EFFECT OF REPETITIVE TASK TRAINING ON UPPER LIMB FUNCTIONS AND DAILY ACTIVITIES AMONG PERSONS WITH HEMIPLEGIA

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ABSTRACT

Background and purpose: Stroke is a leading cause of long-term disability worldwide, with a profound impact on individuals functioning abilities and quality of life. Among the evidence-based therapies, repetitive task training has emerged as a promising approach in neuro rehabilitation following stroke, aiming to improve the performance of everyday activities that are essential for independent living and is highly effective in promoting motor learning and functional improvement by engaging patients in meaningful and purposeful activities. This study aims to determine the effect of repetitive task training to improve upper limb functions and activities of daily living in persons with hemiplegia.

Methods: This is a quasi-experimental design with convenient sampling included 32 clients. The experimental group received intervention based on repetitive task training, while the control group received conventional occupational therapy. Outcome measures were Fugl Meyer Assessment for upper limb functions and Modified Barthel Index for daily living activities. The statistical analysis was done with significance at a 5% alpha level using SPSS version 23. **Results:** Data were analyzed, since the p-value was 0.00 for the findings between the experimental group and control group in both scales, it showed significant improvement in upper limb functions and daily activities in the experimental group compared to the control group.

Conclusion: This study concluded that the effect of repetitive task training proved its effect on upper limb functions and daily activities among clients with stroke.

Keywords: upper limb functions, daily activities, repetitive task training, stroke

INTRODUCTION

Recently, with the extension of average human life expectancy, issues associated with population aging and the occurrences of adult vascular diseases have risen. Furthermore, the occurrence of stroke as a category of vascular disease in younger adults has surged due to multiple factors[1-

[3].The World Health Organization (WHO) has documented an annual global incidence of 15 million stroke cases. Stroke is additionally recognized as a neurological impairment that leads to harm to the cerebrovascular system with indications of diminished blood flow to the brain, including thrombosis, embolism, and hemorrhage[3-5].

Notably, just 10% of post-stroke patients achieve full recovery, 30% pass away, and 60% endure chronic dysfunction[6]. Among those enduring chronic dysfunction, 60–80% of patients experience upper extremity functional dyskinesia as a consequence of stroke[7,8]. These individuals carry out daily tasks predominantly with the unaffected upper limb, and as they refrain from utilizing the affected limb[9,10], the final outcome is the total disuse of the affected limb[9]. Given that many small activities, such as eating, washing, dressing, and writing, involve the hands and upper limbs, the incapacity to use an upper limb could result in a loss of upper limb function and, as a result, lead to a decrease in motion associated with daily living, which hampers independent activities of daily living (ADL)[11]. This situation may heighten feelings of depression, anxiety, sleep disruption, and helplessness, shift the overall lifestyle toward reliance, diminish self-respect and self-efficacy, and provoke physiological pain[12], consequently impacting the quality of life (QoL)[13].

A task-oriented approach is an activity-centered strategy that involves the repetitive training of a task, focusing on functional performance directed at the successful completion of the task, where the benefits of exercise training are enhanced through the environment, task analysis, feedback, and repeated practice[14]. Functional tasks, which aid in reinstating the reflex loops into a network of neural CNS patterns, help in organizing motor behavior, while occupational performance promotes interactions within various environmental systems based around human characteristics and their surroundings. A modification in the human or environmental system brings about behavioral change in a patient. Based on this theory, as the patient works towards achieving a functional goal, the effectiveness of the approach depends on providing the patient with a functional task rather than training the pattern of normal motion, thereby allowing the patient a chance to proactively address challenges. Additionally, the patient participates in multiple task-oriented activities through effective therapy that includes various functional tasks[15]. In contrast to tasks designed in a clinical setting, the functional performance of tasks linked to real daily living has shown to be more advantageous, which occurs in the task-oriented approach as a clinically applicable tactic for patients[15]. Consequently, the treatment aims to improve motor functions as patients actively use the upper limb on the affected side[10]

Previous studies related to efficacy of task oriented approaches conducted to find out it's effect on upper extremities to improve upper limb function, fine dexterity and basic activities of daily living and laboratory findings of plasticity development[16,17,22]. However, various studies have been done to find the efficacy of task oriented approach to improve upper extremity functions and ADL, there is no study done to find out the effect of repetitive task training to improve upper extremity functions and activities of daily living among persons with stroke. . Hence this

study has been done to find out the effect of repetitive task training to improve upper limb functions and daily activities among persons with hemiplegia in Indian context.

