

# **RESEARCH ARTICLE**

#### EFFECTIVENESS OF MIRROR THERAPY ON UPPER EXTREMITY MOTOR FUNCTIONS (UEMFs) & ACTIVITIES OF DAILY LIVING (ADLs) IN STROKE PATIENTS AT DEPARTMENT OF NEUROLOGY, KGMU LUCKNOW

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# Manuscript Info

## Abstract

Manuscript History

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#### Key words: -

Stroke, Mirror therapy, Upper Extremity Motor Functions, Activity of Daily Living **Background:** Stroke, global health problem and second cause of death with fourth leading cause of disability worldwide. Mirror therapy is a new approach in rehabilitation used in different neurological disorders including stroke. In mirror therapy, a mirror is placed beside the unaffected limb, blocking the view of the affected limb. This creates the illusion that both limbs are functioning properly.

**Objectives:** The objective of the study was to assess the effectiveness of mirror therapy on upper extremity motor functions and activity of daily living in stroke patients.

**Method:** A quasi-experimental one group pre-test post-test design used by convenient sampling assign 35-stroke patients who met the inclusion criteria. The intervention administered in the morning for a week and a self-structured tool (UEMFs assessment scale) for Upper extremity motor functions and ADL Independence scale for activity of daily living. Data were collected every day in a week.

**Results:** The result showed that UEMFs score was significant after intervention (p<0.001), ADL score was significant (p<0.001). There was significant improvement from pre to post test was found in UEMFs status among stroke patents (p=0.015). The significant improvement in ADL status among stroke patients. (p=0.003). The significant correlation was found between UEMFs (r=0.737, p<0.001) and ADL (r=0.857, p<0.001).

**Conclusion:** The study concluded that Mirror therapy was an effective, non-pharmacological measure for improving upper extremity motor functions and ADL among stroke patients.

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#### Introduction:-

Stroke is the third leading cause of life lost all over the world. Stroke is an important cause of premature death in developing countries like India, largely driven by demographic changes and enhanced by the increasing prevalence of the key modifiable risk factors.<sup>7</sup>

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Health is not a static process and is always changing. Health is the aspect of functional as well as the metabolic efficiency of a living being. Generally, the meaning of health is to be free from illness, injury, or pain. Health is the general condition of a person in the mind, body, and spirit. Any disturbance in the normal state of a human being that interrupts its vital functions is known as disease.<sup>7</sup>

Now a day's Stroke is seemly an important cause of premature death and disability in developing countries like India, largely driven by demographic changes and enhanced by the increasing prevalence of the key modifiable risk factors.85% of patient with stroke is experiencing hemiplegia and upper extremity functional impairment/lose. Hemiplegia is having an impact on the activity of daily living because it damages the upper extremity motor function.<sup>4</sup>

In India, from 2003 to 2013, the relative rate of stroke death fell by 33.7% more among those >65 years and the actual number of stroke deaths declined by 18.2%. Yet each year, 795,000 people continue to experience a new or recurrent ischemic or hemorrhagic stroke. (WHO, 2016).6

Mirror therapy is a form of motor imagery in which a mirror is used to convey visual stimuli to the brain through observation of one's unaffected body part as it carries out a set of movements. The underlying principle is that movement of the affected limb can be stimulated via visual cues originating from the opposite side of the body.<sup>3</sup>

World Health Organization (WHO) (2020) has stated that the cerebrovascular diseases, headache or a migraine which is the most common cause in most patients. Across the world, around 80% of the patients with cerebrovascular diseases are manifesting these symptoms.<sup>1</sup>

Yang et. al. (2017) was conducted a study on effects of two-handed task training on upper limb function of chronic hemiplegic patients after the development of the motor function of the cerebral cortex is asymmetrical to the dominant hand. Based on such asymmetrical development of the cerebral cortex, when the left hand is 15 performing a task, the cerebral cortex motor area of the right cerebral hemisphere activates. Thus, the left hemisphere, which is the dominant cerebral hemisphere due to the lateralization of the cerebral hemisphere, is more closely related with motor planning in ADL performance and the same relationships were shown after cerebral hemisphere injury due to stroke.<sup>8</sup>

