<sup>1</sup> Acute strokes are most often associated with the middle cerebral artery (MCA). It breaks off

directly from the internal carotid artery and contains four main arteries with the letters M1, M2, M3, and M4. These veins give blood to deeper brain structures such the caudate, internal capsule, and thalamus as well as portions of the frontal, parietal, and temporal lobes of the brain.<sup>2,3</sup> The ischemic and hemorrhagic stroke are caused by variable risk factors, such as

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hypertension, smoking, obesity, alcohol use, and nutrition.<sup>4,5</sup>

In terms of occurrence, stroke displays notable prevalence rates, ranging from 334 to 424 cases per 100,000 individuals residing in urban areas, while in rural regions, the rates range from 84 to 262 cases per 100,000 people.<sup>6</sup> The ability to keep your center of gravity over your BOS, usually while standing up straight, is known as balance. Stroke patients with balance issues fall into one of two categories: 1) Static Balance, which is the capacity to maintain posture while at rest. 2) Dynamic balance – The capacity to maintain control of posture while carrying out functional tasks. The effectiveness of a task-oriented walking training is raising the self-efficacy of balance in stroke survivors. Self-efficacy is described as a rating of one's capacity for planning and carrying out tasks.<sup>7,8</sup>

According to the task-oriented perspective, movement develops as a result of interactions between various brain systems, is planned around a purpose, and is limited by the surrounding. Task-oriented training encompasses a different set of therapies, including sit-to-stand exercises, ground walking training, ground walking training on a treadmill, cycling programmes, endurance training, and circuit training, as well as reaching activities for balance improvement.<sup>9</sup> Swiss-ball workouts are frequently employed as they contribute to enhancing strength, endurance, flexibility, coordination, and balance. This makes the patient more active and enhances their postural awareness, symmetry, alignment, alertness, and balance. Swiss ball movement enables the performance of both static and more strenuous dynamic stretches.<sup>10</sup>

### Aim

To find out the comparison between task-oriented training and Swiss ball exercise on Trunk Impairment among middle cerebral artery Stroke patients.

### Material and Methods

This research is an experimental study. The study was conducted with a sample size of 30 participants. The participants were selected from SCPT(SMCH Hospital) and Saicharan Physio Centre, according to inclusion and exclusion criteria. Participants received

an extensive overview of the method, and a formal informed consent form was acquired.

**Materials required:** Paper cups, Swiss ball, Chair.

**Study period:** from November 2022 to March 2023.

#### Inclusion criteria:

- Age group of 45-60
- Both the gender
- Middle cerebral artery Stroke
- Subjects with score <7 in trunk-impairment scale

#### Exclusion criteria:

- Obese patients (BMI>30)
- Disease of the cerebellum, Parkinson's disease, and vestibular lesion
- Arthritis, degenerative illnesses, and low back pain.
- Visual defect
- Psychosomatic disorders

**Outcome measure:** Following a cerebrovascular accident, the evaluation of trunk motor dysfunction is conducted through the utilization of the Trunk Impairment Scale (TIS). Ranging from 0 to 23, the TIS appraises the coordination of the trunk, as well as the stability and equilibrium during both static and dynamic seated positions.

### Procedure

The subjects willing to participate were randomly split into two distinct groups using concealed envelope methods as Group A (15 Subjects) and Group B (15 subjects). All the 30 subjects were assessed with Trunk Impairment Scale as a pre test and the same test was performed for post test at the end of 4 weeks following the intervention protocol. Group A received task oriented training and Group B received swiss ball exercise along with convention therapy given for both the groups. Exercises were given for 4 weeks, 5 days per week, 10 repetition \* 3 sets. Pre test and post test values were calculated and tabulated.

#### Group A (Task oriented training)

##### 1. Forward reach

- Place the arms at the sides and sit steadily in a chair with good back support.

- Reach the hands straight ahead toward the therapist's hand while keeping them clenched together.
- Hold for 5 seconds, then recline and sit normally in the chair.
- 10 repetitions of the exercise.

### **2. Forward trunk bending and picking object placed on table**

- Place the arms at the sides and sit steadily in a chair with good back support.
- Slowly bend forward from the hips and Reach out with the unaffected hand to grasp the object on the table.
- return back to normal position and do it for 10 reps.

### **3. Lateral bending and picking object placed on table**

- Sit in a stable chair with proper back support, with arms at rest.
- Place a small object (such as a pen or a small ball) on a table, within reach.
- Slowly bend to the side from the waist, reaching towards the object on the table.
- Pause for a moment in the lateral bent position while maintaining balance and stability.
- Repeat the movement on the opposite side, reaching for the object placed on the table to the other side.
- Continue alternating sides for 10 reps.

