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THE EFFECTIVENESS OF MOTOR RE-LEARNING IN THE POST-STROKE UPPER LIMB FUNCTIONAL RESTORATION

Mansoor Ahmad[1], Irfan Ullah[2], Sidra Malik[3], Zakir khan[4], Dr Ijaz Ur Rehman[*5], Muhammad Shayan[6], Muslim Khan[7]

[1]*Coordinator/Lecturer at Iqra National University Swat Campus*
[2] *Physiotherapist at Rahman International Hospital Swat*
[3]*Master Student at Ibadat International University Islamabad*
[4]*Lecturer at Iqra National University Swat Campus*
[5]*Principal AHS & Assistant Professor at DAKSON Institute of Health Sciences Islamabad & Nazar College of Physiotherapy*
[6]*Physiotherapist at Abeer Saeed Memorial Hospital Chakdara*
[7]*Associate Prof, IQRA National University, Swat*

[*5]ijazphysio46@gmail.com

Corresponding Author: *
Dr Ijaz Ur Rehman
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ABSTRACT

Background: *Stroke is the leading cause of disability worldwide currently. Upper limbs ADLs –based functions is grossly affected leading to functional dependence of the stroke patients. Upper limbs functional rehabilitation is an essential component of the stroke physical rehabilitation. The aim of this study is to find out the effectiveness of upper limbs –specific motor –re-learning approach in the upper limbs' functional restoration.*

Method: *40 stroke outpatients (n=40) are selected through purposive sampling & randomly assigned into two groups (CG & TG) for this study irrespective of their gender, ethnicity, age, stroke type, chronicity & level of dependence. The control group (CG) for 40 minutes -30 sessions (5days/week for 8 weeks) received conventional physical therapy interventions while the TG received conventional physical therapy along with upper limb motor re-learning for 40 minutes -30 sessions (5days/week for 8 weeks).*

Results: *The results of the study showed by comparing pre-intervention & post-intervention score, that motor-re-learning has significantly improved upper limb functions as compared to the conventional physiotherapeutic interventions.*

Conclusion; *The result of this study can be concluded that comparatively motor-re-learning is clinically more effective in the functional restoration of upper limbs in stroke patients.*

Keywords: *stroke, conventional physiotherapeutic interventions, motor re-learning, wolf motor functional test*

INTRODUCTION

Stroke is the leading cause of disability worldwide currently. Upper limbs ADLs –based functions is grossly affected leading to functional dependence of the stroke patients. Stroke is a debilitating for the patients & family alike. WHO defined stroke

as "focal or global neurological cerebral deficits resulting in clusters of signs & symptoms leading to death or lasting more than 24Hr, with no other cause than the vascular abnormalities". Stroke is broadly divided into; a) ischemic stroke b) hemorrhagic stroke. The causes of stroke are as follow; a) cerebral thrombosis b) cerebral embolism c) cerebral haemorrhage. The stroke risk factors are categorized into a) modifiable risk factors; such as Diabetes mellitus, hypertension, cholesterol, obesity, smoking, etc. b) Non-modifiable risk factors; such as; age, gender. It has been reported that stroke survivors are doubled worldwide in the last 25 years & based on this statistic, it has been predicted that, it will double in the next 50years. Half (50%) of the stroke survivors (4.7 million stroke survivors worldwide) globally have lifelong residual motor disability. Among these stroke patients with residual motor disability, 30-60% has non-functional paretic upper limb, affecting their independence & ADLs. Thus, upper limbs functional rehabilitation is an essential component of the stroke physical rehabilitation. Various physiotherapeutic approaches have been developed & used for the functional restoration of stroke patients globally, which predominantly exercise –based & functional activities based. There is still a need for the more effective, time –sensitive & cost-effective physiotherapeutic approach for the functional rehabilitation of the stroke patients worldwide. Motor –relearning is one of the physiotherapeutic approaches used in the rehabilitation of the stroke patients[1]. It has been reported that motor –relearning (MRP) is effective in the functional restoration of the stroke patients[2-4]. The aim of this study is to find out the effectiveness of upper limbs –specific motor –re-learning approach in the upper limbs' functional restoration.

Methodology

stroke outpatients (n=40, Male, n=25, Female, n=15) are selected through purposive sampling & randomly assigned into two groups (CG & TG) for this study irrespective of their gender, ethnicity, age, stroke type, chronicity & level of dependence. The control group (CG) for 40 minutes -30 sessions (5days/week for 8 weeks) received conventional physical therapy interventions while the TG received conventional physical therapy along with upper limb motor re-learning for 40 minutes -30 sessions (5days/week for 8 weeks). The inclusion criteria were a) 1st time stroke patients (clinically verified stroke patients) irrespective of their age & gender with no Proprioceptive or visual impairments, or vestibular disorders. B) Stroke patients with the upper limb motor Brunnstrom recovery stage 3-4, while the exclusion criteria were; a) recurrent stroke patients b) stroke patients with visual, Proprioceptive impairments & vestibular disorders. The selected study's subjects were briefed about the aim, procedure & duration of the study & written consent was taken. Before the conduction of the study approval from the hospital ethical committee & admin was taken.

