

To Compare the Effect of Core Strengthening with Conventional Therapy Versus Task Oriented Exercise with Conventional Therapy in Improving Balance and Function in Stroke

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Abstract

Introduction: Stroke is a medically defined syndrome of acute, focal neurological deficiency assigned to vascular injury (infarction bleeding) of the central nervous system. Stroke is the second main source of death and disability all around the world. Stroke consists of multiple diseases caused by a vast range of factors, disease course, and mechanisms.

Method: A total of 36 stroke patients were selected according to the inclusion and exclusion criteria from the Department Of Physiotherapy and Neurology Dept., Shri Mahant Indires Hospital, Patel Nagar, Dehradun (Uttarakhand). They are divided into two groups, Group A and Group B, Group A received core strengthening along with conventional therapy and Group B received task oriented exercise along with conventional therapy to improve balance and function. The post-intervention data was compared with pre-intervention data and the data will be analyzed using statistical software SPSS 21 version and Microsoft Word, Excel has been used to generate graphs tables, etc. Various statistical measures such as mean, standard deviation, and paired t-test were utilized for all the scores of participants included in the study.

Conclusion: This study provides valuable insights into the effectiveness of core strengthening with conventional therapy versus task-oriented exercises with conventional therapy in improving balance and function in stroke patients. Both interventions show promise, with core strengthening along with conventional therapy generally demonstrating slightly superior outcomes. Future research should aim to confirm these findings and explore additional factors that contribute to rehabilitation success.

Keywords: BBS, TIS, SSQOL, TUG, Core strengthening, Task-oriented exercises, Conventional therapy

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INTRODUCTION

Shiksha Verma et al (2022) "To Compare The Effectiveness Of Bobath Approach Along With Core Stability Training Versus Bobath Approach Along With Conventional Therapy On Trunk Function And Sitting Balance In Stroke Patients, *NeuroQuantology*, Volume 20(13), Page 3699-3720, doi: 10.14704/nq.2022.20.13.NQ88454

Stroke is a major disease that can cause disability in adults and is the second leading cause of death in the world. The term stroke was coined by the William Cole in the last 17th century. Physiologically stroke is an acute, focal injury of the central nervous system of a vascular origin, contributing to a local or systemic neurological insult. Stroke survivors often have multipledys functions which seriously affect their daily life, work and social communication. Following stroke one side of the upper and lower limbs are affected but trunk muscle are affected on both sides leading to insufficient trunk rotation and difficulty in maintain balance.¹

Stroke is a medically defined syndrome of acute, focal neurological deficiency assigned to vascular injury (infarction hemorrhage) of the central nervous system. Stroke is the second main source of death and disability all around the world. Stroke consists of multiple diseases which can be caused by vast range of factor, disease course and mechanisms. Most of the strokes are ischemic (85%) essentially caused by small vessel arteriosclerosis, cardio embolism and large artery athero-thromboembolism. Ischemic strokes in younger patients can result due to distinct spectrum of causes such as extracranial dissection. Approximately 15% of the strokes worldwide are the consequence of intracerebral hemorrhage.²

General impairments due to stroke are: reduced strength and slowed movement of trunk muscles. It leads to issues in positional sense, sitting balance and ambulation of patients. Balance is highly associated with trunk symmetry and function. Static and dynamic balance is prognostic element for rehabilitation in stroke as head control and movements of limbs provide strong impact on activities of daily living. Core strengthening exercises play important role in functional conclusions in stroke patients. As stated in International Classification of Functioning, Disability and Health, 70.5% of the primary outcomes classified were in domain of activity and participation.

