ORIGINAL ARTICLE

# EFFECTIVENESS OF MOTOR LEARNING PROGRAM AND TASK SPECIFIC TRAINING FOR THE TREATMENT OF CHRONIC STROKE

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ABSTRACT

**Introduction**: Stroke is a 'neurological focal deficit caused by an interrupted blood supply that persists beyond 24 hours. Stroke rehabilitation consisted of many treatment regimes. This trial was designed to compare the effects of motor relearning and task-specific training for the treatment of chronic stroke patients.

**Material & Methods**: A randomized control trial was conducted at Holy Family hospital Rawalpindi from September-2016 to September-2017 through convenient sampling. A total of 30 subjects were divided into two equal groups. Action Research Arm Scale and Wolf Scale were used to evaluate the effectiveness of Motor Relearning Program and Task-Specific Trainings on upper extremity functions. The assessments were made at 0-day, 1 month, 2 months, 3 months and at 4 months. For between-group analysis independent t-test was used while Repeated Measure ANOVA was used to see the differences within groups.

**Results**: Results showed that there was no significant difference between motor relearning program and task-specific training for the improvement of upper extremity function among the patients with chronic stroke as the *p*-value was non-significant on the ARAT (p=0.722) Scale and on Wolf Scale (p=0.856). In the experimental group Motor Relearning Program showed significant improvements in upper limb functions from pre-treatment to post-treatment (p=<0.005) and in the control group Task-Specific Training showed significant improvements in upper limb function (p= <0.05)

**Conclusion**: Motor relearning program and task-specific training have the same effectiveness for improving the functions of the upper extremity among chronic stroke patients.

**Key Words**: Action research arm scale, motor relearning program, stroke, task specific training, wolf scale

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## INTRODUCTION

Stroke is a 'neurological focal deficit caused by an interrupted blood supply that persists beyond 24 hours'.[1] An analogous stroke syndrome in which the symptoms of stroke settle completely within 24 hours is known as Transient Ischemic Stroke (TIA).[2] A variety of options are used for treatment of stroke which include medical and physical therapy treatment.[3]

Most common problems which arise after stroke included spasticity, swallowing problem, urinary incontinence and cognition impairment.[4] Almost 85 % of patients with stroke develop weakness in upper limb which has been reported to recover in 3 to 6 months with retaining some weakness in their upper limb. Different studies show different levels of disability; 20% patients has been reported not able to use arm after 6 months and 15 % patients have been reported unable to walk without support.[5] In the Western world, adult disability is most common because of stroke and stroke is amongst the second most common cause which leads to death.[6] It has been reported that neurodevelopmental management of the stroke survivors on daily basis does not improve clinical outcomes. That is one the reasons that physiotherapists are discovering rehabilitation interventions of different types which includes task-oriented training, electrical muscle stimulation, biofeedback, neurodevelopmental therapy, Brunnstorm therapy, proprioceptive neuromuscular facilitation, and strength training.[7] There are number of studies in which the effectiveness of task-oriented training has been revealed.[8] It involves patients actively which has been reported to facilitate neuroplasticity and thus improves function.[9]

It is concluded from different studies that task-related training and motor relearning program are more valuable than traditional therapies for the rehabilitation of patients with stroke.[10] Task-oriented rehabilitation in stroke patients will has been reported to improve activities of daily life.[11] A study conducted in 2015 concluded that motor relearning program is effective for improving functions of upper limb in stroke patients.[12] However, in another study it was reported that the tasks in those studies involved mostly gross motor exercises of the upper extremity and simple repetitive training tasks and that they were not sufficient to improve patients'

grasping ability to hold objects with various sizes, shapes and weights using the shoulder, elbow, wrist and fingers.[13] The latter study was conducted to assess the effectiveness of motor relearning program versus task-specific training in upper limb functions among chronic stroke patients. Furthermore, the study was limited in providing effective tools to provide other professionals the exact strength to treat chronic stroke while using the same treatment regimes.[14] Thus this study was design to determine the effect of Motor Relearning Program and Task-Specific Training for the treatment of chronic stroke patients while using proper protocols and proper tools.