Materials and methods

Study design

This study is a quantitative quasi-experimental research design with convenient sampling technique. Stroke patients who were residents of Tamil Nadu came to receive treatment at brain and spine hospital at Chennai from February 2024 to April 2024.

Participants

In brain and spine hospital at Chennai there were a total of 35 stroke clients during this research period, who met our inclusion and exclusion criteria. In this 3 clients discontinued the study. The samples were selected according to the inclusion criteria which are the person with both right and left hemiplegia, person with both gender, person's age between 35 years to 55 years, person with good or mild cognitive impairment, persons who have decreasing spasticity level. Exclusion criteria include person with above 55 years of age, person with moderate or severe cognitive level, person who have difficulty in following commands, person with cardiorespiratory, neurological, psychiatric and orthopedic conditions.

Instrument

1. Fugl Meyer Assessment:

The Fugl-Meyer Assessment (FMA) is a stroke-specific tool used to evaluate motor function, balance, sensation, and joint function in patients with post-stroke hemiplegia. It uses a 226-point Likert scale across five domains, rating each task on a 3-point scale. The FMA helps measure stroke recovery severity and guides treatment planning based on impairment levels.[18]

2. Modified Barthel index :

The scale, also known as the Maryland Disability Index, assesses a person's ability to perform 10 basic Activities of Daily Living (ADLs) to determine their level of independence. For activities like bathing and grooming, a score of 1 is given if the individual can perform them independently, and 0 if they cannot. For bowels, bladder, toilet use, feeding, dressing, and stair climbing, a maximum score of 2 is given if the activity is done independently, 1 if help is needed, and 0 if the person is unable. Transferring and mobility are scored up to 3 points, with 2 points if minimal help is required, 1 if more help is needed, and 0 if the person is entirely dependent. The total score provides a quantitative estimate of the person’s independence.[19]

Procedure

Ethical approval certificate has obtained from Saveetha college of occupational therapy to work in brain and spine hospital for the research purpose. Informed consent was obtained from the patients as well as from the concerned centers. The patients were explained about the procedure and those who are willing for the therapy were selected using convenient sampling method. Following that screening test Mini - mental state examination (MMSE) was conducted to find out the level of cognitive skills among stroke patients. 32 patients were selected based on

selection criteria and baseline pretest measurements were assessed using Fugl Meyer Assessment and Modified Barthel index. They were randomly allocated to either experimental group (17) with repetitive task training or to control group (15) with conventional occupational therapy for the study duration of 12 weeks (36 sessions). Each session lasted for 40 minutes by demonstrating the procedure to patients for 10 minutes and the task administered and trained with the clients for 30 minutes. After the study duration, post - test measurements using the outcome measures were assessed and analyzed using appropriate statistical method.

Experimental group members received repetitive task training program according to their occupations. Activities like reaching objects at certain height, holding water bottle, pouring water into glass, holding comb and trying to comb hair, switching on and off fan, opening a big jar, wearing on a specs, opening a laptop, picking up mobile from the table and making a call, holding a spoon, opening and closing tap , removing cloths from rope, trying to fold cloths, wearing a slipper or socs, holding scissor and cutting paper, beating an egg, using a stapler, wearing shirt or t-shirt, wearing watch, turning paper, typing, writing and signing. Control group received conventional occupational therapy program using various approaches such as neurophysiological approaches like roods approach, NDT, Brunnstorm approach and PNF for improving upper limb functions and daily activities.

