



## EFFECT OF MIRROR THERAPY ON UPPER EXTREMITY MOTOR FUNCTIONING AMONG PATIENTS WITH STROKE: AN EXPERIMENTAL STUDY

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### ABSTRACT

Stroke is a global health problem. It is the second commonest cause of death and fourth leading cause of disability worldwide. The present study was intended to assess the effect of mirror therapy on upper extremity motor functioning among patients admitted with stroke. Quasi experimental pre-test post-test control group design was adopted. Sample consisted of 60 patients with stroke who had either one of the upper extremity motor impairment with NIHSS Score between 5-15 through Purposive sampling technique. Socio-personal and clinical variables of the participants were collected using structured interview schedule and upper extremity motor functioning was assessed using Fugl-meyer assessment [FMA] tool. Followed by pre-test, mirror therapy was administered to the participants of experimental group for 30 minutes in a day for continuous 7 days. Post-test was done on 7th day of intervention for both groups using the same tool. Result revealed that the minimum and maximum score of upper extremity motor functioning of patients with stroke was 48.0 and 63.0, with mean score 57.2 and there was a statistically significant difference ( $p < 0.05$ ) in the post-test score of upper extremity motor functioning between experimental and control group. There was significant association between upper extremity motor functioning and number of hospitalization due to stroke attack ( $p = 0.023$ ). The study concluded that mirror therapy can be considered as a safe and effective rehabilitation method for patients with stroke for improving their upper extremity motor functioning.

**KEYWORDS :** Upper extremity motor function; mirror therapy; patients with stroke; NIHSS; FMA tool.

### INTRODUCTION

Stroke is a term used to describe the neurologic changes occurs due to the interruption in blood supply to a part of the brain. Worldwide, each year approximately 20 million people experience stroke; of them, 5 million would die and 5 million would be disabled.

Without effective interventions, the number of global deaths was projected to rise to beyond 6.5 million. Stroke is the leading cause of serious, long-term disability. Of these who survive a stroke, 50% to 70% are functionally independent, and 15% to 30% live with permanent disability. The Indian Council of Medical Research (ICMR) estimated that among all the non-communicable diseases, stroke caused around 41% of deaths and 72% of DALYs in India.

Stroke was the leading cause of disability among adults, and upper extremity hemi paresis restricts functional activities predominantly in the long term.

As upper extremity function was critical for the performance of fine motor tasks, its therapeutic importance should be emphasized during rehabilitation programs.

Even after conventional treatment, more than 50 percent of patients report continuous disability of upper extremity function. For those, programs to restore upper extremity function were an important part of stroke rehabilitation.

National Stroke Association reported that, among 9 out of 10 stroke survivors manifests some degree of paralysis following a stroke. There were various rehabilitation methods practiced for improving upper extremity motor function, such as exercise training of the paralysis arm, functional electric stimulation,

bilateral arm training and robotic assisted rehabilitation. Recently, the mirror therapy as a promising therapy was popular with researchers due to it being simple, cheap, and manoeuvrable. Mirror therapy refers to the application of a simple device, called a "mirror box," which uses the principles of the same object image and distance reflected by the plane mirror to replace the normal limb image, which achieves the rehabilitation goal of eliminating abnormal sensation and restoring motor function.

In the recent years there has been extensive research about the various therapeutic measures that have been used for recovery of upper limb function. But very few studies had been done to evaluate effectiveness of mirror therapy and during the clinical posting the investigator had come across a large number of patients who suffered from stroke are having disability especially in the extremities which impairs the activities of daily living.

Keeping this in view the researcher intended to assess the effect of mirror therapy on upper extremity motor functioning among patients with stroke.

### MATERIALS AND METHODS

The present study aimed to assess the effect of mirror therapy on upper extremity motor functioning among patients with stroke. The design used for this study was quasi-experimental pre-test post-test control group design using quantitative approach. Sample consisted of 60 patients with stroke who had either one of the upper extremity motor impairment with NIHSS Score between 5-15.

Among them 30 participants were selected as experimental group and 30 participants as control group from

selected hospitals at Thiruvananthapuram. Purposive sampling technique was used in this study. Socio-personal and clinical variables of the participants were collected through structured interview schedule. Upper extremity motor functioning was assessed using Fugl-meyer assessment tool. Pre-test was conducted to both experimental and control group using Fugl-meyer assessment tool on the first day of intervention. In this study mirror therapy is the intervention.