Kamal Narayan Aryaet. al. (2019) was conducted a randomized controlled trial. To assess the Effect of activitybased mirror therapy on lower limb motor-recovery and gait in stroke. The objectives of this study were to determine the effect of activity-based mirror therapy (MT) on motor recovery and gait in chronic post-stroke hemiparetic subjects. The sample was 36. A randomized, controlled, assessor-blinded trial was used. Fugl-Meyer assessment lower extremity (FMA-LE), Rivermead visual gait assessment (RVGA), and 10-meter walk test (10-MWT) was used to assess the effectiveness. The results showed that the experimental group exhibited significant and favorable changes for FMA-LE (mean difference = 3.29, 95% CI = 1.23-5.35, p = .003) and RVGA (mean difference = 5.41, 95% CI = 1.12-9.71, p = .015) in comparison to the control group. No considerable changes were observed on 10-MWT. Conclusion Showed That Activity-based MT facilitates motor recovery of the lower limb as well as reduces gait deviations among chronic post-stroke hemiparetic subjects.<sup>2</sup>

#### Statement of problem:

Effectiveness of mirror therapy on upper extremity motor functions (UEMFs) & activities of daily living (ADLs) in stroke patients at Department of Neurology, KGMU Lucknow.

## **Objectives:-**

- 1. To assess the UEMFs & ADLs before the intervention (MT) in stroke patients.
- 2. To assess the UEMFs & ADLs after the intervention (MT) in stroke patients.
- 3. To compare UEMFs & ADLs before and after intervention (MT) in stroke patients.
- 4. To assess the association of mirror therapy on UEMFs & ADLs with selected demographic variables.

#### **Hypotheses:**

- 1. H<sub>1</sub>. There will be significant difference on UEMFs after intervention.
- 2.  $H_2$  There will be significant difference on ADLs after intervention.
- 3. H<sub>3</sub>- There will be significant association between UEMFs and ADLs after intervention.

## Method:-

#### Research approach:

A quantitative approach was chosen for the study.

#### **Research design:**

In this study, the researcher selected quasi experimental. (one group pre-test-post-test-design).

# Variables:

## Independent variable:

In this study the independent variable was mirror therapy.

## **Dependent variable:**

Upper extremity motor function and Activity of Daily Livings (UEMFs & ADLs).

## Demographic variable:

Age, gender, education, occupation, type of family, residence, monthly income, marital status, duration of stroke, stroke affected part, other related illness, previous family history of stroke.

## Setting of the study:

The researcher selects a specific setting for this study where she gathered information related to study. In this study setting was the Department of Neurology, KGMU, Lucknow. KGMU is an autonomous tertiary care hospital located in ChowkLucknow and one of the largest governments funded research centres within the main hospital that receives 20 patients with stroke monthly from all over India.

## **Population:**

In this study the population was the stroke patient who was admitted in stroke ward, KGMU Lucknow.

## **Target population:**

In this study, the target population was stroke patient who are having impairments in upper extremity due to stroke and admitted in stroke ward.

#### Accessible population:

In this study the accessible population was hemi paresis patient who were admitted in stroke ward.

Sample and Sampling technique.

#### Sample:

The sample of the study was the stroke patient who was admitted in stroke ward in Neurology Department, who fulfil the inclusion criteria and agreed to participate in the research study.

#### Sampling technique:

In this study Non- probability convenient sampling technique was used to select stroke patient who are admitted in neurology stroke ward.

## Sample size:

Sample size was 35.

#### Criteria For sample selection:

#### Inclusion criteria:

- 1. Patients with first episode of stroke and having upper extremity motor function impairment(hemiparesis).
- 2. Patients who admitted first time for stroke treatment.
- 3. Patients who are fully oriented and able to understand and obeys commands.
- 4. The age of sample (30-70).
- 5. The stroke patients whose GCS score will be 13-15.

## **Exclusion criteria:**

- 1. Critically ill patients.
- 2. Global aphasia and cognitive impairment not understand instruction.
- 3. CNS disorder.
- 4. Patients who had poor cognitive function.
- 5. Patients who had fracture on stroke affected extremities.
- 6. Those who have both Hypertension and DM.

