

# Literature Review on Role of Mirror Therapy and Motor Relearning Program for Hand Recovery in Chronic Stroke Patients

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**Abstract:** *This study is about mirror therapy and motor relearning program and to investigate their role in hand recovery in chronic stroke patients. An inclusive search on PubMed, PEDro, Goggle Scholar databases using keywords Mirror Therapy, Motor relearning program, chronic stroke, Upper limb. Randomized controlled trails, Quasi - experimental studies published since 2010 were taken. 15 studies were included in the study. The result of this review provides evidence that both MRP and MT have a significant positive effect on the improvement of the gross motor and fine motor functions of the upper extremity of patients suffering from chronic stroke, giving better results than conventional therapy alone. This study will show the benefits of both interventions and that we can optimise recovery by using both interventions in conjunction with each other and design them in a way that closely emulates activities of daily life.*

**Keywords:** Mirror Therapy, Motor relearning program, chronic stroke, Upper limb, Hand rehabilitation

## 1. Introduction

The World Health Organization (WHO) defines stroke as "rapidly developing clinical signs of (or global) disturbance of cerebral function, with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than vascular origin." (Sacco et al., 2013) <sup>[1]</sup>. According to statistics, there are over 80 million people currently living who have experienced a stroke globally, and there are approximately 13.6 million new stroke cases every year worldwide.

Out of all the stroke survivors approximately 80% have either an upper or lower limb paresis. Out of that about two-thirds of the patients won't regain functional arm use six months after the occurrence of stroke. Only 5 - 20% achieve full arm recovery of arm function. (Thieme et al., 2013) <sup>[2]</sup>

Over the last century there have been significant developments in brain sciences and neurosciences with various newer types of rehabilitation techniques being introduced (Dimyan & Cohen, 2011) <sup>[3]</sup>. Interventions used by Therapists for hand rehabilitation are numerous, with many new advances being made at a fast pace, with techniques such as Robot assisted Arm training gaining prominence rapidly, whereas techniques such as electrical stimulation have many evidence suggesting its usefulness in improving upper limb functional activities.

Motor relearning program comprised of following functional activities: opening/closing lid of bottles, picking the water in glass and drink It, arranging puzzles, reach and manipulate the glass of water in different directions and putting into the mouth, pick small objects from one container to another, turning doors handgrips, reading magazine and turning the pages of books or newspaper. The exercises regime was

designed according to the motor deficit of the individual patient. If the task or function was difficult for the patient to perform, then those tasks were fragmented into different parts so that the patient can easily perform it. Generally, each exercise or Task was repeated 10 to 15 times with affected arm. The progressive increase in tasks was so adopted that as the Mirror Therapy is another neurorehabilitation technique designed to help improve motor functions in both upper and lower limbs after stroke by triggering motivation during training through visual feedback. This technique involves the patient performing limb movements in their affected limb while observing the reflection on a mirror, which creates a visual illusion of increased movement in the impaired limb.

Ramachandran et. al., in the rehabilitation of phantom limb, was the first to describe a clinical use of MT, observing a significant improvement after treatment (E. Kim & Kim, n. d.) <sup>[5]</sup>. Many studies have reported recovery biomechanical and ADLs in terms of functionality after MT treatment. (K. Kim et al., n. d.) <sup>[6]</sup>

**Objective of the study:** The objective of this study is to find the effectiveness of motor relearning program and mirror therapy in chronic post stroke patients, individually, both together, on in combination with other treatment techniques.

## 2. Materials and Methods

**Source:** An inclusive search on PubMed, Google Scholar, Science Direct database using keywords Mirror Therapy, motor relearning program, Post stroke, Upper limb, rehabilitation, stroke.

**Study Selection:** Meta - analysis, Systemic reviews, Randomized control trails, observational studies and case control trials were taken for the study. A total of 11 articles were selected.

The following inclusion criteria -

- (a) Studies published in English
- (b) Published between 2006 - 2022.