### **4. Picking up paper cups placed around the patient from the same position**

- Set up several paper cup around the patient's sitting position, within their reach on the table.
- Explain the task to the patient and demonstrate the activity, providing clear instructions and encouragement.
- Instruct the patient to use their unaffected hand to reach for and pick up one cup at a time.
- Once they have picked up a cup, instruct the patient to bring it back to a designated location.
- Repeat the process, having the patient reach for and collect the remaining cups, one by one, and place them in the designated location.

## **Group B (Swiss ball exercise)**

### **1. Anteroposterior pelvic tilt**

- Sit on the Swiss ball while ensuring that the feet are planted firmly on the floor, the shoulders are spread apart.
- Ensure to have proper support and stability while sitting on the ball, should assist the patient
- Place the hands on the hips or across your chest for added stability.
- Begin to perform an anterior pelvic tilt, gently tilt the pelvis forward, allowing the lower back to curve slightly.
- And perform posterior pelvic tilt, gently tilt the pelvis backward, flattening the lower back against the Swiss ball.
- Hold the anterior and posterior pelvic tilt for 5 seconds while maintaining the balance on the Swiss ball.
- Repeat the anterior and posterior pelvic tilts for 10 times.

### **2. Lateral pelvic tilt**

- Sit on the Swiss ball while ensuring that the feet are planted firmly on the floor, the shoulders are spread apart.
- Ensure to have proper support and stability while sitting on the ball, should assist the patient
- Start by tilting the pelvis to the left side. This movement should be initiated from the hips, not the upper body.
- Hold the left tilt for 5 seconds, focusing on maintaining the balance.
- Slowly return to the starting position, aligning the pelvis in a neutral position.
- Repeat the same movement, Hold for 5 seconds and maintain your balance.
- - Return to the starting position and repeat the exercise for 10 repetitions on each side.

### **3. Upper trunk rotation**

- Sit on the Swiss ball while ensuring that the feet are planted firmly on the floor, the shoulders are spread apart.
- Place the hands clasped together, and Start by rotating the upper trunk to the right side. Keep the lower body stable and focus on rotating from the waist up.

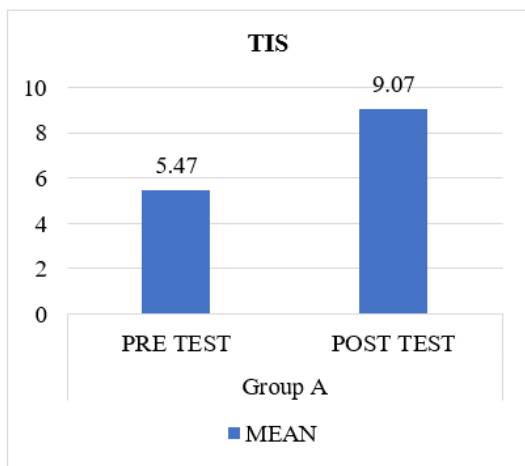
- Hold the right rotation for 5 seconds, Slowly return back to the neutral position, aligning the upper trunk with the lower body.
- Repeat the same movement, this time rotating the upper trunk to the left side. Hold for 5 seconds.
- Return to the starting position and repeat the exercise for 10 repetitions on each side.

**4. Lower trunk rotation**

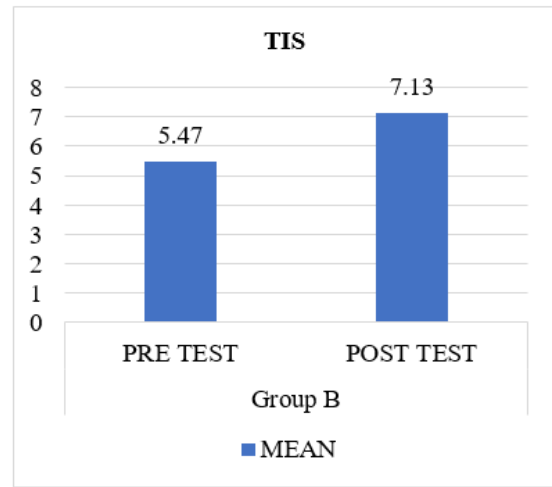
- Sit on the Swiss ball while ensuring that the feet are planted firmly on the floor, the shoulders are spread apart.
- Place the hands clasp together, and Start by rotating the lower trunk to the left side.
- Rotate as far as comfortable and Hold the position for 5 seconds, focusing on maintaining balance and stability.
- Slowly return to the starting position.
- Repeat the same movement, Hold for 5 seconds and maintain balance.
- 10 repetitions of the exercise should be performed on each side before returning to the beginning position.