## MATERIAL AND METHODS

A randomized controlled trial was conducted in Holy Family Hospital Rawalpindi from September 2016 to September 2017. Patients of both gender with age 30-50 years, diagnosed cases of chronic stroke having > +1 score on Ashworth Scale, both hemorrhagic and ischemic stroke with weakness in the affected arms causing limitations in performing activities of daily living were included. Patients with co-morbidities that can affect their performances, for example, severe arthritis, cancer, dystrophies, symptomatic shoulder subluxation and patients with anticipated inability to complete follow-up assessment were excluded. A total of 30 patients were included in the study using non-probability convenient sampling for inclusion in the study. These patients were randomly divided into motor relearning program (MRP) (n=15) and task-specific training program (TST) (n=15). The motor learning group exercises included lifting a cane, lifting paper clip, turnkey in lock and fold towel. The control group exercises included lifting pencils, stacking checkers, flipping cards and squeezing a rubber ball. Frequency of sessions was 5 days a week with duration of 40 minutes each session for both groups. A repetition of techniques was 10 repetitions per session in each group and there were total 60 sessions in 4 months.

Data was collected at baseline, 1-month, 2-month, 3-month and then at 4 months after the interventions. Data was collected through general demographic questionnaire included age, height, weight, BMI, Action Research Arm Scale and Wolf scale. Parametric tests were used including repeated measure ANOVA for within group analysis and independent sample t-test was used for between the groups' comparison.

## RESULTS

In this study the total participants were 30, out of which 5 were from age group of 30-35 years, 8 participants were in age group of 36-40 years, 10 participants were from age group of 41-45 years while 7 participants were of age group between 46-50 years (Figure 1). Out of the total 30, male participants were 19 (63.3%) while females were 11 (36.7%). The participants suffering from haemorrhagic stroke were 23 and 7 had ischemic stroke. 18 participants had right arm affected and 12 participants were with left arm affected (Table 1). In the experimental group, p-value between pre-treatment and post-treatment was 0.001 on ARAT scale showing that there was significant improvement in upper limb functions among chronic stroke patients by motor relearning program. In the same way, on Wolf scale, p-value between pre-treatment and post- treatment was 0.004 on Wolf scale showing that there were significant improvement in upper limb functions among chronic stroke patients in terms of motor relearning program (Table 2). In the control group on ARAT scale, the p-value was 0.013 which showed significant difference from baseline to post treatment. Similarly, the p-value from pre-treatment and post-treatment was 0.001 on Wolf scale which indicates significant difference in functional activities of upper limbs before and after treatment (table 3). For measuring the difference in values of ARAT and Wolf motor scale of both groups, independent sample t-test was applied. No notable difference was shown between MRP and TST groups as the p-value was 0.722 on ARAT Scale and 0.856 on Wolf scale (table 4).

## DISCUSSION

The aim of this study was to find out the effectiveness of the motor relearning program and the task-specific training for the treatment of chronic stroke. By using motor relearning program or task-specific training the upper extremity functions were assessed to collect data before treatment, at first month, at second month, at third month and at fourth month to observe the changes that occurred in the control and the experimental group. The results of the study demonstrated marked changes which recover the activities of daily life of upper limbs among chronic stroke patients. The results showed that the motor relearning program and the task-specific training showed a significant improvement in upper limb functions. So, both motor relearning programs and task-specific training had similar effects to improve upper limb functions among chronic stroke patients. In these two assessment scales, different functional tasks were performed to assess the improvement in functional outcomes of the upper limb among chronic stroke patients. This study showed statistically no significant difference in treatments for the improvement of the function of the upper limb in chronic stroke patients when comparison was done between groups by using independent t-test.

