ORIGINAL ARTICLE

Effectiveness of Mirror Therapy on Upper Limb Function in patients with Stroke (Monoplegic)

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ABSTRACT

Background: stroke is serve as strong cause of long term disability and decline in functional capacity**.** Physical activity is directly proportional to decrease in obesity and increase in quality of life. Physical activity improves long term outcome of stroke and decrease the economic burden Mirror therapy is a technique which is first developed to treat amputated limb and found effective to improve upper limb function. Mirror therapy is proposed to increase neural plasticity by activating visual illusion in cerebral hemisphere.
Aim: To find the effectiveness of mirror therapy in post stroke (monoplegic) patients.
Methodology: 30 patients who met inclusion and exclusion criteria were recruited. out of 30 patients 16 patients were selected by using random table number and divided into equal two groups by lottery method, containing 08 participants each. Experimental group was given mirror therapy with parasagital mirror frequency of 30minute/daily, 5 days/week and four weeks. Control group was given same treatment protocol but with covered mirror. Outcome measurement tool was FMA. Outcome was taken at baseline, week 02 and week 04 respectively. One way ANOVA was used to measure the effectiveness of mirror therapy.
Results: One way ANOVA was applied to measure statistical significance, statistical analysis showed that FMA total score, pain, sensation and joint pain has ($p = 0.001$, $p \leq 0.05$) at week 01 and week 02.This statistical value depict that mirror therapy is effective to improve upper limb function.
Conclusion: it is concluded that mirror therapy has significant role to improve upper limb function.
Keywords: Mirror therapy, monoplegia, stroke, FMA

INTRODUCTION

Stroke is defined as interruption of blood supply to brain. Sign and symptoms of stroke depend on area involved in brain. The area of brain that loss blood supply is deprived from oxygen and nutrient supply so cells of that area start to die and ultimately results in loss of functions[1]. There are almost twenty six rehabilitation strategies under six domains are used for stroke rehabilitation. The six major domains include neurofacilitatory approaches, motor skill learning (CIMT), isolated concept, techniques using mirror neuron and motor imagery hypotheisis, Technology supported training and adjuvant therapies[2]. Mirror therapy and mental practice with motor imagery are techniques using hypothesis of mirror neuron and motor imagery. Adjuvant therapies include electrical stimulation (sensory and motor), invasive and non invasive brain stimulation and transcranial magnetic stimulation[2].

Upper extremity disorder is most common problem among post stroke patient even after 6 month post stroke. Almost 60-70% post stroke patients suffer from upper extremity dysfunction[3]. Upper extremity dysfunction leads to limitation in social activities because upper limb involved in activities of daily living[4]. Among post stroke patient upper extremity function play important role in prognosis and course of treatment[5]. Upper extremity muscle strength, upper extremity muscle tone and grasping power are important key factors that determine ability to perform activities which involve upper limb[6].

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Monoplegia refers to one limb weakness either arm or leg. There are many causes of monoplegia with involvement of upper limb including injury to multiple cervical roots, psychogenic, stroke, brachial plexus injury and head injury. The most common cause of monoplegia is stroke. Monoplegia involving upper limb in post stroke patient comprises almost 1%[7].

Mirror Therapy improves function by altering mechanism of action in cortex. Alteration in cortex is influenced by three factors mainly observation of hand movement in mirror, motor imagery of an assumed affected hand and assistance in exercising assumed affected hand. These factors contribute to increase motor evoked potential (MEP) which in turn improve motor function with use of mirror therapy. This phenomenon is investigated by Fukumura et al[8].

The objective of study is to find the effectiveness of mirror therapy in monoplegic stroke patients to improve the upper limb functions. Improvement in upper limb motor function will improves the quality of life among these patients. This Study will generate evidence regarding effectiveness of mirror therapy in improving upper limb function and quality of life among monoplegic patients. Upper limb role is essential in activities of daily living and instrumental activities of daily living. There is a comparatively slow recovery in fine motor movements as compared to gross motor activities. There is less evidence of mirror therapy effectiveness on monoplegic post stroke patient in our setting. Mirror therapy is simple, inexpensive and patient directed treatment for stroke rehabilitation.

METHODOLOGY

Thirty patients from Khalid Rehabilitation Center of Faisalabad who met inclusion and exclusion criteria were recruited . out of 30 patients 16 patients were selected by using random table number and divided into equal two groups by lottery method, containing 08 participants each. After consent demographic information filled by each participant including name, age, and other relevant personal information (Total 4). Criteria that was used for mirror therapy training is given below. Outcome measure was taken pre training and after 2 weeks successively by Fugual Mayer assessment scale. To measure the effectiveness of intervention (mirror therapy) after two and four weeks ANOVA was used.

