

Impact of Task Oriented Training on Activities of Daily Living in Post Stroke Rehabilitation: A Single Arm Randomised Controlled Trial

Manivannan S.^{1*}, CKV Bhuvaneswari²

¹PhD Research Scholar, Division of Physical Medicine & Rehabilitation, Annamalai University, Chidambaram, Tamil Nadu

²Lecturer, Division of Physical Medicine & Rehabilitation, Annamalai University, Chidambaram, Tamil Nadu

*Corresponding author's: Manivannan S.

Article History	Abstract
Received: 06 June 2023 Revised: 05 Sept 2023 Accepted: 18 Nov 2023	Introduction: There are several complications following the stroke including reduced functional independence, inability to maintain adequate posture, alterations in daily activities and several others. Physical therapy intervention aims at improving the stated complications targeting the task-oriented approach. This study investigated the effect of task-oriented training in post stroke patients on activities of daily living. Methodology: In this single-arm randomized controlled trial, 10 post-stroke males with hemiparesis and functional limitations in activities of daily living (ADL) were recruited following informed consent. The study implemented a structured intervention including activities like Forward Reach and Grasping Pen in sitting, Ball squeeze, stacking rings, piling up the Cones, Pegboard activities, Ball kicking, and Stepping drill. Each activity had a different dosage based on the specific drill performed. Pre and post-test evaluations were conducted on Day 0 and Day 21, utilizing the Functional Independence Measure (FIM) and Barthel Index (BI). Results: Within the group comparisons revealed statistically significant differences ($p < 0.05$). The pre and post-test readings for FIM were evaluated as 52.50 ± 15.130 and 69.0 ± 11.972 respectively and for BI were observed as 61.0 ± 14.870 and 74.50 ± 7.619 respectively. Conclusion: Task-oriented training is an effective and viable method for enhancing functional independence and strength in activities of daily living (ADLs) in patients with hemiparesis following stroke.
CC License CC-BY-NC-SA 4.0	Keywords: Stroke, Task-oriented training, Functional Independence Measure (FIM).

1. Introduction

The World Health Organization (WHO) defines a stroke as follows: a sudden onset of clinical evidence of a worldwide disruption of brain activity that lasts for 24 hours or more, or that results in death with no discernible cause other than vascular origin¹. CVA, also referred to as a stroke, is a disease that results from inadequate blood flow to the brain. The brain receives less oxygen and nutrients when there is a decline in blood flow, which damages the brain's tissues and causes function loss².

A stroke is defined as an abrupt neurological eruption brought on by insufficient blood flow to the brain. Blood flow to the brain is regulated by two vertebral arteries in the back and two internal carotid arteries in the front (circle of Willis)³. Abrupt cessation of cerebral blood flow and depletion of oxygen and glucose initiate a series of pathogenic processes. The penumbra around the dying neurons in the ischemic core tissue lasts a little while longer, but the neurons themselves perish within minutes. Cell survival is significantly impacted by an ischemia episode's duration and severity. Cerebral oedema, or the accumulation of fluid in the brain following an ischemic stroke, starts minutes after the event and peaks three to four days later. Tissue necrosis, extensive cell membrane rupture, and fluid migration into the brain tissues from the circulation are the causes. Over time, the swelling normally goes away in two to three weeks. By increasing intracranial pressure, significant oedema can lead to neurological impairment and intracranial hypertension⁴.

Globally, stroke is a major public health concern. Stroke's estimated adjusted prevalence rates are 334–424/100,000 in urban areas and 84–262/100,000 in rural areas. Current population-based research indicates that the incidence rate ranges from 119 to 145 per 100,000. 80.1 million stroke victims globally

occurred in 2016, comprising 41.1 million women (38.0–44.3) and 39.0 million men (36.1–42.1). Approximately 795,000 Americans have a new or recurrent stroke each year. In 2016, one out of every 19 deaths in the US were caused by a stroke, which occurred once every three minutes and 42 seconds.⁵. According to community-based research, the incidence of stroke in India ranges widely, from 147-922 per 100,000 people⁶. According to a 2012 update to the India stroke factsheet, the estimated age adjusted prevalence rate for stroke in rural regions is between 84 and 262/100,000, and 334-424/100,000 in urban areas⁷.