Core strengthening is essential for maintaining the correct posture of the lumbar and pelvic regions throughout sports activities. Exercises for core strengthening act as treatment for simultaneously engaging the abdominal and multifidus muscles in order to stabilize the body and head during the starting point of limb movements and during the procedure of these movements. The cooperative contractions of transversus abdominis and multifidus muscles enhance the stability of each part when the spine is in neutral position or in motion.³

The core strengthening exercise consist of three sub parts, bed exercises, wedge exercises and ball exercises. First, the bed exercises without devices consist of bridge exercise, bridge exercise with legs crossed, bridge exercises with one leg, curl ups with straight reaching, curl ups and side bridges exercises. Second, the wedge exercises consisting of curl ups with straight reaching, curl ups with diagonal reaching and curl ups with arms crossed and ball exercise. Core strengthening exercise along with conventional therapy are as follows: pelvic control exercise, bridging, curl up, side bridging exercise, range of motion exercise, mobility exercises and stretching exercises.

Trunk impairment scale (TIS) was used to assess trunk performance in patients with neurological conditions. Its reliability has been reported as 0.82. Trunk impairment scale evaluates both static and dynamic trunk balance, as well as trunk coordination. The subscales scores are 7 for static sitting balance, 10 for dynamic sitting balance, and 6 for trunk coordination. The total score ranges from 0 to 23, with higher scores indicating better trunk performance. Dynamic balance ability was measured using the Timed Up and Go Test (TUG).⁴

Task-oriented approach, movement appears as an interaction between various systems in the brain and is coordinated around a goal and restricted by the environment. Task-related practice is approved during stroke rehabilitation to enhance functional performance of daily activities such as walking and reaching to grab objects.⁵

Task oriented exercise could provide appropriate visual input and, substitutes for missing or decreased proprioceptive input from the affected body side. Task oriented training improves motor performance, motor control strategies, sensory recovery, and daily function more than the traditional treatment.⁶

AIM OF THE STUDY

The aim of the study is to compare the effects of core strengthening with conventional therapy v/s task oriented exercise with conventional therapy in improving balance and functions in stroke.

OBJECTIVES OF THE STUDY

- ❖ To assess the efficacy of core strengthening along with conventional therapy in improving balance and functions in stroke patients.
- ❖ To assess the efficacy of task oriented exercise along with conventional therapy in improving balance and functions in stroke patients.
- ❖ To find which treatment is better in improving balance and functions in stroke.

NEED OF THE STUDY

Although many studies have done on core strengthening and task oriented exercise but none has done a comparative study between core strengthening with conventional therapy versus task oriented exercise with conventional therapy in improving balance and functions in stroke.

PURPOSE OF THE STUDY

The purpose of stroke rehabilitation is to treat the underlying cause of balance issues, enhance strength and stability, it also ensures safe and efficient ways or procedures to improve balance and function in patients with stroke.

HYPOTHESIS

- ❖ **Experimental Hypothesis:** There may be significant difference between the effect of core strengthening with conventional therapy and task oriented exercise with conventional therapy in improving balance and functions in stroke.
- ❖ **Null Hypothesis:** There may not be any significant difference between the effect of core strengthening with conventional therapy and task oriented exercise with

conventional therapy in improving balance and functions in stroke.

REVIEW OF LITERATURE

Nishu Sharma et. Al (2018) did study on Stroke. 30 subjects are taken for the study and divided into two groups, group A and group B. The study was conducted in the Department of Physiotherapy, SGRRIMHS, patelnagar Dehradun (Uttarakhand). A sample of 15 subjects each in 2 groups The study concluded that hand functions improved by Intermittent Pneumatic Compression and Mirror Therapy in sub-acute stroke subject sand interventions should be emphasize to restore motor and sensory function.⁷

Niranjan Kumar, et al. (2020) This study concluded that Modified Constraint Induced Movement Therapy (mCIMT) is more effective than Mirror Therapy (MT) in upper extremity and hand functions in stroke patients. In this study the patients from mild to moderate and moderate to severe post stroke indispensability and Mirror Therapy (MT) both was improved better in stroke patients. But when we have compared than it showed Constraint Induced Movement Therapy (mCIMT) is more effective than Mirror Therapy (MT) in upper extremity and-hand functions in stroke patients. So hypothesis accepted.⁸