**Data analysis**

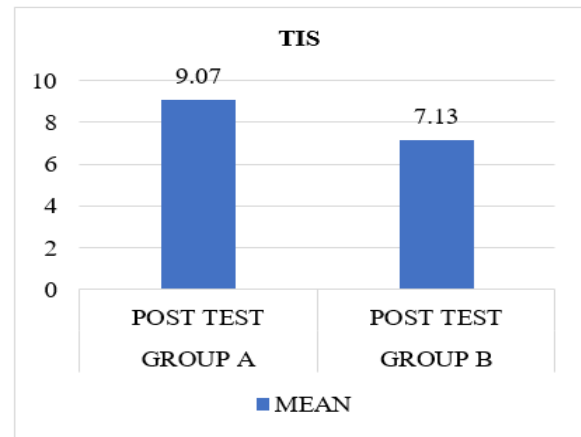
Using tabular and inferential statistics, the gathered data was evaluated. The mean and standard deviation (SD) were utilized for all parameters. The statistically significant differences between pre-test and post-test measures were examined using a paired t-test. When utilizing the unpaired t-test to look at significant changes in the experimental group, the significance level of  $p < 0.0001$  was determined to be statistically significant.



**Graph-1 Comparison of pre-test and post-test values of task oriented training using Trunk Impairment Scale**



**Graph-2 Comparison of pre-test and post-test values of Swiss ball exercise using Trunk Impairment Scale**



**Graph-3 Comparison of post-test values of task oriented training and Swiss ball exercise**

**Results**

A statistical analysis of quantitative data revealed a statistically significant difference in values between the ( Group A)Task oriented training and (Group B) Swiss ball exercise.

Graph - 1 compares the pre and post-test values of (Group A)Task oriented training using Trunk Impairment Scale. The mean value of the pre-test is 5.47 and the post-test is 9.07 using Trunk impairment scale. As a result, the findings are considered statistically significant when the p-value is  $< 0.0001$ .

Graph - 2 compares the pre-test and post-test values of ( Group B) Swiss ball exercises using Trunk

Impairment Scale. The mean value of the pre-test is 5.47 and the post-test is 7.13 using Trunk Impairment Scale. As a result, when the p-value is less than 0.0001, the results are considered statistically significant.

Graph - 3 compares the post-test values of the Group A and B, revealing that the mean value of Group A was 9.07 using Trunk Impairment Scale, whereas the Group B mean value was 7.13 using Trunk Impairment Scale. As a result, the findings are considered statistically significant when the p-value is less than <0.0001.

This shows that the Task oriented training produces better functional results in the Group A than the Group B.

### Discussion

This study is to find out the comparison between task-oriented training and Swiss ball exercise on balance among middle cerebral artery Stroke patients.

In 2022 Romita R Shah conducted a study on functional mobility in chronic stroke survivors as a result of distributed practice in task-oriented training and concluded that Participants who received both conventional physical therapy and task-oriented training using the distributed practice method improved more than those who only received conventional therapy.<sup>13</sup>

The efficacy of task-oriented training intervention in enhancing balance among patients with middle cerebral artery (MCA) stroke is being examined was studied by Remya M Nair and Jince Augustine in 2021 and concluded that Balance was statistically significantly improved in stroke patients who underwent Task Oriented training in addition to traditional physical therapy compared to the control group. It can be used to manage stroke victims and improve balance. Thus the study determines the long-term effects of task-oriented walking on improving balance in large groups.<sup>7</sup> With the consideration of the result obtained from this study, we made an attempt to provide intervention for 4 weeks, 5 days per week, 10 repetition\* 3 sets. With 15 subjects in each group.

In 2009, Marijke Rensink undertook a study focusing on task-oriented training in stroke

rehabilitation. The systematic review yielded a conclusion that task-oriented training demonstrated greater effectiveness in aiding stroke patients. In view of this finding we decided to train the MCA stroke patients with task oriented exercises such as Forward reach, Forward trunk bending and picking object placed on table, Lateral bending and picking object placed on table, Collecting paper cups placed around the patient from the same position along with conventional therapy in order to improve the balance among them. As a result, task-oriented training was successful in enhancing trunk control.<sup>11</sup>

In 2004 G Verheyden et al. Clin Rehabil conducted a study on A new approach used to assess motor impairment in the trunk following a stroke is called the Trunk Impairment Scale and concluded that from the assessment, recommendations for treatment and the degree of trunk activity quality can be drawn. So as the above mentioned study says Trunk impairment scale was used to assess the ability of trunk balance in this study. The patients with less than or equal to score 7 in the trunk impairment scale were used. Following the experiment, there was a noticeable difference in the two groups' capacity for trunk control. The experimental group's increase on the Trunk Impairment Scale was considerably superior to the control groups.<sup>12</sup>

### Conclusion

The research findings established that Group A, comprising individuals who underwent a combination of task-oriented training and conventional therapy, demonstrated greater effectiveness compared to Group B, which underwent a combination of Swiss ball exercise and conventional therapy, in enhancing trunk balance among individuals affected by MCA Stroke.

**Ethical clearance:** The ISRB committee of a private hospital and institution in Chennai has provided its clearance for the conduct of human research that complies with all applicable national laws, institutional regulations. (Application Number - 03/029/2022/ISRB/SR/SCPT).

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**Conflict of interest:** The authors state that there is no conflict of interest

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