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) [1]. 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) [2]

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) [3]. 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.) [5]. Many studies have reported recovery biomechanical and ADLs in terms of functionality after MT treatment. (K. Kim et al., n. d.) [6]

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

**Study Selection:** Meta-analysis, Systemic reviews, Randomized control trials, observational studies and case control trials were taken for the study.

The following inclusion criteria -
(a) Studies published in English
(b) Published between 2006 - 2022.

A total of 11 articles were selected. Studies which are excluded –
(a) Non-English
(b) Non-human

### 3. Results and Discussion

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<td>J Pak Med et al., (2019)</td>
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<td>Shaker et al., (2020)</td>
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<td>Wolf Motor function test, FMA (upper limb), NHPT, Stroke impact scale, Arm use ratio</td>
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<td>Madhoun HY, et al., 2021</td>
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<td>Shankar Sahayaraj M et al., (2016)</td>
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<td>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</td>
<td>To compare the efficacy of Motor Relearning Programme and Bobath technique with Motor Relearning Programme in improving functional activities among hemiplegic patients.</td>
<td>Bobath technique with Motor Relearning Programme shows significant improvement in functional activities than Motor Relearning Programme.</td>
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<td>Ranjeet Singh et al.,</td>
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<td>Motor Assessment Scale (TUG) and Sit to stand (STS)</td>
<td>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).</td>
<td>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.</td>
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<td>MAS, BI and SSQOL</td>
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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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[7] To Compare the Effectiveness of Motor Relearning Programme in Improving Patient Quality of Life and Activity Daily Living for Hemiplegic Stroke PatientsTamilarasiThiagaraja, Department, Supervisor Physiotherapist at Kensington Green Specialist Centre, Singapore.