#### Description of the data collection tool and technique:

Section 1: Demographic variable and clinical profile

Demographic variables include age, gender, education qualification, occupation, types of family, place of residence, monthly income and marital status. Clinical profile includes duration of stroke, stroke affected side, associated illness and history of stroke in family.

Section 2: Upper Extremity Motor Functions (UEMFs) assessment scale

This section includes a self-structured assessment scale used by investigator which was used to assess the range of motion exercises score.

The (UEMFs) scoring is reliant on an investigator's self-assessed the subject after demonstrating the mirror therapy exercises and the investigator's ability to judge the changes in upper extremity motor functions in stroke patient after giving mirror therapy. It includes 5 categories according to performance of subjects and giving score by investigator accordingly.

#### Scoring of the tool:

SCORE	INTERPRETATION
00-00	None motor function
01-25	Poor motor function
26-50	Mild motor function
51-75	Moderate motor function
76-100	Good motor function

**Reliability:** The reliability of the tool was established by test retest method which was r = 0.81. It's reliable.

Section 3: Index of Independence in Activities of Daily Living (ADL)

This section includes self-structured scale for assessment of activities of daily living in stroke patient. The ADL scale is reliant on a researcher's ability to judge the performance of activities of daily living after mirror therapy. This scale includes 5 categories of independence level of patients.

SCORE	INTERPRETATION
00-00	Total dependence
01-05	Severe dependence
06-10	Moderate dependence
11-15	Slight dependence
16-20	Independence

#### **Reliability:**

The reliability of the tool was established by test retest method was 0.86. It is reliable.

#### **Procedure of data collection:**

The investigator got the formal permission from the college authority and hospital.

The study participants those who fulfil the inclusion criteria were selected by convenient sampling technique.

Brief explanation about the purpose of the study was given to the subjects, assurance was given the subjects, assurance was given that the data will be utilizes only for the purpose of the study. Written consent was obtained from each subject and maintained the confidentiality. At first demographic details were obtained from stroke patients. The investigator gave thorough description about the tool and data collection procedure and intervention.

# Demonstrate the range of motion exercises in front of mirror (Mirror Therapy)

Phase A:

- 1. The investigator demonstrates the range of motion exercises in front of mirror to the stroke patients for 30 minutes in everyday till one week.
- 2. Mirror therapy administered 30 minutes per day for one week.
- 3. It includes the range of motion exercises of upper extremities i.e. Fingers, Thumb, Hand, Wrist, Forearm and Elbow.
- 4. The researcher demonstrates the range of motion exercises to the patient and patients will do these exercises in front of mirror.
- 5. During the session, the investigator asked to the subjects try to do the same movements in the paretic hand while they were moving the non- paretic hand.
- 6. Subject was instructed to observe the reflection of the non-affected hand while doing exercise of both hands.

## Phase B:

- 1. It includes some component of activities of daily living such as feeding, combing, holding the object, brushing and dressing.
- 2. Advice patient to perform certain parameters of ADLs Such as feeding, combing, holding the object, brushing and dressing.
- 3. Post-test was taken on 7<sup>th</sup> day.

## **Results:-**

Section I: Distribution of the demographic and clinical variables among stroke patients.

 Table 1:- Frequency and Percentage Distribution of stroke patients according to their Demographic Variables among stroke patients. n=35

Variable	No.	%
AGE (IN YEARS)	•	•
30 - 40 years	4	11.4
41 - 50 years	14	40.0
51 - 60 years	15	42.9
61 - 70 years	2	5.7
Gender		
Male	17	48.6
Female	18	51.4
Educational status		
Illiterate	10	28.6
High School	7	20.0
Intermediate	12	34.3
Graduate or above	6	17.1
Occupation		-
Farmer/ Labourer	5	14.3
Private job	14	40.0
Government job	9	25.7
Unemployed	7	20.0
Type of family		
Nuclear	25	71.4
Joint	10	28.6
Residence		-
Rural	18	51.4
Urban	17	48.6
Income		
< 10000	11	31.4
10001 - 20000	13	37.1
20001 - 30000	6	17.1
30001 & above	5	14.3

