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Effectiveness of Mirror Therapy on Upper Extremity Motor Function Among Stroke Patients in Selected Hospitals, Kollam

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Abstract: ***A nonrandomized control group research study was done to evaluate the effectiveness of mirror therapy on upper extremity motor function among stroke patients in selected hospitals, Kollam. The objectives were to assess the effect of mirror therapy on upper extremity motor function among stroke patients, to find the association between pretest motor scores with selected demographic variables. Conceptual framework used was Roy's Adaptation Model by Sr. Callista Roy. Quantitative research approach was selected with nonrandomized control group research design. Convenient sampling was used. Sample size included 60 samples, 30 each in experimental and control group. Based on inclusion criteria samples were selected. Pretest was conducted for both experimental and control group on first day, followed by mirror therapy and on 7th day posttest was conducted. The mirror therapy was provided only for the experimental group, with 10 minutes duration, no intervention was given for the control group. The findings of the study were, there is significant difference in pretest motor function scores and posttest motor function scores of the affected upper extremity in the experimental group at 0.05 level of significance, which indicates that there is significant decrease in the disability among stroke patients following MT intervention. The association between effectiveness of mirror therapy and selected demographic variables were found at 0.05 level of significance.***

Keywords: Mirror therapy; stroke; upper extremity motor function; stroke patients

1. Introduction

Globally, stroke or cerebrovascular accident is the second leading cause of death and the third leading cause of disability.[1] Stroke is a major cause of loss of life, limbs and speech in India, with the Indian Council of medical research estimating that in 2004, there were 9.3 lakh cases of stroke and 6.4 lakh cases due to stroke in India, most of the people being less than 45 years old. W.H.O. estimate suggests that by 2050, 80% of stroke cases in the world would occur in low and middle income countries mainly India and China. In China, 1.3 million have a stroke each year and 75% live with varying degrees of disability. Various predictions assume that the next two decades suggests tripling in stroke mortality in Latin America, the Middle East, and sub-Saharan Africa.[2] Worldwide, 70% of strokes and 87% of both stroke-related deaths and disability in the developing world, the trend of increasing incidence of stroke is seen. This is the reason why now India has come out with national guidelines for stroke management. Globally, cerebrovascular accidents (stroke) are the second leading cause of death and disability. Yearly 15 million worldwide suffer a stroke. Nearly 6 million deaths occur and another 5 million are left permanently disabled.

As per a recent study published in the Journal of Stroke by two experts, Jeyaraj Durai Pandian and Paulin Sudhan, the prevalence rate of strokes is 84-262 per 100,000 populations in rural India and 334-424 out of 100,000 populations in cities.[3] Stroke is one of the causes leading to death and disability in India. The incidence rate is 119-145/100,000 based on the recent population based studies.[4] According to Trivandrum stroke registry during a six month period 541 strokes were reported in Trivandrum, 431 in the urban and 110 in the rural communities.[5]

A stroke occurs due to the interruption of the blood supply to the brain, which usually occurs because a blood vessel bursts or is blocked by a clot. This cuts off the supply of oxygen and nutrients, causing damage to the brain tissue. The common symptoms of a stroke are sudden weakness or numbness of the face, arm or leg, most often on one side of the body. Other symptoms include: confusion, difficulty in speaking or understanding speech; difficulty in seeing with one or both eyes; difficulty in walking, dizziness, loss of balance or coordination; severe headache with no known cause; fainting or unconsciousness. The effects of stroke depends on which part of the brain is injured and how severely it is affected. A very severe stroke can cause sudden death.[6]

Worldwide, stroke is the second leading cause of death above the age of 60 years, and the fifth leading cause of death in people aged 15 to 59 years old.[2] Mostly individuals get affected by stroke in their peak productive life. Stroke rehabilitation has its own importance in this regard. The underlying principle of mirror therapy which is also a part of stroke rehabilitation is that movement of the affected limb can be stimulated via visual cues originating from the opposite side of the body. Hence it is thought that this form of therapy can prove useful in patients who have lost movement of an arm or leg including those who have had a stroke and related defects.[7] Mirror therapy has been shown to increase cortical and spinal motor excitability, most probably through the effect on the 'mirror neuron system'. In the human brain mirror neurons account for about 20% of all the neurons. It had been found that these mirror neurons are responsible for laterality reconstruction i.e., ability to

differentiate between the left and the right side. When the mirror therapy is used mirror neurons get activated and help in the recovery of affected parts.[8] Mirror therapy was found to be a simple and economical technique which can stimulate the brain noninvasively. This intervention unquestionably has neural foundation. It was scientifically found that multiple areas of the brain such as the occipital lobe, dorsal frontal area and corpus callosum are involved during the simple MT regime. Bilateral premotor cortex, primary motor cortex, primary somatosensory cortex, and cerebellum also get reorganized to enhance the function of the damaged brain.[9] In a study to find the effectiveness of mirror therapy researchers reviewed 14 relevant studies involving 567 participants. They found at the end of treatment that mirror therapy improved movement of the affected limb and the ability to carry out daily activities and atleast as an adjunct to normal rehabilitation for patients after stroke. And no adverse side effects were reported as part of this intervention in the study. [10] Another study was done to evaluate the mean treatment effect of mirror therapy on motor function of the upper extremity in patients with stroke utilizing a meta-analysis approach. Even though the included studies shown high heterogeneity, meta-analysis provided some evidence that mirror therapy may significantly improve motor function of the upper limb in patients with stroke. They also recommended that well designed studies are needed further to expand the evidence base.[11]