Shama Praveen, Niraj Kumar, Archana Chauhan (2018) did study of This research was done to find out the combined-effect of mirror therapy and thermal stimulation on functional independence of upper limb in sub-acute stroke cases. 30 participants between 45-65 years of age with clinical diagnosis of stroke. Patients were randomly divided into two groups i.e. group A and group B. Each group contain 15 patients and treatment was administered for 6 times a week over a period of 4 weeks. The treatment comprises of 30 minutes of mirror therapy and thermal stimulation. Outcome was measured in terms of UEFI score, to record the functional improvement in the upper limb. Paired 't' test was done for statistical analysis. Results showed there was significant improvement in functional independence of upper limb, based on pre and post UEFI scores in patients who were administered mirror therapy and thermal stimulation for duration of 4 weeks. On comparing both groups group A shows significant improvement than group B.⁹

A. Anas Ahamad (October 2019) et al. Conducted a study on the comparison between the effects

of task oriented training program and balance training on improving balance in stroke patients. 30 patients was sampled within the age group of 40-65 years with Stroke were randomly divided into two groups, Group A (n=15) and a group B (n=15). The subjects in the group A is treated with Task oriented training program and the subjects in the group B is treated with balance training. Balance is measured by Berg Balance Scale and Performance oriented Mobility Assessment before and after completion of six months of treatment program. The 6 months exercise program shows that Task oriented training program was more effective in improving balance in Stroke.

Hosam Magdy Metwally (Nov 23, 2015) *et al.* Conducted a study on the effectiveness of task oriented program and balance exercises on postural stability in stroke patients. 30 stroke hemiparetic subjects were assigned into two equal groups (group I and II): group (I) received task oriented training program in addition to selected physical therapy program (PNF technique, weight bearing exercises and gait training) while group (II) received balance exercise in addition to selected physical therapy program (PNF technique, weight bearing exercises and gait training). Subjects were assessed using biodex stability system including postural stability test. Task oriented training could be considered a valuable method for treating balance in stroke patients.

Chanuk Yoo, JuHyung Park (Aug 27, 2015) *et al.* Conducted a study on the Impact of task-oriented training on hand function and activities of daily living after stroke. Subjects: Thirty-two patients who had been diagnosed with stroke and underwent rehabilitation therapy participated in the task-oriented training. Methods: The participants carried out task-oriented training for 30 min per day for 4 weeks. Their hand function and activities of daily living were evaluated before and after the training. Results: The task-oriented training had a significant impact in terms of improving hand function and activities of daily living. Conclusion: According to the results of this study, task-oriented training resulted in improved hand function and activities of daily living in stroke patients.

METHODOLOGY

In this study 36 patients having stroke were divided into two groups. 18 patients were included in group A and 18 patients in group B. These subjects were solicited from the Shri Mahant Indires Hospital, Department of Physiotherapy and Neurology

Dept., Patel Nagar, Dehradun (Uttarakhand) and selected according to the inclusion and exclusion criteria.

Inclusion Criteria: Age below 65 years, Both genders male and female, Patient with a history of first-time stroke, Patient who achieved sitting for at least 10s, Patient who have acute and subacute ischemic stroke, Patient who had a definite diagnosis of stroke confirmed through CT or MRI.

Exclusion Criteria: Age above 65years, Unable to communicate and unable to follow commands, Patient who are paralyzed on both sides (Quadriplegia), Any visual, sensory and hearing impairment.

Outcome Measures: Berg Balance Scale (BBS), Trunk Impairment Scale (TIS), Stroke Specific Quality Of Life Scale (SSQOL), Time Up And Go Test (TUG).