The interventions procedure for CG were as follow; a) Positioning b) Passive ROM exercise c) weight bearing exercise d) active ROM exercise e) electrical stimulations, while for the TG, the MRP includes the steps as follow; a) task analysis b) identification of missing component & its practice c) goal explanation & identification, instructions, practice, cues, verbal & visual feedback, manual guidance d) transference of training. The purpose of MRP for upper limb functional restoration were as follow; 1) To activate & elicits activities in the upper limb musculatures & to train motor control for functional reach & pointing 2) To activate & elicits activities in the upper limb musculatures & to train motor control for wrist functional manipulation 3) To activate & elicits activities in the upper limb musculatures & to train motor control for thumb opposition & palmer abduction. 4) To activate & elicits activities in the upper limb musculatures & to train motor control for the training of the opposition of the ulnar & radial side of the hand. 5) To activate & elicits activities in the upper limb musculatures & to train motor control for the manipulation of objects. 6) To activate & elicits activities in the upper limb musculatures & to train motor control for holding objects of the daily use for significant amount of time. The outcome measure used for the study were) wolf motor function test b) Fugal –mayer assessment score.

Results

The results of the study showed by comparing pre-intervention & post-intervention score, that motor-re-learning has significantly improved upper limb functions as compared to the conventional physiotherapeutic interventions. For comparison between the groups, student t-test was applied. All study subjects were assessed before the study (pre-test score or initial assessment) & the completion of 8-weeks (post-test score or final score) on two specified questionnaires; a) wolf motor function test (WMFT) b) Fugal –mayer assessment (FMA) score. For the TG the FMA pre-test score was 19.30 & the post-test means was 29.45, while WMFT pre-test means was 31.34 & post-test means was 37.67 as shown in Tables below;

Table-1: FMA analysis (n-20)

Groups	Pre-test (Means ±SD)	Post-test (Means ±SD)	P-value
CG	20.23± 5.3	24.56±6.3	>0.001
TG	19.30±4.8	29.45±8.3	

Table-2: WFMT analysis (n-20)

Groups	Pre-test (Means ±SD)	Post-test (Means ±SD)	P-value
CG	30.3± 4.2	33.34± 5.3	>0.001
TG	31.34± 5.3	37.67± 5.3	

Discussion

Stroke is the leading cause of disability worldwide currently. Upper limbs ADLs –based functions is grossly affected leading to functional dependence of the stroke patients. Upper limbs functional rehabilitation is an essential component of the stroke physical rehabilitation. The aim of this study is to find out the effectiveness of upper limbs –specific motor –re-learning approach in the upper limbs' functional restoration. The results of the study showed by comparing pre-intervention & post-intervention score, that motor-re-learning has significantly improved upper limb functions as compared to the conventional physiotherapeutic interventions. For comparison between the groups, student t-test was applied. All study subjects were assessed before the study (pre-test score or initial assessment) & the completion of 8-weeks (post-test score or final score) on two specified questionnaires; a) wolf motor function test (WMFT) b) Fugal –mayer assessment (FMA) score. The result of this study shows that stroke patients with upper limbs marked paresis significantly improved upper limbs functions with the interventions of MRP, the finding of this study is consistent with the findings of other previous studies[5–10]. MRP is a task-based functional re-learning approach with the emphasis of repeated learning using visual & auditory feedback. The assumptions about MRP are based on the learning process, which is comprised of task practice & modulation the motor tasks according to the concurrent feedback. These MRP learning process involves various parts of the brain & motor task is refined with repetitive practice[11–15]. MRP in this study was diverse & easy to understand for the study's subjects & increased number of repetitions made sufficient amount of motor relearning. MRP is step wise functional re-learning approach, which has been cost-effective, easy to grasped & comprehend. MRP is designed to transfer the motor skills learned in one environment to other patient-specific environment, which is an essential component in the community rehabilitation of the stroke patients[16–19].

Limitation

It is recommended that large heterogeneous sample size RCTs studies needs to be conducted with longer period or follow up procedure for the study's subjects in order to evaluate the effectiveness of MRP in stroke population.

Conclusion

The result of study can be concluded that comparatively motor-re-learning is clinically more effective in functional restoration of upper limbs in stroke patients. The finding of this study is consistent with the previous studies.

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