# Marital status

Variable	No.	%
DURATION OF STROKE		÷
1-15 days	26	74.3
16-30 days	9	25.7
STROKE AFFECTED SIDE		
Dominant side	24	68.6
Non-dominant side	11	31.4
ASSOCIATED ILLNESS		
Nil	6	17.1
Hypertension	26	74.3
Diabetes Mellitus	3	8.6
HISTORY OF STROKE IN FAMILY		
Yes	13	37.1
No	22	62.9
Married	26	74.3
Unmarried	1	2.9
Divorced/ separated/widower	8	22.9

Section II: The effect of mirror therapy on Upper extremity motor functions (UEMFs) and Activity of daily livings (ADLs).

Table 2.1:- Comparison of Pretest a	nd posttest score of Upper	r Extremity Motor Function	ons (UEMFs score) in stroke
patients. n=35			

UEMF Score	Total Score		Wilcoxon Signed Rank Test		
	Mean	SD	Change	z-value	p – value
Pre-Test	1.71	2.57	2.86	4.21	<0.001
Post Test	4.57	4.68			

This table shows that the what changes in the mean and SD of pretest and posttest score of UEMFs. It shows that the mean pre-test UEMF score was  $1.71\pm2.57$  which after post-test increased to  $4.57\pm4.68$ . The increase in mean UEMF score was significant (p<0.01).

 Table 2.3:- Comparison of Pretest and posttest score of Activity of Daily Living (ADL score) in stroke patients.

 n=35.

ADL Score	Total Score		Wilcoxon Signed Rank Test		
	Mean	SD	Change	z-value	p – value
Pre-Test	4.46	3.26	2.97	4.61	<0.001
Post Test	7.43	4.82			

The mean pre-test ADL score was  $4.46\pm3.26$  which after post-test increased to  $7.43\pm4.82$ . The increase in mean ADL score was significant (p<0.001).

Section C: Find the changes in pre and post test status on UEMFs and ADLs After intervention.

**Table 3.1:**Comparison of Pretest and posttest status of Upper Extremity Motor Functions (UEMFs score) in stroke patients. n=35

UEMF	Pre-Test		Post Test		McNemar chi square	p-value
	No.	%	No.	%		
None motor function	19	54.3	9	25.7	5.95	0.001
Poor motor function	16	45.7	26	74.3		
Total	35	100.0	35	100.0		

The overall UEMF status based on UEMF score showed that initially a larger proportion 54.3% had none motor function which after post-test improved and only 25.7% left in that category. Further the proportion of poor motor function (minute improvement category) increased from 45.7% to 74.3%. The significant improvement from pre to post test was found in UEMF status among the stroke patients. (p=0.015).

 Table 3.2:- Comparison of Pre-test and Post-test status of Activity of Daily Living (ADL status) in stroke patients.

 n=35

ADL	Pre-	Test	Post Test		Fest Post Test		McNemar chi square	p-value					
	No.	%	No.	%									
Total dependence	7	20.0	4	11.4	14.3	0.001							
Severe dependence	17	48.6	9	25.7									
Moderate dependence	11	31.4	11	31.4									
Slight dependence	0	0.0	11	31.4									
Total	35	100.0	35	100.0			3	5	100.0	35	100.0		

The overall ADL status based on ADL score showed that initially a larger proportion 20.0% had total dependence and 48.6% had severe dependence which after post-test improved and only 11.4% had total dependence and 25.7% had severe dependence. Further the proportion of slight dependence (minute improvement category) increased from 0.0% to 31.4%. The significant improvement from pre to post test was found in ADL status among stroke patients (p=0.003).

Section IV: Find out correlation between Upper Extremity Motor functions and activity of daily livings in stroke patients after mirror therapy.