PROCEDURE

The subjects were screened for inclusion and exclusion criteria and then the baseline measurement was taken. An informed consent was taken from patients who were willing to participate in the study. Eligible subjects were randomly allocated into two groups. Group A participants receiving core strengthening along with conventional therapy. Group B participants receiving task oriented exercise along with conventional therapy. Both groups had received exercises program for improving balance and function. The study was of 8 weeks, 6 days per week at Department of Physiotherapy and Neurology Dept., Shri Mahant Indires Hospital, Patel Nagar, Dehradun, Uttarakhand. Examination include assessment which was performed on first and the last day of treatment & data was recorded in group A pre scoring was via Berg Balance Scale (BBS), Trunk Impairment Scale (TIS), Stroke Specific Quality Of Life Scale (SSQOL) and Time Up And Go Test (TUG) and after the scoring the patient undergone treatment with core strengthening along with conventional therapy and task oriented exercise along with conventional therapy.

❖ **In Group A,** core strengthening exercises were performed alongside conventional therapy 6 days a week for 8 weeks, with each session lasting 40 minutes. The training progressed by increasing the number of repetitions from 4 to 5 based on the patient's condition.

❖ **Core Strengthening:** Core strengthening

involves coordinating the muscles of the pelvis, lumbar region, and hips to stabilize the vertebral column, maintaining an erect posture during activities such as sitting, standing, and walking, while preventing spinal buckling.

- ❖ **Conventional Therapy:** Conventional therapy encompasses a range of evidence based treatment techniques selected by a physiotherapist and commonly used worldwide for managing specific conditions (Kishner and Colby, 2007).

Exercise 1 consisted of core strengthening exercises: Pelvic control exercise, bridging exercises, curl up, side bridging exercise.

Pelvic control exercises include anterior-posterior tilts, lateral shifts, and transverse rotations, and are performed in an upright posture. Bed exercises, such as bridging, are also utilized.

Bridging exercise: Progression starts with bridging on both legs, advancing to one-legged bridging, and then side bridging. Side bridging targets the internal and external oblique's as well as the quadratus lumborum.

Curl-ups: These are performed with progressions from straight reaching to diagonal reaching, and with arms crossed. Patients perform curl-ups to a 15-degree angle in a crook-lying position and hold this position for 10 seconds. Additionally, the multifidus muscle is activated by having the patient in a quadruped position, lifting one arm at a time, followed by alternating leg extensions.

Exercise 2 consisted of conventional therapy: Range of motion exercises, mobility exercises, stretching.

In Group B, task-oriented exercises were combined with conventional therapy, conducted 6 days a week for 8 weeks. Each session lasted 40 minutes, with progression achieved by increasing the number of repetitions from 5 to 6 based on the patient's condition.

TASK ORIENTED EXERCISE

Task oriented exercise originates from movement science and motor skill learning literature. In this approach, patients practice motor tasks that are specific to real-life contexts and receive feedback during the process. In the field of skill learning, it is linked to various practice conditions, types of feedback, and transfer conditions that help improve

the application of learned skills.

Group B will perform Task oriented exercises with conventional therapy

- **Exercise 1:** Heel lifts (repeat 5 times)
- **Exercise 2:** Slow unilateral and bilateral arm movements along with slow forward and backward walking (repeat for 5-6 times).
- **Exercise 3:** Walking 3 meters, turning the patient around a target point and return to the starting point (repeat for 5-6 times).
- **Exercise 4:** Standing up from a chair (repeat for 5-6 times).
- **Exercise 5:** Reaching and Grasping: Using the unaffected hand, the patient hold a ball and performs reaching and grasping movement (repeat for 5-6 times).
- **Exercise 6:** From standing position on balance board, patient holds a ball in unaffected hand and performs reaching and grasping while maintaining balance on the board (repeat for 5-6 times)
- **Exercise 7:** Conventional therapy: Range of motion exercises, mobility exercises, stretching.



Fig. 1: Showing Pelvic control exercise; Bridging exercise in supine position with knee flexed, Arms rest at your sides, palms facing down. (Core Strengthening exercises)



Fig. 2: Showing Range of motion exercises: Knee flexion in supine position. (Conventional Therapy)



Fig. 3: Showing Abduction with leg straight, lift the leg slightly parallel to the ground in supine position.