During task-oriented training, patients practice everyday tasks to develop control over a range of functional activities and postures. This approach helps patients become less dependent on assistive devices and move toward greater independence⁸. Based on system theory, task-oriented training is a restorative and rehabilitative method for improving motor control. This was introduced by Bernstein in 1967 to help individuals with aberrant movement get back on track. This strategy involves a training program that concentrates on particular functional tasks in order to improve and maintain optimal functional capability⁹.

Task-specific training is a type of therapy that concentrates on getting the patient to do vital bodily tasks. The therapist grades or advances the exercise to make sure the client continues to find it challenging. It is regularly employed to promote "learning"⁹. Gaining control over a range of functional activities and postures is the aim of this training. Attain active motions following a period of assisted active activity.

Transition the patient from requiring assistive devices to autonomous function as soon as they are able to do so. to effectively battle the effects of immobility and the emergence of secondary disabilities including loss of flexibility and weakening of the muscles. to promote CNS healing while avoiding learned inactivity of the afflicted areas⁹. The assignments need to be difficult, progressively adjustable, and require involvement from the participants. It is important to separate it from repetitive training, where a task is usually divided into smaller parts and then put back together into a larger task after each part is understood.

Task-oriented training has become the gold standard for motor restoration in cases with stroke-induced motor impairments. According to *Shumway Cook & Woollacott (2001)*, movement emerges as an interplay between multiple brain systems that are arranged around a goal and limited by the surroundings in a task-oriented manner¹⁰. The active application of task-oriented training will lead to improvements in functional outcomes and general health-related quality of life for stroke survivors. Task-oriented training is beneficial for stroke survivors. Training focused on impairments is giving way to training based on activities. Personal training needs to be purposeful, task-specific, and repetitive. Numerous task-oriented training treatments are applicable to everyday nursing practises, including walking on the floor, rising from a sitting position to a standing one, reaching and sitting, grasping objects, and arranging objects. Instead of being therapist-centered, this type of training is task- and patient-centered¹⁰. The purpose of this study was to determine how well task-oriented training affected daily living activities for post-stroke patients.

2. Materials And Methods

10 post stroke males of age group 45-65 years with hemiparesis and having difficulty in ADLs participated in this single arm randomised controlled trial. All the participants assigned for the study were in rehabilitation phase, they were having active movement and were able to perform task specific activities. Post stroke individuals in acute phase and those with other neurological conditions with hemiplegia were not allocated to the study. The study was performed at Division of Physical Medicine and Rehabilitation, Annamalai University, Tamil Nadu. An informed consent was procured prior to the commencement of the study.

Every participant went through a planned therapy regimen that included Forward Reach and Grasping Pen exercises. In these exercises, the patient sat in a chair and attempted to reach for a pen, grab it, and then release it with the afflicted hand. There were two sets and eight repetitions. The patient was instructed to write on a sheet of paper while sitting in a chair. The affected hand would write on the paper while the non-affected hand stabilized it. This was done for ten minutes every day. The patient was instructed to sit in a chair with his forearm resting on the armrest for another drill in which they had to squeeze a sponge ball. The patient was directed to squeeze and release a sponge ball ten times in two sets, placed in the palm of the affected hand. Another activity the patient completed was a "stacking drill" in which he was instructed to remove rings from a tower and reposition them there. If necessary, the patient was allowed to use his unaffected hand for support. Another drill had the patient stack cones in a pile on the right side of a table, raise them with his afflicted hand, and then position them in a

straight row on the left side of the table for eight repetitions in a set. The patient was next given the opportunity to place blocks on a wooden pegboard in a different set of exercises. He was told to use his afflicted hand to remove and reposition the blocks on the pegboard, and he was also free to use his non-affected hand for support if necessary. He was permitted to use the injured leg to kick a ball for eight repetitions across two sets of standing and sitting. Using a stepper with your feet To start, place your entire right foot on the stepper. Press through your right heel as you step onto the stepper, bringing your left foot to meet your right to create a standing stance. As soon as both feet are on the ground, take a step down with your right foot first, then with the left. Do two sets of ten repetitions. The Barthel Index and the Functional Independence Measure (FIM) were used to gauge the effectiveness of the treatment plan. The Functional Independence Measure (FIM) is a non-diagnostic instrument designed to gauge impairment across various demographic groups. The FIM equipment consists of the self-care assessments include sphincter control, transfers, movement, communication, and social cognition.

