

Effect of Mirror Therapy on Motor Function, Balance, Unilateral Neglect and Gait Parameters in Patients with Stroke - A Review

Kiran¹, Dr Suman Mehra², Dr Surekha Dabla³, Dr. Ritu Tomar⁴, Poonam⁵

¹College of Physiotherapy, Pt. B. D. Sharma UHS, Rohtak, India

²College of Physiotherapy, Pt. B. D. Sharma UHS, Rohtak, India

³Head of Department of Neurology, Pt. B. D. Sharma UHS, Rohtak, India

⁴College of physiotherapy, Pt. B.D. Sharma UHS, Rohtak, India

⁵College of physiotherapy, Pt. B.D. Sharma UHS, Rohtak, India

Corresponding Author: Dr. Suman Mehra

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ABSTRACT

Introduction: Stroke is the most common neurological disorder among general population associated with impaired muscle tone, imbalance, in-coordination and unilateral neglect. Physical therapy has got a profound role in treating patients with stroke. Among many treatment approaches, the mirror therapy has been used in treating stroke patients. Mirror therapy (MT) is a simple, low-cost and evidence-based approach for stroke rehabilitation. MT works on the principle of creating illusion and activating mirror neurons of motor cortex which enhances neuroplasticity.

Keywords: Mirror Therapy, Stroke, Gait, Balance, Unilateral neglect, Motor Function

INTRODUCTION

Stroke is the second biggest cause of death and the third biggest cause of disability worldwide.¹ According to World Health Organization (WHO) stroke is defined as “a clinical syndrome consisting of rapidly developing clinical signs of focal (or global in case of coma) disturbance of cerebral function lasting more than 24 hours or leading to death with no apparent cause other than a vascular origin”.²

Age, sex, and race are unchangeable risk factors for strokes, as other changeable risk factors like hypertension, alcohol use, smoking, obesity.³ In stroke an individual suffers from dropping of voluntary control and is unable to carry out various activities of lower limb as well as upper limb. It mainly gives rise to the half body paralysis, accompanied by with or without sensory &

visual loss leading to dependency or long-term care.⁴

Despite the pharmaceutical intervention, physical therapy plays remarkable role in management of stroke patients. Physical therapy intervention includes balance training, neuro-facilitation, constraint induced movement therapy and mirror therapy to enhance motor performance and improve functional outcome in patients with stroke.⁵ Mirror therapy along with conventional treatment found to be effective in improving balance, gait, motor function, functional mobility and unilateral neglect in stroke patients.⁶ The main objective of the review was to evaluate the effect of mirror therapy for improving motor function, balance, unilateral neglect, and gait parameters in patients with stroke.

Mirror therapy:

Mirror therapy, first introduced by Ramachandran et al., aims to alleviate phantom limb pain post-amputation. This therapy enables the phantom limb to experience kinesthetic sensations. It operates on the principle that either new axons grow or existing connections are strengthened, leading to its effectiveness. The author concluded that mirror therapy is particularly effective in treating phantom limb pain.⁶ Additionally, it has been found beneficial for patients with complex regional pain syndrome, stroke, and those recovering from hand surgery. The principle behind mirror therapy is the mirror-based visual illusion, a neuropsychological phenomenon that fosters motor recovery and stimulates neural activity in the injured brain. It aids in normalizing activity within the post-lesional primary motor cortex and enhances interhemispheric communication. In healthy individuals, mirror therapy (MT) may activate the ipsilateral motor cortex, as well as the contralateral occipital, sensorimotor, and premotor areas.⁸ During therapy, the patient sits in front of a mirror placed in the midsagittal plane, perceiving the reflection of the intact limb as if it were the affected limb, thus creating the illusion that the healthy limb's movements are coming from the affected limb behind the mirror.⁹

Mirror Therapy after stroke:

Beneficial effects of mirror therapy in stroke patients have been reported in literature on motor function, balance, unilateral neglect and gait parameters.

In their initial study on paretic limb after stroke, Serap Sütbeyaz et al. (2007) found that when mirror therapy is added to a traditional rehabilitation program, stroke patients experience longer-term improvements in their lower extremity motor recovery and functioning.⁷ Ching Yu Wu et al. (2013), reported that patients with sensory impairments in the MT group recovered their ability to sense temperature more fully than those in the CT group.¹⁰

Following the activity-based MT intervention, Arya et al. reported statistically significant difference. Particularly, hip-knee flexion and ankle dorsiflexion exercises during the intervention help to improvement in flexor synergy in stroke patients.¹³ Sang gu ji, reported there were significant improvements in gait ability between the mirror group and the control group following four weeks of mirror therapy.¹¹ During the acute period of a stroke, Jeyaraj D. Pandian reported that MT was beneficial in treating unilateral neglect.¹²