Fig. 4: Showing Straight Leg Raise (SLR) in supine lying position with legs straight and arms on side.



Fig. 5: Showing Reaching and grasping: Using the unaffected hand, the patient hold a pen or an object and performs reaching and grasping movement (repeat for 5-6 times) in sitting position.

DATA ANALYSIS

To determine if the differences between groups are statistically significant:

1. **Calculate Mean and Standard Deviation:** For each group and outcome measure.
2. **Perform t-tests:** To compare pre and post-treatment changes between groups. A paired t-test for within-group changes

and an independent t-test for between-group comparisons.

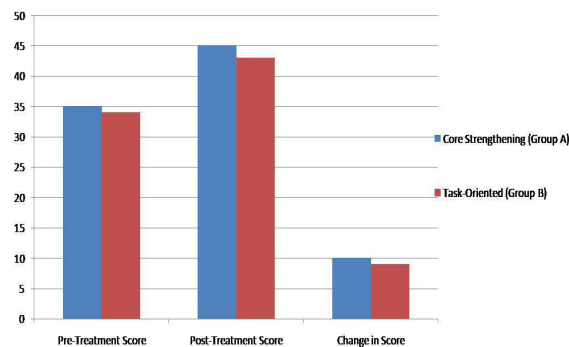
3. **Analyze p-values:** To determine if the differences are statistically significant (typically, $p < 0.05$).

STATISTICAL SOFTWARE

Statistical analysis was carried out physically as well as with statistical software SPSS 21 version and Microsoft word, Excel has been used to generate graphs table etc. Various statistical measures such as mean, standard deviation, paired t-test were utilized for all the scores of participants included in the study. To analyze the difference between Group A and B in pre and post intervention.

RESULT

The result of data analysis of the outcomes measures that is with BBS, TIS, SSQOL and TUG within the group A and B. The score was analyzed and interpreted to determine which intervention is more effective in improving balance and function in stroke patients.



Calculation:

- **Change in Score for Group A:** Post-Treatment Score-Pre-Treatment Score = $45 - 35 = +10$
 $\text{Post-Treatment Score} - \text{Pre-Treatment Score} = 45 - 35 = +10$
- **Change in Score for Group B:** Post-Treatment Score-Pre-Treatment Score = $43 - 34 = +9$
 $\text{Post-Treatment Score} - \text{Pre-Treatment Score} = 43 - 34 = +9$

Table 1: Berg Balance Scale (BBS) Scores

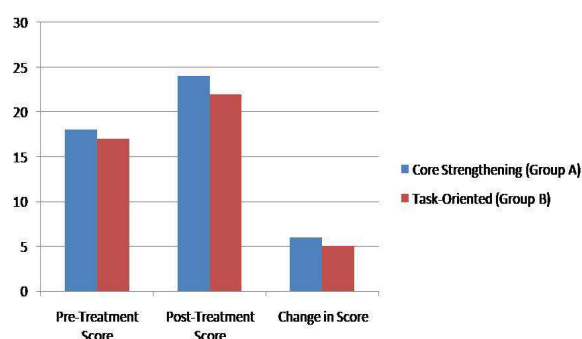
Group	Pre-Treatment Score	Post-Treatment Score	Change in Score
Core Strengthening with conventional therapy (Group A)	35 ± 4.5	45 ± 3.2	+10
Task-Oriented exercise with conventional therapy (Group B)	34 ± 4.8	43 ± 3.5	+9

Calculation:

- **Change in Score for Group A:** Post-Treatment Score–Pre-Treatment Score=45–35=+10\text{Post-Treatment Score} - \text{Pre-Treatment Score} = 45 - 35 = +10Post-Treatment Score–Pre-Treatment Score=45–35=+10
- **Change in Score for Group B:** Post-Treatment Score–Pre-Treatment Score=43–34=+9\text{Post-Treatment Score} - \text{Pre-Treatment Score} = 43 - 34 = +9Post-Treatment Score–Pre-Treatment Score=43–34=+9

