OPEN ACCESS

ORIGINAL ARTICLE

Comparison of 4-Weeks Motor Relearning Programme and Mirror Therapy in Improving Upper Limb Motor Function in Stroke Patients - RCT

Zujaja Ashraf [1], Aqsa Naveed[2], Nimra Sultan[3], Nimra Rafaqat[4], Maham Nasir[5], Wardah Zafar[6], Gaber S Soliman[7]

[1] Physiotherapist, Al Qasim institute of special children, Dina Lahore, Pakistan
[2 3 4] Internee, Pakistan Institute of Medical Sciences, Islamabad, Pakistan
[5] Assistant Professor/ Principal, Yusra Institute of Rehabilitation Sciences, Islamabad, Pakistan
[6] Lecturer, Yusra Institute of Rehabilitation Sciences, Islamabad, Pakistan
[7] Assistant Professor, Department of Physical Therapy and Health Rehabilitation, College of Applied Medical Sciences, Jouf University, Saudi Arabia

Author`s Contribution

[1 5] Substantial contributions to the conception or design of the work for the acquisition, analysis or interpretation of data for the work, [2 5 6] Drafting the work or reviewing it critically for important intellectual content, [5 6] Final approval of the version to be published, [3 6] Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Article Info.

Received: October 25, 2024
Acceptance: February 06, 2025

Conflict of Interest: None
Funding Sources: None

Address of Correspondence

Name: Maham Nasir
Email Id: mahamnasir7@gmail.com
ORCID: 0000-0002-1598-6090

Cite this article as: Ashraf Z, Naveed A, Sultan N, Rafaqat N, Nasir M, Zafar W, Soliman G S. Comparison of 4-Weeks of Motor Relearning Programme and Mirror Therapy in Improving Upper Limb Motor Function In Stroke Patients. JRCRS.2025:13(1):28-32. https://dx.doi.org/10.53389/JRCRS.2025130106

A B S T R A C T

Background: Vascular injury (infarction, hemorrhage) of the central nervous system is the cause of stroke, a clinically recognized syndrome of acute, localized neurological impairment.

Objective: To compare the effectiveness of motor relearning programme and mirror therapy in improving upper limb motor function in acute stroke patients.

Methodology: A randomized control trail was conducted in Yusra Institute of Rehabilitation Sciences, Islamabad, consisting of 28 participants meeting the inclusive criteria was randomly allocated into experimental group and control group. Protocol provided in 4-weeks 3 sessions per week. Assessments were taken before and after the therapy by using Motor Assessment Scale. Data analyses were taken by SPSS-23.

Result: Among 28 individuals, the percentage of male participant was 53.6 and percentage of female participant was 46.4. MAS has been analyzed through statistical software. In relative with obtained results of all variables pre and post therapy information related to movements ranges of participants have been analyzed. Statistical tests were applied based on normality test. Both mirror therapy and Motor relearning programme showed significant difference after experiment and hand activity function and upper arm function were better in MRP group showing p value < 0.05.

Conclusion: It is determined that Motor Relearning Programme and Mirror Therapy did not show any significant improvement in upper limb motor function among the two groups while on differentiation within the groups Motor Relearning Programme results were more remarkable that of Mirror Therapy.

Keyword: Motor Relearning Programme, Mirror Therapy, Motor Assessment Scale, Stroke.

Introduction

Vascular injury (infarction, hemorrhage) of the central nervous system is the cause of stroke, a clinically recognized syndrome of acute, localized neurological impairment.[1] the second biggest cause of mortality and disability in the world is stroke. Cerebrovascular accident is a disease with many different risk factors, illness processes and mechanisms that might contribute to its development. Although its impact varies for various subtypes of stroke, high blood pressure is

the most significant modifiable risk factor.[2] the transient ischemic attack is a kind of Cerebrovascular accident that lasts less than 24 hours and is based on the same mechanism as an ischemic stroke but occurs at a different time.[3]