FIM is an ordinal scale consisting of seven levels and eighteen elements that is intended to identify changes that occur during the course of an inpatient medical rehabilitation program. Ranks functional status according to the amount of help needed, ranging from complete independence to complete support. The tool is used to assess the degree of handicap a patient has and any modifications to that degree¹¹. The Barthel Scale/Index (BI), on the other hand, is an ordinal scale that is used to evaluate performance related to everyday living (ADL). A higher score denotes greater capacity for independent functioning after hospital discharge. The value assigned to each item is based on the time and physical assistance required to finish it. The Barthel Index evaluates a person's requirement for help with ten daily life activities. The original Index is a three-item ordinal rating scale that a therapist or other observer can administer in 2–5 minutes. Each item is rated according to the patient's ability to perform the action on their own, with some assistance, or in need of assistance based on observation (0=unable, 1=needs assistance, 2=independent). Multiply the final score by 5 to obtain a score on a 100-point scale. According to suggested recommendations, scores of 0–20 denote "complete" dependency, 21–60 denote "severe" dependency, 61–90 denote "moderate" dependency, and 91–99 denote "slight" dependency¹².

3. Results and Discussion

10 male post stroke individuals of mean age 55.10 ± 5.466 years participated in the study with the mean BMI calculated was 28.10 ± 2.601 . After a comprehensive evaluation, pre-test readings of the outcome measure were collected on Day 0, and after the accomplishment of the intervention the post-test readings of the outcome measures were taken on Day 21. On comparing the outcome within the group, the pre-test and post-test values of Functional Independent Measure (FIM) came out to be 52.50 ± 15.130 and 69.0 ± 11.972 respectively and that for Barthel Index the pre-test and post-test values came out to be 61.0 ± 14.870 and 74.50 ± 7.619 respectively. Within the group comparisons of both the variable was found to be statistically significant ($p < 0.05$).

The discussion that follows attempts to clarify the findings and observations from this inquiry in the context of the evidence that is currently available. Numerous studies have shown that improving ADLs with task-oriented training after a stroke improves functional condition, allows for independent living, and shields against low quality of life.

A significant amount of effort is needed to execute daily tasks, which are heavily reliant on limb function and are essential for carrying out small movements like eating and dressing. Because they limit daily activities, finding solutions for hand function issues in stroke patients is crucial.

The active application of task-oriented training will lead to improvements in functional outcomes and general health-related quality of life for stroke survivors. Task-oriented training is beneficial for stroke survivors. In this study, task-oriented training is largely used within a strong evidence-based framework to improve fine motor skills in patients who struggle with basic everyday tasks. Consequently, task-oriented training is a viable rehabilitation approach to improve ADLs. The assignments ought to be difficult and progressively adjustable, necessitating full engagement.

In a study to evaluate the impact of priming on task-oriented training on upper extremity outcomes (body function and activity) in chronic stroke patients, *Erika Shirley Moreira da Silva et al. (2013)* came to the conclusion that combining task-oriented training with priming could be a promising intervention strategy for improving upper extremity function in chronic stroke patients. An additional investigation by *Veronica T. Rowe and Marsha Neville¹⁴ (2020)* examined the efficacy of a TOTE Home (Task Oriented Training and Evaluation at Home) program for individuals suffering from subacute stroke. The findings indicated that by utilizing client-centered, salient tasks, TOTE Home improved motor function and promoted an adaptive response that led to sustained improvement following the

intervention. *Byoung-Jin Jeon, Won-Ho Kim, Eun-young Park, (2015)*¹⁵ found that task-oriented training therapies were successful in improving muscle strength and gait-related activities in both acute and chronic stroke patients. This was achieved by conducting a meta-analysis on repetitive or circuit training in order to better understand the effects of task-oriented training on stroke survivors. Using the data from the aforementioned investigations, a workout program was created and implemented. When the arm and lower extremity are trained simultaneously with integrated meaningful tasks, specific functional activities increase. Because observation was added, this intervention's effects were noticeably greater than those of physical training alone. This could account for the notable improvements in the FIM and Barthel index scores following the training course.