Mirror therapy refers to the application of a simple device, called a "mirror box," which uses the principles of the same object image and distance reflected by the plane mirror to replace the normal limb image, which achieves the rehabilitation goal of eliminating abnormal sensation and restoring motor function. The investigator demonstrated each exercise such as:-

1. Make a fist and then open hand slowly. Repeat 3 Sets of 15 repetitions.
2. Touch thumb to the tip of each finger. Repeat 3 sets of 15 repetitions for each finger.
3. Turn palm up and down. Repeat 3 sets of 15 repetitions.
4. Pretend to play the piano, pushing each finger on the table once at a time. Continue for 2 minutes.
5. Place a wash cloth on the table. Wipe the table in a circular motion, back and forth, and up and down for 2 minutes.
6. Place a water bottle on the table, grasp it with hand, lift it up 2 inches, place it back on the table and let go. Repeat 3 sets of 15 repetitions.
7. Place 5 coins on the table. Pick them up one at a time until they are all in palm. Place them back on the table, one at a time, using thumb and index and middle finger tips. Repeat 5 times.
8. Place a foam ball on the table. Pick up the ball, squeeze it and place back down on the table and let go. Repeat 3 sets of 15 repetitions.
9. Place 20 small objects on the table. Position a bowl next to the small objects. Place the small objects, one at a time, into the bowl. Repeat 3 times.
10. Crawl fingers along the mirror in various directions (up, down, diagonally) for 2 minutes.

During the session, subjects were asked to try to do the same movements in the paretic hand while they were moving the non-paretic hand. Subjects are instructed to observe the reflection of the non-affected hand while doing exercise of both hands. Mirror therapy was administered to the participants of experimental group for 30 minutes in a day for continuous 7 days in the presence of investigator. On the 7th day of intervention, a post test was taken from both experimental and control group using the same tool.

**RESULTS**

**Section 1: Distribution of patients with stroke based on socio-demographic variables**

**Table 1: Distribution of patients with stroke based on socio-demographic variables**

Sl no	Variable	Category	Control Group (n=30)		Experimental Group (n=30)	
			Frequency	Percentage	Frequency	Percentage
1	Age in years	40-49	7	23.3%	3	10%
		50-59	6	20.0%	10	33.3%
		60-69	11	36.7%	13	43.3%
		70-80	6	20.0%	4	13.4%
2	Gender	Male	10	33.3%	9	30.0%
		Female	20	66.7%	21	70.0%
3	Religion	Hindu	13	43.3%	19	63.3%
		Christians	11	36.7%	17	20.0%
		Muslims	6	20.0%	11	16.7%

4	Education	Primary	7	23.3%	6	20.0%
		Secondary	5	16.7%	8	26.7%
		Higher secondary	4	13.3%	5	16.7%
		Graduate	6	20.0%	8	26.7%
		Postgraduate	3	10.1%	2	6.6%
		Technical/professional	4	13.3%	1	3.3%
		No formal education	1	3.3%	-	-
5	Occupation	Un-employed	6	20.0%	7	23.3%
		Office-work	10	33.3%	8	26.7%
		Coolie	3	10.0%	4	13.3%
		Business	5	16.7%	7	23.3%
		Retired	-	-	2	6.8%
		Technical/professional	3	10.0%	1	3.3%
		Unskilled	3	10.0%	1	3.3%
6	Marital status	Married	17	56.7%	21	70.0%
		Un-married	3	10.0%	3	10.0%
		Separated/divorced	4	13.3%	3	10.0%
		Widow/widow	6	20.0%	3	10.0%
7	Monthly income	≤ 1501	5	16.7%	5	16.7%
		1501-5000	7	23.3%	6	20.0%
		5001-10000	-	-	-	-
		10001-25000	9	30.0%	14	46.6%
		>25,000	9	30.0%	5	16.7%
8	Type of family	Nuclear	11	36.7%	15	50.0%
		Joint	10	33.3%	8	26.7%
		Extended nuclear	9	30.0%	16	23.3%
9	Dietary habits	Vegetarian	6	20.0%	20	66.7%
		Non-vegetarian	24	80.0%	10	33.3%
10	Adverse health habits	Smoking	12	40.0%	13	43.3%
		Tobacco use	5	16.7%	7	23.3%
		Alcoholism	2	6.7%	4	13.3%
		None	8	26.7%	5	16.7%
		Others	3	10.0%	1	3.4%

**Section 2: Distribution of patients with stroke based on clinical variables**

**Table 2: Distribution of patients with stroke based on clinical variables**

Sl no	Variable	Category	Experimental Group (n=30)		Control Group (n=30)	
			Frequency	Percentage	Frequency	Percentage
1	Number of hospitalization due to stroke	First attack	15	50.0%	16	53.3%
		Second attack	11	33.3%	11	36.7%
		≥3 Attacks	5	16.7%	3	10.0%
2	Type of stroke	Ischemic stroke	20	66.7%	25	83.3%
		Haemorrhagic stroke	10	33.3%	5	16.7%
3	Area of stroke	Right hemisphere	18	60.0%	24	80.0%
		Left hemisphere	12	40.0%	6	20.0%