Cerebrovascular accident (CVA) or stroke is one of most common conditions affecting people in developed and underdeveloped countries.[1] About 88% of stroke victims start their lives properly while most of them face lifetime disability.[4] CVA is a major global cause of long duration impairments that has a significant impact on both individuals and society. Following stroke, rehabilitation is an iterative process that involves assessments and specialized training aspects that are sometimes hampered by healthcare facilities inadequate resources.[5] The principal goal of post stroke rehabilitation is to help the stroke victims regain as much of their pre morbid functionality as they can in their homes, community and if feasible, workplace environments. Both inpatient and outpatient setting are possible for the delivery of rehabilitation.[6] there is evidence that mirror therapy enhances hand and arm function. The sound hand is seen in a mirror that is projected onto the side of the impaired hand during mirror therapy. These types of training are advised as an additional treatment for stroke survivors who have severe arm paralysis because they do not require residual motor function in the paretic limb.[7] Beginning in 1980, several approaches to stroke the patient reeducation were put forth, the most significant of which was the motor relearning programme, also known as task oriented motor relearning (MRP).[8] Next are the programmes for muscle building and physical reconditioning, movement therapy induced by restricting the healthy side, full weight supported or partial weight suspension with treadmill training, robot assisted sensory motor stimulation, mental imagery and so on in addition to virtual reality.[3] In accessible literature, limited studies were found on effects of improving upper limb motor function in stroke patient by applying motor relearning programme and mirror therapy, no study is conducted within 4-weeks protocol. The optimal approach for patient recovery in most studies involves following protocol for six months. Motor Relearning programme helps to relearn the basic physiological movements and Mirror Therapy helps to stimulate neuronal pattern. This study addresses the improvement of motor functions in stroke survivors.[9]

The motor relearning programme is an easy and convenient technique as it does not require any special equipment's, it can be performed at home by using different movement techniques. Likewise, a mirror is required for mirror therapy, they are less time consuming and once learned can be used to enhance neuroplasticity. The current study was conducted to determine the effects of motor relearning programme and mirror therapy in improving upper limb motor functions in stroke patients with 4-weeks. The hypothesis was there will be remarkable difference in effects of MRP and MT.

Methodology

Study was conducted in Yusra Institute of Rehabilitation Sciences, Islamabad, a randomized controlled trail (RCT) (NECT/06074081) design was followed from September 2023 to January 2024. Ethical approval was received from Yusra Institute of Rehabilitation Sciences, Islamabad committee (YIRS/IRB/00016). The sample size was determined using Open Epi, the goal of study was to reach 80% power with 95% confidence level in the exposed-to-unexposed ratio.[10] Acute (hemiplegic attack within 1-2 weeks) and sub-acute stroke(hemiplegic attack within 3- 11 weeks) were included after taking consent from them.[9] The individuals got a thorough neurological and cognitive evaluation prior to randomization. Information papers and data collecting instruments were contained in equally numbered envelopes, half of which were marked group Experimental group A (containing MRP) and Experimental group B (containing MT). These marked papers were put in container after being folded so that the labels were hidden. Patients who met the requirements for eligibility and expressed willingness to take part were asked to select one envelope to be placed in one of two groups. Patients in Experimental group A received treatment through motor-relearning programme. Patients were instructed to perform multiple tasks like holding objects, elbow extension/flexion and multiple movements of shoulder joint. This group received MRP for duration of 4 weeks,3 days per week,2 hours session per day.[5] Patients in Experimental group B received treatment through mirror therapy. Patient was sitting in such a way that the mirror was placed in perpendicular direction on a table. Sound limb was placed in front of mirror and affected limb was place behind the mirror. Patient was received visual feedback from sound limb. This group was received MT for about 4 weeks, 3 days per week, 2 hours session per day.[6] The three Upper Limb sub-scales of motor assessment scale (MAS); upper arm functions, hand movements and advanced hand activities were used to evaluate each participants both prior and after treatment.[7]SPSS 23 was utilized for data analysis. As data was normally distributed independent T test and paired t test were applied.

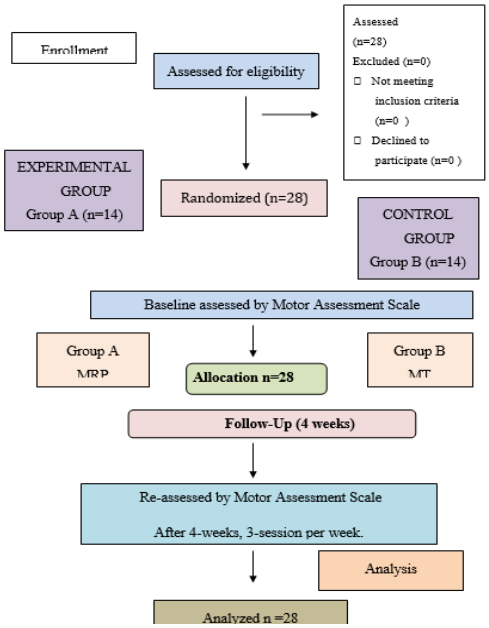

Figure 1: CONSORT Diagram showing methodology

Results

This section presents group analysis based on normality tests and demographic data. (Table 1) After 28 individuals were examined, the percentage of male participant was 53.6 and percentage of female participant was 46.4.