MATERIALS & METHODS

Author Year	Study location	Study design	No. of participant	Intervention	Outcome	Result
Serap Sütbeyaz, 2007 ⁷	Turkey	Randomized, controlled, assessor-blinded	N= 40 MT group(n=20) Control group(n=20)	MT Group= mirror therapy + conventional therapy Control group= conventional therapy Duration: 5 days a week, for 4 weeks.	Level of spasticity Motor recovery. Functional mobility.	Motor recovery Significantly more improved in the mirror group compared with the control group (P=.002).
Ching yi wu 2013 ¹⁰	Taoyuan	Single-blinded, Randomized controlled trial	N=33 MT group (n=16) Control group(n=17)	The MT group = bimanual symmetrical movement of upper limb upper extremity. Control group = task-oriented upper extremity training.	Motor function Sensory and ADL Functions.	MT group performed better in motor function (P=.04) Sensory assessment improved significantly more in the MT group

				Duration :1.5 hours/day, 5 days/week, for 4 weeks.		than in the CT group. No significant difference on the Motor Activity Log.
Sang gu ji 2014 ¹¹	Korea.	Randomized controlled study.	N=34 MT Group(n=17) control group(n=17).	MT group = conventional rehabilitation therapy and mirror therapy for the lower limbs. Control group= sham therapy and conventional rehabilitation therapy. Duration: 5 days per week for 4 weeks.	Temporospatial gait characteristics= single stance, stance phase, step length, stride, swing phase, velocity, and cadence.	Significant difference in post-training single stance, step length and stride length between the Experimental group and the control group (p < 0.05). No significant differences between two groups on stance phase, swing phase, velocity, cadence, and step width (P > 0.05).
Pandian JD 2014 ¹²	Punjab, India.	Randomized controlled trial	N=48 MT group (n=24) Control group(n=24)	Both the groups received limb activation exercises. Duration:1-2 hours a day 5 days a week for 4 weeks	Unilateral neglect	Improvement in unilateral neglect (P<0.0001) picture identification task (P< 0.0001) and line bisection test (P= 0.006) in the mirror therapy group.
Arya 2017 ¹³	New Delhi, India.	Randomized, Controlled, assessor-blinded trial.	N=36 MT group (n=18) Control group(n=18)	MT group=Activity-based MT comprised movements. Control group = Conventional therapy.	Motor recovery Motor function Gait parameter	Experimental group exhibited significant changes for motor function (P = .003) and RVGA (P=.015) in comparison to the control group. No significant changes were observed on 10-MWT.
Limtrakarn W 2021 ¹⁴	Pathum Thani, Thailand.	Randomly blinded	N=20 MT group (n=10) Control group(n=10)	Mirror group = mirror therapy + conventional treatment. Control group = conventional treatment Duration: 60 minutes per day, 5 days per week for 12 weeks.	Motor recovery Motor function Balance	Subjects of both groups had significant improvements in all variables measure (p < 0.05). MT group had greater improvement on the FMA (P<0.05).

Verma 2021 ¹⁵	India	Randomized, controlled trial (RCT).	N=56 MT group (n=28) Control group (n=28)	Experimental group = conventional therapy along with the MT for LE. Control group = placebo therapy + conventional therapy. Duration: 30 minutes in a day, 6 days a week, for 6 weeks.	Motor recovery Level of Spasticity. Balance.	Experimental group showed significant changes in balance score (P = 0.000) when compared to control group.
Xin wen 2022 ¹⁶	Guangdong, China	Randomly allocated	(N=52) MT group (n=26) Control group (n=26)	Experimental group = 30 minutes of additional mirror therapy. Control group = conventional therapy for 30 minutes, six times a week, for 3 weeks	Motor function Instrumental Activities of Daily Living.	Significant improvement in the score changes of FMA- UE and IADL in the experimental group compared to the control group after treatment (P < 0:05).

DISCUSSION

Through above studies, it was found that mirror therapy is effective technique in terms of motor recovery, balance, enhance the ability to perform activities of daily living, motor function, step length, unilateral neglect when utilizing mirror therapy with other interventions like other form of electrical stimulation.

CONCLUSION

This review concludes that mirror therapy is effective in improving gait, balance, enhance the ability to perform activities of daily living, motor function, functional mobility, unilateral neglect for the rehabilitation of upper and lower limb functioning after a stroke. Mirror therapy can be utilized alone or in conjunction with conventional physical intervention for beneficial effect in stroke patients.

Declaration by Authors

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