This study showed improvement in upper limb functions by either the task-specific training or the motor relearning program. No significant differences were observed between the two groups. Both groups showed improvement. Likewise, the results of a trial were similar to those of the present study conducted on 20 patients for 6 weeks. Both Motor relearning program and thermal stimulation were effective in improving the upper limb motor functions, however, motor relearning proved more effective than thermal stimulation.[15] Similar results were shown by a study conducted on the effectiveness of the task-oriented progressive resistance strength training program which was reported to enhance the muscle strength in lower limb among chronic cerebrovascular accident patients.[16]

It has been reported that the task-orientated bilateral arm training and repetitive bilateral arm training group showed a significant effect on the recovery of upper extremity functions.[17] A study on the effectiveness of task-specific activities reported re-organization of pathways in the cortex among that patient receiving task-oriented activities.[14] Similar findings were reported in a trial where the effectiveness of task-oriented training was observed on upper extremity muscle activation.[18]

A study conducted on the efficacy of occupational therapy task-oriented approaches in upper extremity

post-stroke rehabilitation showed that task-oriented approaches improved functions of the upper limb.[19] Motor imagery can be used effectively in clinical practice to treat stroke clients. It provides an easy way to re-learn motor-task with less exertion.[20] This study supports another study which reports the possibility of positive effects of task-oriented training in patients with impaired cognitive functions.[21] A study conducted on the effectiveness of task-orientated training in improving the upper limb function after stroke supported the effectiveness of task-orientated training in improving the upper limb functions over conventional treatment in the sub-acute stage of stroke.[22] In building up the functional recovery of stroke patients the motor relearning program and task-specific training were found to be more productive.[23] The meaningful task-specific training produced statistically significant improvement in upper extremity motor recovery in the patients who had a sub-acute stroke.[24]

## CONCLUSION

It is concluded that motor relearning programs and task-specific training have similar effects on upper limb functions among chronic stroke patients. Both techniques improve functions of upper limb including dexterity, grip, strength, pinch and gross movement.

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Table 1: Demographics of study participants in both groups

| | | Frequency | Percentage |
|---|---|---|---|
| Gender | Male | 19 | 63.3 |
| | Female | 11 | 36.7 |
| Marital status | Unmarried | 1 | 3.3 |
| | Married | 29 | 96.7 |
| Type of stroke | Haemorrhagic | 23 | 76.7 |
| | Ischemic | 7 | 23.3 |
| Arm affected | Right | 18 | 60 |
| | Left | 12 | 40 |

Table 2: Within motor relearning program group analysis

| | MRP Group | Mean | ± Std. D | P-Value |
|---|---|---|---|---|
| ARAT Scale | Pre-treatment | 2.40 | 0.828 | 0.192 |
| | Month 1 | 2.73 | 1.100 | |
| | Month 1 | 2.73 | 1.100 | 1.000 |
| | Month 2 | 2.80 | 1.082 | |
| | Month 2 | 2.80 | 1.082 | 0.035 |
| | Month 3 | 3.27 | 1.223 | |
| | Month 3 | 3.27 | 1.223 | 0.406 |
| | Post treatment | 3.53 | 1.552 | |
| | Pre treatment | 2.40 | 0.828 | 0.001 |
| | Post treatment | 3.53 | 1.552 | |
| Wolf Scale | Pre treatment | 2.53 | 1.060 | 0.281 |
| | Month 1 | 2.93 | 1.280 | |
| | Month 1 | 2.93 | 1.280 | 0.000 |
| | Month 2 | 3.67 | 1.447 | |
| | Month 2 | 3.67 | 1.447 | 0.290 |
| | Month 3 | 4.13 | 2.100 | |
| | Month 3 | 4.13 | 2.100 | 0.406 |
| | Post treatment | 4.40 | 2.384 | |
| | Pre treatment | 2.53 | 1.060 | 0.004 |