In yet another study which sought to determine whether 6 week of 45 minutes weekly mirror therapy sessions improved upper extremity motor function poststroke. Fugl-Meyer Assessment and Canadian Occupational Performance Measure (COPM) changes were not statistically significant, but positive changes on the Stroke Impact Scale contradicted COPM results were yielded in the study. They also concluded the study with the recommendation that mirror therapy may be an effective treatment for stroke rehabilitation, but further research is needed.[12]In a case report titled using mirror therapy in the home environment the investigators found at the end that a predominantly self-administered home based mirror therapy program is feasible and effective at improving function after stroke.[13]

2. Research Methods

Quantitative research approach was adopted to find the effect of effect of mirror therapy among stroke patients in selected hospitals, Kollam. Population of the study consists of stroke patients at selected hospitals Kollam during data collection. The setting of the present study was in Bishop Benziger Hospital and Upasana Hospital Kollam. In this study sample consisted of 60 stroke patients from selected hospitals of Kollam, 30 in experimental group and 30 in control group. After extensive review of literature and receiving suggestions and opinions from experts the tool was prepared which included the demographic information and self structured mirror therapy exercises which includes 12 statements on a 4 point likert scale.

3. Research Results

Description of sample characteristics

- The data of the age distribution shows that majority of the samples belonged to the age range of 61-65 in both experimental group (46.67%) and control group (56.67%).
- Equal percentage distribution was found for both the genders among experimental group while majorities (53.33%) of the samples were males in control group.
- It was observed that majority of the samples were unemployed in both experimental group (80%) and control group (86.67%).
- It shows that majority of the samples in both experimental group (83.33%) and control group (83.33%) had elementary level of education. 16.67% of samples in the experimental group were illiterate while 16.67% of the control group had higher secondary level of education.
- The data of marital status shows that majority of the samples in both experimental group (83.33%) and control group (56.67%) were married. 3.33% of the samples were single among experimental group but the percentage distribution was 43.33% for the control group. 13.33% of samples in experiment group lost their spouses.
- It was found that majority of the samples in the experimental group (56.67%) had an annual income of Rs. 10,001-15,000. 40% of the samples in the experimental group had an annual income of NRs. 10,000 while 3.33% of the samples had an annual income in the range Rs. 15,001-20,000. Majority (76.67%) of the samples among control group had an annual income of NRs. 10,000 while 23.33% had it in the range Rs. 10,001-15,000.
- According to region of living, majority of the samples in both experimental group (53.33%) and control group(73.33%) lived in the rural region. 46.67% of the experimental group and 26.67% of the control group lived in urban region.

Table 1: Frequency and Percentage distribution of pretest and posttest upper extremity motor function scores of experimental group

(n=30)

	Pretest		Posttest	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Mild disability	0	0%	0	0%
Moderate disability	14	46.67%	18	60%
Severe disability	16	53.33%	12	40%

Table 2: Frequency and Percentage distribution of pretest and posttest upper extremity motor function scores of control group **(n=30)**

	Pretest		Posttest	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Mild disability	0	0%	0	0%
Moderate disability	15	50%	10	33.33%
Severe disability	15	50%	20	66.67%

Table 3: Mean, Standard deviation and't' value of pretest and posttest scores of the experimental group after mirror therapy **(n=30)**

Experimental group	Mean	Standard deviation	t value
Pretest score	22.2	3.97	5.86
Posttest score	23.73	4.43	

$t_{(29)}$ =1.69, Significant at 0.05 level of significance.

Table 4: Mean, Standard deviation and't' value of pretest and posttest scores of the control group **(n=30)**

Control group	Mean	Standard deviation	t value
Pretest score	23.03	4.05	2.26
Posttest score	23.23	4.03	

$t_{(29)}$ = 1.69, Significant at 0.05 level of significance.

Table 5: Mean, Standard deviation and't' value of posttest motor function scores of the experimental and control group **N=60**

Posttest	Mean	Standard deviation	t value
Experimental group	23.73	4.43	0.46
Control group	23.23	4.03	

$t_{(58)}$ =2.001, Not significant at 0.05 level of significance.

Effectiveness of mirror therapy on upper extremity motor function scores among stroke patients in the experimental and control group

- The mean posttest score (23.73±4.43) of the experimental group was higher than the mean pretest score (22.2±3.97) and the calculated paired 't' value (5.86) is greater than table value (1.69) at 0.05 level of significance. Hence there was statistically significant difference between pretest scores and posttest scores of the experimental group. So there was significant difference in pretest motor function scoresand posttest motor function scores of the affected upper extremity in the experimental group.
- The mean posttest score (23.73±4.43) of the experimental group was higher than the mean posttest score (23.23±4.03) of the control group and the calculated unpaired 't' value 0.46 is less than table value 2.001 at 0.05 level of significance. Hence there was no statistically significant difference between the upper extremity motor function scores among experimental and control group.

4. Conclusion

The present study aimed to find the effectiveness of mirror therapy on upper extremity motor function among stroke patients in selected hospitals, Kollam. The findings of the study showed that the mean difference of the posttest score of the experimental group was (23.73) greater than the control group (23.23) at 0.05 level of significance after mirror therapy intervention to the experimental group. So the mirror therapy was not effective in improving the upper extremity motor function among stroke patients in selected hospitals, Kollam.

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