Table 2: Trunk Impairment Scale (TIS) Scores

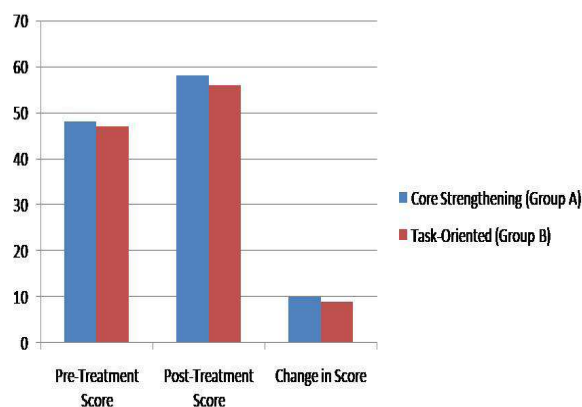
Group	Pre-Treatment Score	Post-Treatment Score	Change in Score
Core Strengthening with conventional therapy (Group A)	18 ± 3.0	24 ± 2.5	+6
Task-Oriented exercise with conventional therapy (Group B)	17 ± 3.2	22 ± 2.8	+5

**Calculation:**

- **Change in Score for Group A:** Post-Treatment Score–Pre-Treatment Score=24–18=+6\text{Post-Treatment Score} - \text{Pre-Treatment Score} = 24 - 18 = +6Post-Treatment Score–Pre-Treatment Score=24–18=+6
- **Change in Score for Group B:** Post-Treatment Score–Pre-Treatment Score=22–17=+5\text{Post-Treatment Score} - \text{Pre-Treatment Score} = 22 - 17 = +5Post-Treatment Score–Pre-Treatment Score=22–17=+5

Table 3: Stroke-Specific Quality of Life (SSQOL) Scores

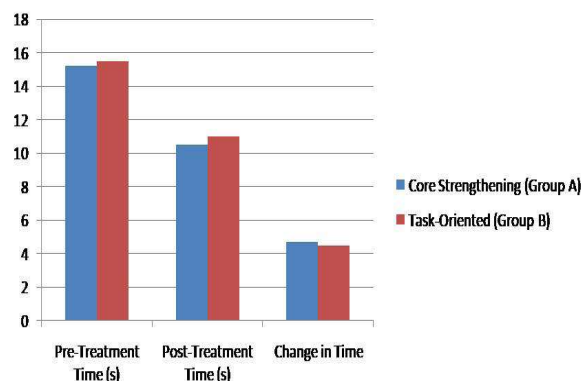
Group	Pre-Treatment Score	Post-Treatment Score	Change in Score
Core Strengthening with conventional therapy (Group A)	48 ± 6.0	58 ± 5.5	+10
Task-Oriented exercise with conventional therapy (Group B)	47 ± 6.2	56 ± 5.8	+9

**Calculation:**

- **Change in Score for Group A:** Post-Treatment Score–Pre-Treatment Score=58–48=+10\text{Post-Treatment Score} - \text{Pre-Treatment Score} = 58 - 48 = +10Post-Treatment Score–Pre-Treatment Score=58–48=+10
- **Change in Score for Group B:** Post-Treatment Score–Pre-Treatment Score=56–47=+9\text{Post-Treatment Score} - \text{Pre-Treatment Score} = 56 - 47 = +9Post-Treatment Score–Pre-Treatment Score=56–47=+9

Table 4: Timed Up and Go Test (TUG) Times (Seconds)

Group	Pre-Treatment Time (s)	Post-Treatment Time (s)	Change in Time
Core Strengthening with conventional therapy (Group A)	15.2 ± 1.8	10.5 ± 1.6	-4.7
Task-Oriented exercise with conventional therapy (Group B)	15.5 ± 2.0	11.0 ± 1.7	-4.5

**Calculation:**

- **Change in Time for Group A:** Pre-Treatment Time - Post-Treatment Time = $15.2 - 10.5 = -4.7$ Pre-Treatment Time - Post-Treatment Time = $15.2 - 10.5 = -4.7$
- **Change in Time for Group B:** Pre-Treatment Time - Post-Treatment Time = $15.5 - 11.0 = -4.5$ Pre-Treatment Time - Post-Treatment Time = $15.5 - 11.0 = -4.5$

DISCUSSION

The present study aimed to “Compare the effects of core strengthening with conventional therapy versus task-oriented exercises with conventional therapy in improving balance and function in stroke.

