WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 14, Issue 15, 1776-1783. Research Article ISSN 2277–7105

EFFECT OF NEUROPLASTICITY WITH TASK SPECIFIC CIRCUIT TRAINING ON FUNCTIONAL ACTIVITIES OF UPPER LIMB AMONG ACUTE STROKE PATIENTS

Manjula S.*, Dr. P. Senthil Selvam and Diana

[1]MPT, Research Scholar, School of Physiotherapy, Vistas, Thalambur, Tamil Nadu- 600130, India.

[2]PHD, Prof, HOD, School of Physiotherapy, Vistas, Thalambur, Tamil Nadu- 600130, India.

[3]MPT, Vistas, Thalambur, Tamil Nadu- 600130, India.

Article Received on
20 June 2025,

Revised on 10 July 2025,
Accepted on 30 July 2025

DOI: 10.20959/wjpr202515-37873

***Corresponding Author**
Manjula S.
MPT, Research Scholar,
School of Physiotherapy,
Vistas, Thalambur, Tamil
Nadu- 600130, India.

ABSTRACT

Background: According to the study by Jong hoon moon et al (2018), the task specific circuit training group exhibited noteworthy advancements in terms of motor activity utilization compared to neurodevelopment treatment group, suggesting a significant recovery. The use of therapeutic tools may have a beneficial effect on the utilization of enhance their motor function and abilities in their arms and hands. **Aim Of The Study:** To assess the effect of neuroplasticity with task specific circuit training on functional activities of upper limb among acute stroke patients. **Objectives Of The Study:** To assess the effect of task specific circuit training on motor changes of upper limb. To assess the effect of task specific circuit training on functional activities of upper limb. **Methodology:** This study consists 30 samples of acute stroke patients were divided into 2 groups. Group A (experimental group) has 15 samples Group B (control group) has 15 samples. Task specific circuit training was given to group A and conventional physiotherapy were given to group B for the duration of 8 weeks. Pre and post values of CAHAI-13 (Chedoke arm and hand activity inventory scale) and Fugl meyer (upper extremity) were taken. **Result:** The Pre and post test values of Task specific circuit training in Chedoke arm and hand activity inventory scale(CAHAI-13) and Fugl meyer (upper extremity) showed significant improvement in functional activities of acute stroke patients. **Conclusion:** Neuroplasticity

with task specific circuit training was effective on functional activities of upper limb among acute stroke patients.

KEYWORDS: Stroke, task specific circuit training, neuroplasticity, functional activities, CAHAI-13, fugl meyer.

INTRODUCTION

Stroke is a second commonest cause of death[1] and fourth leading cause of disability worldwide.[2] Stroke is the leading cause of disability and functional impairments. The incidence of stroke increases dramatically with age, and doubling in the decade after 65 years of age.[3] Weakness (paresis) is found in eighty to ninety percent of all patients after stroke and is a major factor in disability. Patients are unable to generate the force necessary for initiating and controlling movements.[4] The degree of weakness is related to the location and size of the brain injury and varies from a complete inability to achieve any visible contraction to measurable impairments in force production.[5]

The effects on the upper extremities are major cause of functional impairment. This impairment of the upper extremity often leads to loss of independence with activities of daily living.[6] Indeed, hand function is crucial for performing delicate movements in daily life such as eating meals and dressing. Identification of solutions for hand function disorders in stroke patients is important, because they restrict everyday life activities.[7]

There are many interventions that are intended to help people regain function and range of motion in their hand and arm after stroke. Motor cognitive and perceptual disability could occur in patients who suffered brain damage from stroke, which could decrease there capacity to perform daily activities.[8]

Limited practice of motor activities is likely to have a negative impact upon functional recovery and could prolong impatient rehabilitation because of the patient dependency on the unaffected upper extremity for normal function.[9] which results in problems such as learned disuse , postural patterns, contractures and functional restriction involving the affected upper extremity[10]

Recovery and prognosis of stroke generally fastest in the first few weeks after onset, with measurable neurological and functional recovery occurring in the first month after stroke and these changes are largely due to functional induced plasticity.[11] A functional training

approach that emphasizes use of more involved extremities and an enriched environment effectively stimulates neural reorganization.[12] Carr and shepherd suggested task oriented training as a treatment method to help improve deteriorated motor skills of stroke patients and their capacity to perform daily activities and diverse functional activities properly applied to patients can help and improve their actual motor skills and capacity to perform daily activities.[13]

AIM OF THE STUDY

To assess the effect of neuroplasticity with task specific circuit training on functional activities of upper limb among acute stroke patients.

OBJECTIVES OF THE STUDY

- To assess the effect of task specific circuit training on motor changes of upper limb.
- To assess the effect of task specific circuit training on functional activities of upper limb.

RESEARCH DESIGN AND METHODOLOGY

An experimental study design was conducted with 30 stroke patients within the age group ranging between 40 and 65 years who fulfilled the inclusion and exclusion criteria.