Studies which are excluded –

- (a) Non - English
- (b) Non - human

### 3. Results and Discussion

| S no | Author, Year                                | Sample size | Outcome measure   | Objective   | Results  | Level of evidence |
|------|---|-------------|---|---|--|-------------------|
| 1    | Ashrafi et al., 2022                        | 93          | Mini - Mental State Examination Test, and Brunnstrom Recovery Stages.   | This study investigated the effect of MT on motor recovery in patients after stroke.  | The obtained findings suggest that MT can increase patients' motor recovery after stroke (p=0.0332)  | Level I           |
| 2    | J Pak Med et al., (2019)                    | 66          | motor assessment scale  | To compare the effectiveness of motor relearning programme with mirror therapy in upper limb motor functions of stroke patients   | Motor Relearning Programme and Mirror therapy were found to be effective in improving upper limb motor functions of stroke patients.   | Level I           |
| 3    | Shaker et al., (2020)                       | 30          | Jebson Hand Function Test (JHFT)  | This study aimed to determine the effect of mirror therapy on improving hand functions in Egyptian chronic stroke patients.   | Mirror therapy had a positive effect on improving hand motor functional skills in a sample of Egyptian chronic stroke patients.  | Level I           |
| 4    | Beom et al., (2016)                         | 33          | Box and block test, 9 - hole Pegboard test, Grip strength, BRS, Wolf Motor function test, FMA (upper extremity)   | To evaluate how effective Robotic to Mirror Therapy System for Functional Recovery of Hemiplegic Arms   | Robotics to MT can be a good way to improve the upper limb motor function after stroke.  | Level I           |
| 5    | Elanchezhian Chinnavan et al., (2020)       | 25          | Fugl - meyer assessment and Functional independent measure.   | To assess how efficient of Mirror Therapy on Upper Limb Motor Functions Among Hemiplegic Patients   | The Combination of conventional and mirror therapy is an effective method on restoring upper limb motor function among hemiplegic patients   | Level II          |
| 6    | Sunnel Kumar immadiet al., 2015;            | 60          | Wolf Motor function test, FMA (upper limb), NHPT, Stroke impact scale, Arm use ratio  | Motor relearning programme is found to be more effective than the conventional physical therapy programme for enhancing functional recovery of the upper limb in stroke patients.   | After the treatment sessions Patients who received motor relearning programme showed significantly better functional ability   | Level I           |
| 7    | Madhoun HY, et al., 2021                    | 22          | Action research arm test: (ARAT), Upper extremity subscale of Fugl - Meyer motor assessment scale: (FGMR)   | To evaluate the effect of Mirror therapy on upper extremity motor functions in stroke patients  | Study concluded that Mirror therapy is proved to improve upper extremity motor functions in stroke patients.   | Level I           |
| 8    | Shankar Sahayaraj M et al., (2016)          | 15          | The Functional Independence Measure scale was used to evaluate functional activities. (ADL). Intervention values for self - care and transfer activities were measured before and after treatment | To compare the efficacy of Motor Relearning Programme and Bobath technique with Motor Relearning Programme in improving functional activities among hemiplegic patients   | Bobath technique with Motor Relearning Programme shows significant improvement in functional activities than Motor Relearning Programme.   | Level II          |
| 9    | Ranjeet Singha et al.,                      | 30          | Motor Assessment Scale Timed Up and Go Test (TUG) and Sit to stand (STS) ite  | To investigate the effectiveness of Motor relearning program (MRP) for improving the basic mobility in chronic stroke patients when compared to conventional physiotherapy (PNF - Proprioceptive Neuromuscular Facilitation). | The MRP group showed significant improvement in Timed Up and Go (TUG) Test and Sit to stand item (STS) of Motor Assessment Scale (MAS) in posttest and post 1 month follow up compared to PNF group. | Level II          |
| 10   | Pracheta Narendrakumar Raval et al., (2020) | 34          | MAS, BI and SSQOL   | (1) To find out whether Motor Relearning Programme (MRP) is effective in improving functional balance and mobility by improving motor performance. (2) To find out effect of the  | Motor Relearning Program along with conventional therapy is effective in improvement of functional balance, functional mobility and quality of life among post stroke patients and it can be         | Level II          |

|    |                        |    |                              |  |  |          |
|----|------------------------|----|------------------------------|--|--|----------|
|    |                        |    |                              | functional improvement of motor performance on quality of life among post stroke patients  | effectively used for post stroke patients in physiotherapy setups and community - based rehabilitation to improve functioning in activities of daily living. |          |
| 11 | Hernández et al., 2019 | 60 | Fugl - Meyer Upper extremity | To determine the intra - and inter - rater reliability of the Fugl - Meyer Upper extremity in patients suffering from early sub - acute stroke | They concluded that Fugl - Meyer Upper extremity is reliable in both within and between raters in patients who have stroke in the early subacute phase.      | Level II |

Level I (systemic reviews, meta - analysis, RCTs)

Level II (non - randomized control trails, case - control trails)

Level III (pre - test - post - test designs, cross - sectional designs)

Level IV (single - subject designs, case series)

Level V (case reports, narrative literature reviews)

#### 4. Discussion

Following stroke, both MRP and MT have been provided beneficial in the overall improvement of hand function with the type of stroke and the degree of severity taken into consideration. There are less published articles on their benefits of either of the interventions in the case of chronic stroke situations. Efficacy of the treatment methods haven't been established well in such conditions.

#### 5. Conclusion

Based on the evidence, I concluded that the studies which are analysed on this review that both MRP and MT have a positive effect on improving the gross motor and fine motor functions of the upper extremity of patients suffering from subacute stroke and that they give better results than conventional therapy alone.

It can also be concluded that MRP combined with MT gives better results than either of the interventions alone. There was lack of data on their effectiveness in combination on patients with chronic stroke and there is need of more investigation about the role of MT in reducing spasticity.

Further research could include an increased sample size, and proper follow up done for long term effects in chronic stroke patients, as most of the studies did not consider the long - term benefits of either intervention. Due to resource constraints, publications only in English were reviewed.

We can optimise the recovery of the impaired upper extremity by using both MT and MRP interventions in conjunction with each other, and by designing them in a way that emulates ADLs of the patient.

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