A stroke occurs when there is an interruption in the blood supply to the brain, leading to brain damage. Approximately 15% of the strokes worldwide are the consequence of intracerebral hemorrhage. Stroke rehabilitation focuses on improving motor function, balance, and overall independence in daily activities.

Two popular approaches to rehabilitation are core strengthening exercises and task-oriented exercises, both combined with conventional therapy, developed to improve balance and

function in stroke patients. Previous studies in stroke suggested that core strengthening exercises and task-oriented exercises may be beneficial for improving balance and function in stroke patients.

Chung *et al.* (2021) conducted that core strengthening exercises combined with conventional therapy significantly improved balance and postural control in stroke patients. The enhancement of trunk stability led to improved static and dynamic balance, which directly contributed to better overall functional mobility. The targeted approach of strengthening the core muscles addressed a fundamental deficit in stroke patients and reduced compensatory movement patterns.

Eun-Jung Chung, PT, PhD (Jan 24, 2013) *et al.* Conducted a study on the effectiveness of core stabilization exercise on dynamic balance and gait function in stroke patients. The results of this study suggest the feasibility and suitability of core stabilization exercise for stroke patients.

Seong-Hun Yu (Jun 30, 2013) *et al.* Conducted a study on the effects of core stability strength exercise on muscle activity and trunk impairment scale in stroke patients. The control group (n = 10) underwent standard exercise therapy, while the experiment group (n = 10) underwent both the core stability-enhancing exercise and standard exercise therapy simultaneously. The results of this study show that the core stability-enhancing exercise is effective in improving muscle activity of the lower trunk, which is affected by hemiplegia.

There is a significant in post intervention in core stabilization exercise with conventional therapy (Group A) < 0.05 which shows greater improvement in balance and functional activity than task-oriented exercises with conventional therapy (Group B).

The statistical value obtained from above experiment shows that group ‘A’ (Core strengthening exercises along with conventional therapy) has better improvement in balance and functional activity than group ‘B’ due to highly significant increase in value of group ‘A’ patients.

Clinically this study demonstrated that by using core stabilization exercise with conventional

therapy and task oriented exercise with conventional therapy, the improvement was seen in core stabilization exercise with conventional therapy in improving balance and function in stroke patients.

Limitations of Study

- **Sample Size:** If the sample size is small, it may affect the reliability of the results. Larger studies are needed to confirm these findings.
- **Measurement Variability:** Variability in pre- and post-treatment scores can influence the results. Ensuring consistent assessment procedures and reducing variability can strengthen the study's findings.
- **Follow-Up:** Long-term effects of these interventions were not assessed. Future studies should include follow-up assessments to evaluate the sustained impact of the treatments.

Future Research

- **Longitudinal Studies:** Investigate the long-term benefits and sustainability of core strengthening and task-oriented exercises.
- **Mechanistic Studies:** Explore the underlying mechanisms through which core strengthening improves balance and quality of life.
- **Comparative Studies:** Compare the effectiveness of these interventions with other rehabilitation strategies to determine the most effective approaches for stroke rehabilitation.

CONCLUSION

This study provides valuable insights into the effectiveness of core strengthening with conventional therapy versus task-oriented exercises with conventional therapy in improving balance and function in stroke patients. Both interventions show promise, with core strengthening with conventional therapy generally demonstrating slightly superior outcomes. Future research should aim to confirm these findings and explore additional factors that contribute to rehabilitation success.

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