Based on the present results the implementation of task-oriented training to improve activities of daily living in post stroke rehabilitation under the guidance of a physical therapist may prove valuable in getting positive outcomes in FIM and Barthel index among stroke survivors in rehabilitative phase.

4. Conclusion

By the virtue of this study, it is concluded that task-oriented training is an effective and feasible training method for increasing function and strength in ADL'S in people who have had a chronic stroke with hemiparesis. Task oriented training is practicing real life tasks with the goal of gaining control over a variety of functional activities, moving them away from the use of assistive devices and towards a more independent living. Task oriented training is effective.

Limitations:

This study could reach out to a limited number of participants and could not make out with a long term follow up. So, we suggest that addition of a control group and a placebo would rather enhance the quality of the research.

Conflict of Interest: There was no conflict of interest among the authors.

References:

1. Ada L., Dorsch S. & Canning C.G. 2006 Strengthening interventions increase strength and improve activity after stroke: a systematic review. *The Australian Journal of Physiotherapy* 52(4), 241–248.
2. Aichner F., Adelwohrer C. & Haring H.P. 2002 Rehabilitation approaches to stroke. *Journal of Neural Transmission. Supplementum* 63, 59–73.
3. Woodruff T.M., Thundiyil J., Tang S.C., Sobey C.G., Taylor S.M., Arumugam T.V (2001). Pathophysiology, treatment, and animal and cellular models of human ischemic stroke. *Mol. Neurodegener.*
4. Prasad K, Vibha D, Meenakshi Cerebrovascular disease in South Asia – Part I: A burning problem. *JRSM Cardiovasc Dis.* 2012.
5. Bansal BC, Prakash C, Jain AL, Brahmanandam KR. Cerebro-vascular disease in young individuals below the age of 40 years. *Neurol India.* 1973,11–18.
6. Banerjee TK, Mukherjee CS, Sarkhel A. Stroke in the urban population of Calcutta—and epidemiological study. *Neuroepidemiology* 2002.
7. Ferry CP., et al. Prevalence of stroke and related burden among older people living in Latin America, India and China. *J Neurol Neurosurg Psychiatry* 2011,1074–1082.
8. Arya, K.N., Verma, R., Garg, R.K., Sharma, V.P., Agarwal, M., & Aggarwal, G.G. (2012). Meaningful task-specific training (MTST) for stroke rehabilitation: A randomized controlled trial. *Topics in Stroke Rehabilitation*, 19(3), 193-211.
9. Baskett, J.J., Broad, J.B., Reekie, G., Hocking, C., & Green, G. (1999). Shared responsibility for ongoing rehabilitation: a new approach to home-based therapy after stroke. *Clinical Rehabilitation*, 13, 23-33.
10. Ivey FM, Hafer-Macko CE, Macko RF (2008) Task-oriented treadmill exercise training in chronic hemiparetic stroke. *J Rehabil Res Dev* 45: 249-259.
11. Gosman-Hedstrom, G, and Svensson, E: Parallel reliability of the Functional Independence Measure and the Barthel index ADLIndex. *Psychiatry* 73:188, 2000
12. Wade, D., & Collin, C. (1988). The Barthel ADL Index: A standard measure of physical disability, *International Disability Studies*, 10, 64-67.
13. Erika Shirley Moreira da Silva, Gabriela Nagai Ocamoto, The effect of priming on outcomes of task-oriented training for the upper extremity in chronic stroke: a systematic review and meta-analysis. *Neurorehabilitation and neural repair* 34 (6), 479-504, 2020
14. Veronica T Rowe, Marsha Neville Task oriented training and evaluation at home OTJR: occupation, participation and health 46-55, 2018.
15. Jeon BJ, Kim WH, Park EY. Effect of task-oriented training for people with stroke: a meta-analysis focused on repetitive or circuit training. *Top Stroke Rehabil.* 2015 Feb;22(1):34-43.