4	Comorbidities	Hypertension	13	43.3%	7	23.3%
		Diabetes	5	16.7%	10	33.3%
		Dyslipidemia	2	6.7%	10	16.7%
		Hypertension and diabetes	2	6.7%	3	10.0%
		Diabetes and dyslipidemia	1	3.3%	3	10.0%
		Hypertension and dislipidemia	2	6.7%	-	-
		Hypertension, diabetes and dyslipidemia	5	16.7%	2	6.7%

**Section 3: Distribution of patients with stroke based on Upper extremity motor functioning**

**Distribution of patients with stroke based on Upper extremity motor functioning before intervention**

Analysis depicts that, the minimum and maximum score of upper extremity motor functioning of patients with stroke was 48.0 and 63.0, with median 58.0 and mean score 57.2 The minimum and maximum score of upper extremity motor functioning in the experimental group was 48.0 and 63.0, with median 57.5 and mean score 56.9, whereas in control group the minimum and maximum score of upper extremity motor functioning was 50.0 and 61.0, with median 58.0 and mean score 57.4. The minimum and maximum score of upper extremity motor functioning in the experimental group was 50.0 and 64.0, with median 60.0 and mean score 59.2, whereas in control group the minimum and maximum score of upper extremity motor functioning was 51.0 and 62.0, with median 56.0 and mean score 56.5.

**Section 4: Effect of Mirror therapy on upper extremity motor functioning among patients with stroke**

**Table 3: Comparison of upper extremity motor functioning among patients with stroke in experimental and control group (n=60)**

Upper extremity motor function	Experimental group (n=30)		Control group (n=30)		t	p
	Mean	SD	Mean	SD		
Pre test	56.93	3.96	57.37	2.80	0.49	0.627
Post test	59.20	3.54	56.47	2.98	3.24**	0.002

\*\*Significant at 0.01 level

The table 3 shows that post-test mean difference between the experimental and control group was statistically significant (p=0.002).

**Section 5: Association between upper extremity motor functioning among patients with stroke and selected socio-personal variables and clinical variables**

There was no statistically significant association between upper extremity motor functioning among patient with stroke and age, gender and adverse health habits. Statistically significant association was found (p=0.023) between upper extremity motor functioning among patient with stroke and number of hospitalization due to stroke attack. There was no statistically significant association between upper extremity motor functioning among patient with stroke and type of stroke, area of stroke and co-morbidities.

**DISCUSSION**

Result revealed that the minimum and maximum score of upper extremity motor functioning in the experimental group was 48.0 and 63.0, with median 58.0 and mean score 57.2. This is in tune with a community-based study of stroke conducted in New Zealand concluded that recovery of motor function associated with stroke severity is 88%. Another study conducted in Cleveland among 30 stroke survivors to assess the upper limb motor function in hemiparesis also support the

findings, which showed normalized Arm motor ability test (AMAT) scores were generally lower than normalized FMA (Fugl-meyer assessment) scores (p <0.001).

The present study findings showed that there was a statistically significant (p=0.002) difference in post-test score of upper extremity motor functioning in the experimental group compared to the control group. A randomized controlled trial study reported congruent result to findings of the present study that the post-test Fugl Meyer assessment score was significantly higher in the mirror therapy group (p=0.001). Another study conducted in department of rehabilitation medicine, Netherland showed post treatment FMA improved more in the mirror group than in the control group (3.6 ± 1.5, p < .05) [19]. A meta-analytic study to evaluate the mean treatment effect of mirror therapy on motor function of the upper extremity in patients with stroke reveals that mirror therapy may significantly improve motor function of the upper limb in patients with stroke and the value of test for overall effect was 4.58 (p= <0.001).

In the present study there was statistically significant association between upper extremity motor functioning among patient with stroke and number of hospitalization due to stroke (p=0.023). This result is in contrast to a study conducted at Chennai. No association was found significant between upper extremity motor functioning among patients with stroke and age, gender, adverse health habits, type of stroke, area of stroke and co-morbidities. These results are in tune with a study done in Chennai which revealed no significant association between socio-personal and clinical variables such as age, gender, education, duration of stroke, affected side, dominant side and co-morbidities. The participants were also under physiotherapy treatment, small sample size, limited time period and long term follow up was not feasible; were some of the limitations of the study.

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