**Table 4:-** Correlation between Upper Extremity Motor Function and Activity of Daily Living in stroke patients. n=35

Variables	Pearson's correlation (r)	p-value
Pre UEMF with Pre ADL	.023	.896
Post UEMF with Post ADL	.300	.080
Pre UEMF with Post UEMF	.737	<0.001
Pre ADL with Post ADL	.857	<0.001

The significant correlation was found between Pre-test UEMF and Post-test UEMF (r=0.737, p<0.001) and Pre-test ADL and post-test ADL (r=0.857, p<0.001).

Section V: Association between the effectiveness of Mirror Therapy on UEMFs and ADLs with selected demographic variables and clinical variables.

There was no significant association found between the effectiveness of Mirror Therapy on UEMFs and ADLs with selected demographic variables and clinical variables.

## **Discussion:-**

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## Major findings and discussions of the study:

There was significant effect in UEMF Score and ADL score after the intervention in stroke patients on post-test p<0.001. Whereas, the findings of the study were supported by the following literature: Radajewska, Alina, Opara, Józef ,Biliński, Grzegorz e,t. al.(2017) The literature indicates that the application of MT combined with comprehensive rehabilitation significantly improved hand function in subacute stoke inpatients without severe hand paresis and without severe cognitive dysfunction. Patients were selected for the study in a targeted manner (according to study selection criteria), whereas assignment to the Mirror group (n = 30) or Control group (n = 30) was based on simple randomization (alternative allocation). Patients were allocated to their study group before baseline measurements were performed. All subjects were tested twice: immediately after admission to rehabilitation and 21 days later—at the end of the intervention. Pre- and post-test clinical evaluations were conducted by one investigator, blinded to the participant group. This was supported by the significant level of the

Wilcoxon test (p = .005). The results of this study indicate that MT as an adjunct to comprehensive rehabilitation is effective for increasing ADL in the older adult.<sup>5</sup>

## **Conclusion:-**

Mirror therapy was an effective, inexpensive and non-pharmacological measure for improving upper extremity motor function. This study was intended to assess the effectiveness of mirror therapy to improve upper extremity motor function in stroke patients. Relevant literature, journal was reviewed to enrich the knowledge on the selected study and it facilitates in selection of appropriate conceptual frame work, developing a model and research plan.

#### **Nursing Implications:**

The present study has implications for nursing practice, nursing education, nursing administration and nursing research.

#### Nursing practice:

- 1. Nurses can implement the practice of mirror therapy to improve upper extremity motor function among stroke patients in clinical and community settings.
- 2. Nurses should assess the upper extremity motor function of patients with stroke by using UEMFs Assessment on daily basis.
- 3. Nurses also involve in educating stroke survivors and their families on the importance of mirror therapy in improvement of upper extremity motor function.
- 4. Nurses should provide support and motivation for stroke patients to continue mirror therapy regimens for permanent incorporation into a daily routine.

#### Nursing education:

- 1. Mirror therapy can be included in the literature on improving upper extremity motor function in stroke patients.
- 2. Mirror therapy training program can be included into the nursing curriculum to improve the upper extremity motor function among stroke patients.
- 3. Continuous education among staff nurses will help to promote and update their knowledge on administration of mirror therapy for improving upper extremity motor function among stroke patients.

## Nursing administration:

- 1. Provision should be made for staff working in neuro ward to get training in mirror therapy and various therapies.
- 2. Protocol for the procedure of mirror therapy can be developed based on the study findings.
- 3. Nursing administrators can motivate nurses to use mirror therapy in their clinical practice.

#### Nursing research:

- 1. Nurse researchers can conduct studies to verify the scientific rationale or physiology behind the effect of mirror therapy to improve upper extremity motor function among stroke patients.
- 2. Randomized clinical trials could be under taken so that the validity of the results can be increased and it can be incorporated into the evidence-based nursing practice.

#### Limitations:

- 1. The participants were also under physiotherapy treatment.
- 2. Study findings cannot be generalized due to small sample size.

#### **Recommendations for further study:**

- 1. A similar study could be conducted in rehabilitation centers and community setting.
- 2. A comparative study to assess the effectiveness of mirror therapy to improve the upper and lower extremity motor function among patients with stroke.
- 3. The similar study can be conducted in larger group of population

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