INCLUSION CRITERIA

- stroke patients with 40-65 years of age
- Both male and female
- Mini mental state examination score more than or equal to 24
- Modified Ashworth scale score more than or equal to, 2 in all upper limb muscles
- Medically stable patients.

EXCLUSION CRITERIA

- Multiple stroke
- Cognitive impairments
- Orthopedic condition of upper limb
- Uncorrectable Visual deficits
- Patients with other neurological disorder/musculoskeletal problems.

OUTCOME MEASURES

- Fugl meyer assessment (upper limb)
- Chedoke arm and hand inventory scale (CAHAI-13)

PROCEDURE

The total 30 samples who fulfilled the inclusion and exclusion criteria were recruited for the study. Written informed consent was obtained from the samples. The procedures were explained to the samples, they were divided into two groups namely group A -15 samples (task specific circuit training) and group B -15 samples (conventional physiotherapy).

INTERVENTION

GROUP A

- 5 sessions per week for a duration of 8 week were given, which involved four different workstation.
- Duration of each session were 50 minutes
- Workstation 1 focused on enhancing reaching griping and transferring of objects.
- Workstation 2 aimed at improving strength and control of upper extremity.
- Workstation 3 aimed at improvement of grip, precision of dexterity of the upper extremity.
- Workstation 4 aimed at achieving advanced motor task with upper extremity.

GROUP B

- 5 sessions per week for a duration of 8 week
- Conventional physiotherapy was given for 45 minutes per session
- Stretching
- Strengthening
- Weight bearing exercise

EXERCISE PROTOCOL

GROUP A (experimental group)

S. NO	TASK SPECIFIC CIRCUIT TRAINING
1	Reaching for an object
2	Lifting an empty glass
3	Opening and closing of bottles
4	Moving pegs
5	Stacking cups
6	Using spoon and taking it near the mouth
7	Counting changes [coins]
8	Combing hair
9	Stacking books and newspaper
10	Buttoning of shirt

Figure 1: Buttoning Of Shirt.

Figure 2: Opening & Closing of Bottle.

GROUP B (control group)

S.NO	CONVENTIONAL PHYSIOTHERAPY
1	Passive movements
2	Active assisted movements
3	Mirror therapy
4	Stretches of upper extremity
5	Strengthening of upper limb
6	Weight bearing exercise
7	Balance training
8	PNF training

Figure 3: Mirror Therapy.

Figure 4: Active Asstatistical Analysis.

DATA ANALYSIS AND INTERPRETATION

GROUP A (experimental group): Task specific circuit training

Table 1: Pre Test and Post Test Value.

OUTCOME MEASURE	MEAN		STANDARD DEVIATION		T VALUE	P VALUE
	PRE TEST	POST TEST	PRE TEST	POST TEST		
CAHAI-13	31.80	42.60	3.69	6.17	10.2224	P<0.0001
Fugl meyer	34.73	44.53	10.12	10.93	10.5153	P<0.0001

GROUP: B (Control group): conventional physiotherapy

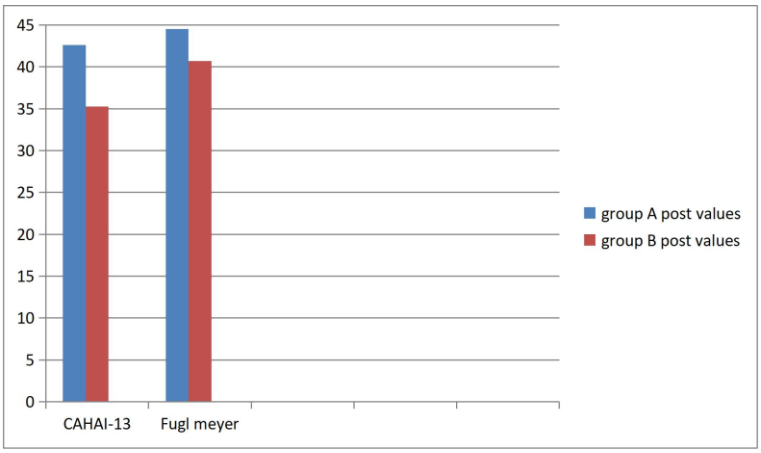
Table 2: Pre Test and Post Test Values.

OUTCOME MEASURE	MEAN		STANDARD DEVIATION		T VALUE	P VALUE
	PRE TEST	POST TEST	PRE TEST	POST TEST		
CAHAI-13	30.73	35.27	3.03	3.77	5.9542	P<0.0001
Fugl meyer	35.00	40.67	5.89	6.84	2.4350	P<0.0001

GROUP A AND B

Table 2: Comparison of post values in group A and B.

OUTCOME MEASURE	MEAN		STANDARD DEVIATION		T-VALUE	P- VALUE
	GROUP A POST	GROUP B POST	GROUP A POST	GROUP B POST		
CAHAI-13	42.60	35.27	6.17	3.77	10.2224	P<0.0001
Fugl meyer	44.53	40.67	10.93	6.84	2.4350	P<0.0001



Graph 1: Comparision of Post Values in Both Group A and B of CAHAI-13 and Fugl meyer.