DATA ANALYSIS

The statistical analysis was done with the help of IBM SPSS version 23.0. Since the samples belonged to sample size (32), non-parametric method was used to test the statistical difference between pre-test and post-test scores of group A and B. Wil-coxon signed rank test and Mann Whitney U test were analyzed in finding hypothesis being tested identifies whether there exists statistically significant difference in consideration of the treatment given. An alpha level of P = 0.05 was measured to be statistically significant.

TABLE 1 COMPARISON BETWEEN PRE-TEST AND POST-TEST OF FMA SCALE IN CONTROL GROUP

Test	Mean	SD	N	Z value	p value
Cntr1_pre	34	11	15	-3.301	0.001*
Cntr2_post	42.2667	10.61311	15		

*** Significant at 5% alpha level**

Since the p value of 0.001 is lesser than 0.05, alternate hypothesis is accepted. Hence, there is statistically significant difference between pre- test and post test scores in the Control Group of

the FMA. This suggests that the intervention received by the control group had significant improvement.

TABLE 2 COMPARISON BETWEEN PRETEST AND POST TEST OF FMA SCALE IN EXPERIMENTAL GROUP

Test	Mean	SD	N	Z value	p value
Expt1_pre	27.2941	7.53131	17	-3.624	0.00*
Expt1_post	50.1176	7.77723	17		

*** Significant at 5% alpha level**

In the Experimental group, since the p value of 0.00 is less than 0.05, alternate hypothesis is accepted. Hence, there is statistically significant difference in Experimental Group between pre-test and post test scores of FMA. This suggests that the intervention received by the experimental group had significant improvement.

TABLE NO. 3 COMPARISON BETWEEN POST TESTS OF CONTROL AND EXPERIMENTAL GROUP IN FMA SCALE

Group	Mean	SD	N	Z value	p value
Cntr1_grp	42.2667	10.61311	15	2.152	0.031*
Expt1_grp	50.1176	7.77723	17		

***Significant at 5% alpha level**

Since the p value of 0.031 is lesser than 0.05, alternate hypothesis is accepted. Hence, there is statistically significant difference in post test scores between Experimental and Control Group of the FMA. This suggests that the intervention received by the experimental group had more improvement when compared to the control group.

TABLE NO. 4 COMPARISON BETWEEN PRETEST AND POST TEST OF MBI SCALE IN CONTROL GROUP

Test	Mean	SD	N	Z value	p value
Cntr2_pre	11.2667	2.84019	15	-3.42	0.001*
Cntr2_post	16.3333	1.63299	15		

*** Significant at 5% alpha level**

Since the p value of 0.001 is lesser than 0.05, alternate hypothesis is accepted. Hence, there is statistically significant difference between pre- test and post test scores in the Control Group of the MBI. This suggests that the intervention received by the control group had significant improvement.

TABLE 5 COMPARISON BETWEEN PRETEST AND POST TEST OF MBI SCALE IN EXPERIMENTAL GROUP

Test	Mean	SD	N	Z value	p value
Expt2_pre	11.6471	2.2067	17	-3.632	0.000*
Expt2_post	17.5294	1.54587	17		

*** Significant at 5% alpha level**

In the Experimental group, since the p value of 0.00 is less than 0.05, alternate hypothesis is accepted. Hence, there is statistically significant difference in Experimental Group between pre-test and post test scores of MBI. This suggests that the intervention received by the experimental group had significant improvement

TABLE 6 COMPARISON BETWEEN THE POST TESTS SCORES OF THE CONTROL GROUP AND EXPERIMENTAL GROUP IN MBI SCALE

Group	Mean	SD	N	Z value	p value
Cntr2_post	16.3333	1.63299	15	2.04	0.041
Expt2_post	17.5294	1.54587	17		

***Significant at 5% alpha level**

Since the p value of 0.041 is lesser than 0.05, alternate hypothesis is accepted. Hence, there is statistically significant difference in post test scores between Experimental and Control Group of the MBI. This suggests that the intervention received by the experimental group had more improvement when compared to the control group.