Table 3: Within –task specific training group analysis

| | TST Group | Mean | ± Std. D | P Value |
|---|---|---|---|---|
| ARAT Scale | pre-treatment | 2.27 | 0.884 | 0.013 |
| | Month 1 | 2.80 | 0.941 | |
| | Month 1 | 2.80 | 0.941 | 1.000 |
| | Month 2 | 2.87 | 0.990 | |
| | Month 2 | 2.87 | 0.990 | 1.000 |
| | Month 3 | 3.13 | 1.187 | |
| | Month 3 | 3.13 | 1.187 | 0.824 |
| | Post treatment | 3.33 | 1.496 | |
| | Pre treatment | 2.27 | 0.884 | 0.013 |
| | Post treatment | 3.33 | 1.496 | |
| Wolf Scale | Pre treatment | 2.60 | 0.737 | 0.086 |
| | Month 1 | 3.00 | 0.926 | |
| | Month 1 | 3.00 | 0.926 | 0.086 |
| | Month 2 | 3.40 | 1.183 | |
| | Month 2 | 3.40 | 1.183 | 0.013 |
| | Month 3 | 3.93 | 1.335 | |
| | Month 3 | 3.93 | 1.335 | 0.192 |
| | Post treatment | 4.27 | 1.486 | |

| | | | | |
|---|---|---|---|---|
| | Pre treatment | 2.60 | 0.737 | |
| | Post treatment | 4.27 | 1.486 | 0.001 |

Table 4: Between-group comparison

| | Independent t test | | | |
|---|---|---|---|---|
| | Group | Mean | ± Std. D | Sig. |
| ARAT Scale | Pre treatment | 2.33 | 0.844 | 0.673 |
| | Month 1 | 2.77 | 1.006 | 0.860 |
| | Month 2 | 2.83 | 1.020 | 0.862 |
| | Month 3 | 3.20 | 1.186 | 0.764 |
| | Post treatment | 3.43 | 1.501 | 0.722 |
| Wolf Scale | Pre treatment | 2.57 | 0.898 | 0.843 |
| | Month 1 | 2.97 | 1.098 | 0.871 |
| | Month 2 | 3.53 | 1.306 | 0.585 |
| | Month 3 | 4.03 | 1.732 | 0.758 |
| | Post treatment | 4.33 | 1.953 | 0.856 |

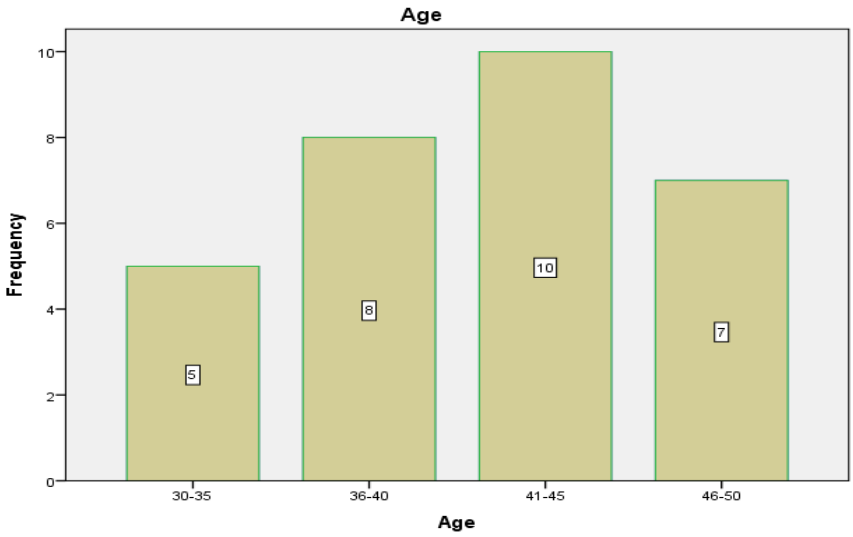


Figure 1: Demographics of study participants in both groups