The independent t-test comparing pre- and post-therapy scores between the MRP and MT groups showed significant improvements in Upper Arm Function Score ($p = 0.001$) and Hand Activity Function Score ($p = 0.004$) post-therapy, favoring the MT group. (Table 2)

The paired t-test revealed within-group improvements in both groups. In Experimental Group B (MRP), significant improvements were observed in Upper Arm Function Score ($p = 0.003$) and Hand Activity Function Score ($p = 0.004$) post-therapy. However, Experimental Group A (MT) did not show statistically significant changes in any parameter. (Table 3)

Table 1 Demographic data shows mean and standard deviation of occupation

Variable	n%
Occupation	Worker =67.9 Housewife = 32.1

Table 2 Independent T-test between pre and post value on Therapy of Advanced Hand Activities Score

Variables	Assessment	Mean±SD	p-value
Analysis Pre Therapy			
Upper Arm Movement Type	MRP	1.6±2	0.100
	MT	2.8±0.7	
Upper Arm Function Score	MRP	3.6±1	0.225
	MT	6.7±3	
Hand Activity Movement Type	MRP	1.55±2	0.179
	MT	5.6±0	
Hand Activity Function Score	MRP	3.99±1.7	0.534
	MT	6.5±3	
Advanced Hand Activities Movement Type	MRP	2±0	0.228
	MT	2.5±2	
Analysis post experiment			
Upper Arm Movement Type	MRP	1.8±2	0.236
	MT	1.5±0.7	
Upper Arm Function Score	MRP	3.2±1	0.001**
	MT	5.6±3	
Hand Activity Movement Type	MRP	4.2±2	0.360
	MT	2.7±0	
Hand Activity Function Score	MRP	2.7±1.7	0.004**
	MT	5.6±3	
Advanced Hand Activities Movement Type	MRP	1.5±0	0.070
	MT	5.6±2	

Significance level: $p<0.01$**

Table 3 Paired T test on pre and post therapy in experimental group A and experimental group B			
Variables	**Assessment**	**Mean±SD**	**p-value**
Analysis of Experimental Group 1 (MT)			
Upper Arm Movement Type	Pre-therapy	1.5±2	0.100
	Post-therapy	2±0.7	
Upper Arm Function Score	Pre-therapy	3±1	0.332
	Post-therapy	6±3	
Hand Activity Movement Type	Pre-therapy	1.5±2	0.191
	Post-therapy	2±0	
Hand Activity Function Score	Pre-therapy	3±1.7	0.353
	Post-therapy	6±3	
Advanced Hand Activities Movement Type	Pre-therapy	1±0	0.192
	Post-therapy	2.5±2	
Analysis of Experimental Group B(MRP)			
Upper Arm Movement Type	Pre-therapy	1.5±2	0.362
	Post-therapy	2±0.7	
Upper Arm Function Score	Pre-therapy	3±1	0.003**
	Post-therapy	6±3	
Hand Activity Movement Type	Pre-therapy	1.5±2	0.363
	Post-therapy	2±0	
Hand Activity Function Score	Pre-therapy	3±1.7	0.004**
	Post-therapy	6±3	
Advanced Hand Activities Movement Type	Pre-therapy	1±0	0.072
	Post-therapy	2.5±2	

Significance level: p<0.01**

Discussion

In this study we examined how motor relearning programme and mirror therapy can improve upper limb motor function in stoke patients as little as 4 weeks. Using the motor assessment scale, we observed variations in movement both before and after sessions. When comparing the results between groups we found that MRP demonstrated much greater improvements then MT but overall, there was no discernible difference between the motor relearning programme and mirror therapy.

A study conducted in 2021 by Aftab A et al. found that motor relearning programme were useful for helping CVA patients with their upper limb function according to this study the exercises were primarily simple repetitive training task and gross motor exercises for upper extremity and they were not enough to help patient get better at using their wrists, fingers, elbows and shoulders to grasp objects of different sizes, shapes and weights within required time period.[9]

On the other hand, after 4 weeks of motor relearning programme we observed a significant movement in ranges when the participants perform simple physiological movements (flexion, extension, abduction, adduction, internal rotation, external rotation,) at the targeted joints during the initial sessions. Later they trained in simple to complex tasks (grasping balls, spoon training, combing and holding objects).

Thirty individuals with stroke were included in another experimental study by Suraj B.Kanasa thirty individuals were divided into two groups in an arbitrary manner. There were 15 patients per in these two groups motor relearning programme was provided to the experimental group of subjects whereas conventional therapy was administered to control group.[10] Improvements in moveability were shown to be facilitated by both traditional therapy and motor relearning programme. The motor relearning programme, however, showed a stronger impact on improving functional moveability after 2 groups were differentiated.[10] additionally, we saw significant gains in patients receiving MRP sessions, which validates the findings of our study.