DISCUSSION

The aim of the study was to find out the effect of repetitive task training to improve upper limb functions and daily activities in person with hemiplegia. The samples were selected from Brain and spine hospital, T. Nagar, Chennai. A total of 32 patients with hemiplegia were selected and divided into 15 patients in control group and 17 patients in experimental group.

The level of cognition in both experimental and control group were measured using MMSE scale (Mini-mental state examination). The experimental group alone underwent repetitive task

training for a period of 3 months, 3 sessions per week with the duration of 40 minutes per session, whereas the control group underwent conventional occupational therapy intervention. After a period of three months of intervention the post-test evaluation was done for both groups and the scores were calculated and results analyzed. The effect of intervention was analyzed by comparing the pre and post-test values of the experimental group.

The results presented in table 1 indicates that there was a statistically significant difference in the FMA scale score for the control group between the pre-test and post-test suggesting that goals specific sensory motor input through consistent training might enhance the upper extremity recovery. This aligns with a study by Samar M. Hatem (Sept 2016) Thattask specific(oriented) training optimizes the motor input as well as the upper extremity motor function.[20]

Conversely, table 2 showed the statistical analysis of FMA scale test in experimental group which demonstrated a highly statistical-significant improvement in the experimental group scores, highlighting the effect of task training on upper limb functions and daily activities among persons with hemiplegia. This finding is supported by research from Maira Hussain (July 2022), which supports the conclusion that repetitive task training was beneficial in the improvement of upper extremity functions post stroke.[21]

Table 3 showed the statistical analysis of post-test between control and experimental group in FMA scale where the experimental group showed greater statistical-significant difference. This indicated that experimental group had more improvement than control group. This outcome is corroborated by a review conducted by Abdulrahaman (October 2022) indicated that repetitive task training had a positive effect on upper limb functions along with T-ADL training for stroke patients.[22]

Table 4 showed the statistical analysis of MBI scale test in control group suggesting that the conventional occupational therapy received by the control group had significant improvement. This findings is supported with the previous study done by Lynn A.Legg(July 2017) suggesting that there was slight improvement in daily living activities with conventional occupational therapy.[23]

Table 5 showed the statistical analysis of MBI scale in experimental group. Hence there is highly statistically significant difference in experimental group between pretest and post test scores of MBI suggesting that the task training received by experimental group had significant improvement. The findings of this result is in accordance with the previous study done by Jin-Uk Choi (September 2015) which suggested that a task oriented training program can be an effective intervention to improve ADL performance in stroke.[24]

Furthermore, Table 6 showed the statistical analysis of post-test between control and experimental group in MBI scale. Hence, there is statistically significant difference in post test scores between experimental and control group of MBI suggesting that the repetitive task training received by the experimental group had more improvement when compared to control group which received conventional occupational therapy. Findings of this result in accordance

with the previous study done by Beverley French (November 2016), suggested that repetitive task training improves upper limb functions with long term impact.[25]

Conclusion

This study was concluded that there was high significant improvement in the experimental group than the control group after repetitive task training. Thus, the study proved the effect of repetitive task training in improving upper limb functions and daily activities in person with hemiplegia. This indicated that repetitive task training should be incorporated with occupational therapy to improve upper limb functions and daily activities among persons with hemiplegia for the better prognosis.

Limitations and recommendations

Limitations includes study was done on a small sample size, study was not compared with gender differences, study doesn't involved laboratory tests or radiographic assessment as outcomes. Recommendations the study can be replicated in large sample size and individual to generalize the result, long term follow up for hemiplegic patients can be done, repetitive task training can be used in various other neurological conditions, study can be conducted for long duration of time, instead of convenient sampling, a randomized controlled trial can be used to conduct this study.

CONFLICT OF INTEREST:

The authors have no potential conflicts of interest

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