RESULT

The statistically values of the group A (Task specific circuit training) and the group B (conventional physiotherapy) were assessed using CAHAI -13 and Fugl meyer.

Group A: Fugl meyer T value -10.5153, P value < 0.0001 and CAHAI-13 T-value – 10.2224, P value < 0.0001 Pre and post valuesrespectively.

Group B : Fugl meyer T value - 9.3201, P value <0.0001 and CAHAI -13 T-value- 5.9542, P value <0.0001. This study result showed statistical improvement in functional gains of upper extremity in both group A and group B. but there was a significantly greater improvement seen in group A (Task specific circuit training)

DISCUSSION

The study was conducted to assess the effects of neuroplasticity with task specific circuit training on functional activities of upper limb among acute stroke patients.30 samples were selected and was divided into 2 groups. GROUP -A (Task specific circuit training) and GROUP-B(conventional physiotherapy). The assessments were taken for the subjects and the task specific circuit training and conventional physiotherapy were given for the individuals and the result were measured using the task specific circuit training and fugl meyer. The collected data was statistically analyzed by Unpaired t-test. The pretest measures of the CAHAI 13 and fugl meyer are evaluated, andthe same is evaluated and recorded as post-test values after 8 weeks of training. In group A(experimental group) task specific circuit group, the average mean differenceof 9.20, t value of 10.2224 and a p value of <0.001 in CAHAI 13, average meandifference of 10.73, t value of 10.5133 and a p value of <0.001 in fugl meyer. In group B(control group) conventional physiotherapy with an the average mean difference of 5.70, t value of 5.5942 and a p value of <0.001 in CAHAI 13, average meandifference of 5,10, t value of 2.4330 and a p value of <0.001 in fugl meyer. The post-test values of the Group A and B were significantly different, according to data collected. Despite the fact that both groups improved statistically, group A(experimental Group)task specific circuit training improved functional gains of upper extremity, more than the Group-B(control group) conventional physiotherapy among acute stroke patients.

Jong-Hoon Moon et al.,(2018) This study was conducted to confirm the effects of a Task oriented circuit training program using rehabilitation tools on upper-extremity functions and daily activities of stroke patients. The results showed that both task oriented circuit training and NDT can improve stroke patients' use of upper extremities in the acute phase, but that Task oriented specific training led to an overall higher level of improvement than NDT in functional recovery.

CONCLUSION

Neuroplasticity with task specific circuit training was effective on functional activities of upper limb among acute stroke patients.

REFERENCES

1. Juhyung park et al., Effects of task oriented training on upper extremity function and performance of daily activities by chronic stroke patients J. Phys. Ther. Sci., 2015; 27: 2657- 2659.

2. K.Hariohm, R. Vasanthan., Book Of Stroke Rehabilitation: a functional activity based approach, 137 – 206.
3. Gui Bin Song, MS, PT, The effects of task-oriented versus repetitive bilateral arm training on upper limb function and activities of daily living in stroke patients. J. Phys. Ther. Sci., 2017; 27: 1353–1355.
4. Jannette Blennerhassett and Wayne Dite ., Additional task- related practice improves mobility and upper limb function early after stroke Australian Journal Of Phys., 50: 219-224.
5. Kimberly J.Waddell et al., Feasibility of high repetition, task specific training for individuals with upper extremity paresis The American Journal Of Occupational Therapy, 68.
6. Carr JH, Shepherd RB: Stroke rehabilitation. London: Butterworth-Helenemann. Yoo C, Park J: Impact of task-oriented training on hand function and activities of daily living after stroke. J PhysTherSci, 2017; 27: 2529–2531.
7. Rensink M, Schuurmans M, Lindeman E, et al.: Task-oriented training in rehabilitation after stroke: systematic review. J AdvNurs, 2019; 65: 737–754. 38
8. Umphred‟s neurological rehabilitation.6 th edition chapter-23: page-711.
9. Elizabeth Domholdt: Bio statistics and research methodology.
10. World stroke organization:2019 (WHO)
11. Camilla Biering Lundquist et al., Fugl Meyer Assessment of Upper Extremity: reliability, responsiveness and validity. Journal of disability and rehabilitation, 2019; 39.
12. Lang CE et al., Dose response of task-specific upper limb training in people at least 6 months post stroke: A phase II, single-blind, randomized, and controlled trial.2019 American Neurological Association.
13. Arya, K.N., Verma, R., Garg, R.K., Sharma, V.P., Agarwal, M., & Agarwal, G.G. (2020).
14. Meaningful task-specific training (MTST) for stroke rehabilitation: A randomized controlled trial. Canadian Partnership for Stroke Recovery.
15. Heidi Johansen-Berg Correlation between motor improvements and altered fMRI activity after rehabilitative therapy Brain, 2020; 125, 273, 2742.
16. Sanford J, Moreland J, Swanson LR, Stratford PW, Gowland C. - Reliability of the Fugl Meyer assessment for testing motor performance in patients following Stroke, 1993 Jul; 73(7): 447-54.