Elanchezhian et al. conducted a randomized control trial research that included 25 individuals who had experienced a hemiplegic stroke.[11] Three groups of 25 subjects were formed. The experimental group received 45 minute of conventional therapy and mirror therapy regimen, whereas the control group received a 45 minute conventional therapy programme.[11] For six weeks, three day a week were dedicated to following this programme. The group who underwent conventional therapy along with mirror therapy

demonstrated a notable levels of refinement, according to the result.[12] In contrast to this study, we did not see any particularly noteworthy improvements in MT treated individuals.

To improve physical functions following a stroke, Salisha Santhosh et al. distinguished between the benefits of motor relearning programme and progressive resistance workouts. Resistance training was administered to one of the two groups, while motor relearning was given to other. Both groups showed the notable enhancements in upper extremity function, while on differentiation, it was concluded that group which received the motor relearning programme showed the better results in upgrading upper extremity physical function after stroke.[13] This study encourages the result of our study in which we found that MRP shows better results in improving upper limb motor function. This study had certain basic limitations, such as the patient quitting the session before the 4-week mark, which prevented them from meeting the 4-week requirement. Only one setup, encompassing a limited geographic area, was utilized for the investigation.

Conclusion

It is determined that MRP and MT did not show any significant improvement in upper limb motor function among the two groups while on differentiation within the groups MRP results were more remarkable that of MT. Consequently, a longer-term study is recommended to evaluate the long-term feasibility of this intervention as a true representation of the population under investigation. In future studies, specifying age group to people over 55 years should give more accurate results. Mirror therapy should be compared with motor relearning programme for better results.

References

1. Murphy SJ, Werring DJ. Stroke: causes and clinical features. Medicine. 2020;48(9):561-6.
2. Fagundes NCF, Almeida APCPSC, Vilhena KFB, Magno MB, Maia LC, Lima RR. Periodontitis as a risk factor for stroke: a systematic review and meta-analysis. Vascular Health and Risk Management. 2019:519-32.
3. Feigin VL, Brainin M, Norrving B, Martins S, Sacco RL, Hacke W, Fisher M, Pandian J, Lindsay P. World Stroke Organization (WSO): global stroke fact sheet 2022. International Journal of Stroke. 2022 Jan;17(1):18-29.
4. Fan J, Li X, Yu X, Liu Z, Jiang Y, Fang Y, et al. Global burden, risk factor analysis, and prediction study of ischemic stroke, 1990–2030. Neurology. 2023;101(2):e137-e50.
5. Herpich F, Rincon F. Management of acute ischemic stroke. Critical care medicine. 2020 Nov 1;48(11):1654-63.
6. Spence JD, De Freitas GR, Pettigrew LC, Ay H, Liebeskind DS, Kase CS, Del Brutto OH, Hankey GJ, Venketasubramanian N. Mechanisms of stroke in COVID-19. Cerebrovascular Diseases. 2020 Sep 17;49(4):451-8.
7. Faridkot P, Arora L, Arora R, Thind AS, Malout P, Narang A. Effect of Constraint Induced Movement Therapy Versus Motor Relearning Programme to Enhance Upper Limb Motor Function in Stroke Patients: A Quasi Experimental Study.
8. Carr JH, Shepherd RB, Nordholm L, Lynne D. Investigation of a new motor assessment scale for stroke patients. Physical therapy. 1985;65(2):175-80.
9. Mateus-Arias OE, Camperos-Toro A, Rangel-Silva A, Mantilla-Toloza S, Martínez-Torres J. Motor relearning program in patients with stroke sequels: a systematic review. Duazary. Revista de la Facultad de Ciencias de la Salud. 2023 Jan 1;20(1).
10. Aftab A, Umar M, Irshaad A, Rashid H, Rauf R. Effectiveness of motor learning program and task specific training for the treatment of chronic stroke. Rehman Journal of Health Sciences. 2021;3(2):80-4.
11. Kanase SB. Effect of motor relearning programme and conventional training on functional mobility in post stroke patients. Indian Journal of Public Health Research & Development. 2020;11(5):496-501.
12. Chinnavan E, Ragupathy R, Yu CW. Effectiveness of mirror therapy on upper limb motor functions among hemiplegic patients. Bangladesh Journal of Medical Science. 2020;19(2):208.
13. Santhosh S, Suma N. To compare the effect of motor relearning programme and progressive resisted exercise for upper-extremity functions in subacute MCA stroke survivors. ISJPES. 2023;10:107-12.