Key exercises in Mirror therapy	Intensity	Volume	Frequency	Duration
Shoulder flexion Shoulder extension Shoulder Adduction Shoulder Abduction rotational activities elbow flexion, elbow extension wrist flexion, wrist extension gripping activities	Start with basic ROM exercises and progress to functional task	15 repetition each exercise	05 sessions/week	04 week

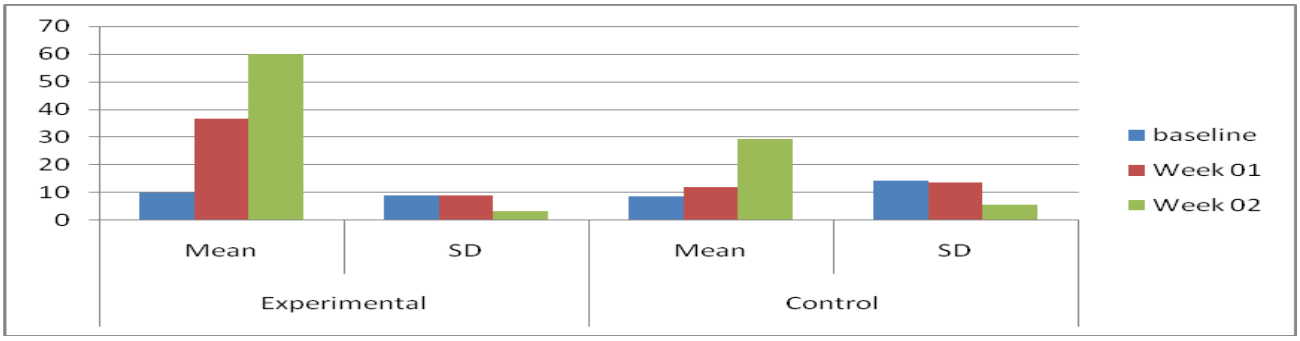
RESULTS

This is comparison between mean total motor function score of experimental and control group at baseline, week 01 and week 02. In experimental group mean score of FMA motor function at baseline was 10.00 with SD 9.07, at week 01 was 36.63 with SD 9.07, at week 02 was 60.13 with SD 3.27. in control group mean score of FMA motor function at baseline was 8.75 with SD 14.49, at week 01 was 12.12 with SD 13.75, at week 02 was 29.25 with SD 5.75.

Above graph show improvement in motor function score among experimental and control group. In graph blue color represent baseline measurement, red color represent week 01 measurement, green color represent week 02 measurement. Graph shows significant increase in total motor function score at week 01 and week 02 in experimental group as compare to control group.

Above table is showing that, results are not significant at base line between the group i.e., both group (experimental and control) have no difference at baseline.

At week 01 ($p = 0.001$, $p \leq 0.05$) showed that results are significant between the group i.e. experimental groups has significant improvement when compared with the control group. At week 02 ($p = 0.000$, $p \leq 0.05$) showed that results are significant between the group i.e. experimental groups has significant improvement when compared with the control group and also change maintained between the groups.



FMA Total score: Experimental vs. control group

FMA (motor function)Total score	Experimental		Control	
	Mean	SD	Mean	SD
Baseline	10.00	9.07	8.75	14.49
Week 01	36.63	9.07	12.12	13.75
Week 02	60.13	3.27	29.25	5.75

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
FMA Total Motor baseline	Between Groups	6.250	1	6.250	.043	.839
	Within Groups	2047.500	14	146.250		
	Total	2053.750	15			
FMA Total Motor week one	Between Groups	2401.000	1	2401.000	17.685	.001
	Within Groups	1900.750	14	135.768		
	Total	4301.750	15			
FMA Total Motor week two	Between Groups	3813.063	1	3813.063	173.110	.000
	Within Groups	308.375	14	22.027		
	Total	4121.438	15			

DISCUSSION

Upper limb motor function is important for activities of daily living. Shoulder, elbow, wrist and hand ROM, strength and coordination serve significant role to perform activities of daily living. Mirror therapy provide a cheap and non invasive method to improve motor function. Total motor function score serve a palatable means to reap certain benefits of mirror therapy. The primary aim of study was to find effectiveness of mirror therapy in post stroke (monoplegia) patient. Duration of training using mirror was consist on 4 weeks, each week 5 day and 30 minute per day. Outcome measure was taken at the end of 0, 2 and 4th week respectively. Outcome measure was FMA(fugual mayer assessment). Main findings of study were: (1) total motor function score progressively increased at week 2nd and 4th week as compare to control group. There is a slight increase in control group was found at the end of 4th week, (2) Sensation was improved in experimental group progressively with training while in control group there is no or slight improvement, (3) joint pain was decreased in experimental group after mirror therapy training than control group, (4) Joint ROM was increased in experimental group than control group.

The increase in total motor function is consistent with previous studies. Similar results were reported by Yavuzer et al in 2008. Experimental group receive mirror therapy 30 minutes daily, 5 days a week and for four weeks. Control group was given shame intervention Measurement was taken pre intervention, post intervention after four weeks and follow up measurement after 6 months. Outcome measurement tools were FIM,MAS and Brunnstrom stages(upper limb). Statistical analysis found mirror therapy effective to improve motor function of upper limb[9].

Results of current study is similar to results that was reports by Dohle et al in 2009. Mirror therapy was experimental intervention. Control group was given shame intervention Study was conducted on post stroke patient (upper limb). Motor training (different tasks including arm and hand postures supported by verbal feedback by therapist) were performed in front of parasagital mirror. Measurement was taken pre test and post test. Outcome measurement tools were FIM, ARAT, Fugl-Meyer, neglect score, BIT and TAP. Statistical analysis found sensation of plegic limb improved after mirror therapy according to FUgl-Meyer sub sensory scale. Total motor function of upper limb improved according to all measurement tools.

CONCLUSION

This study results showed that mirror therapy is effective to improve upper limb function and ability to perform activities of daily living among patients with stroke (monoplegic).

Ethics approval: Ethics approval was taken by university and hospital management. All guidelines given by ethical committee were followed during selection of subjects, application of intervention and collection of data.

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