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Mirror therapy: An effective interventional programme in stroke patients comprehensive review

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Abstract
Background: Stroke is becoming a major health problem in India. Stroke make the person disabled and dependent on others. Recent researches using alternative modalities had thrown light on positive outcome in stroke treatment. Mirror therapy is considered as one of the most effective alternative therapy in stroke rehabilitation.
Methods: A systematic review was done by the researcher to support the study. A steady flow for the study was established based on the previous studies and review studies with Mirror Therapy. About 20 studies of last 15 years were included in reviews. For this review search Pub med, AMED, CINHAL, CCRCT, MEDLINE databases were used.
Results: 25 studies were included in the systemic review. In many studies recovery in neurological status of upper limb and lower limb were assessed using various assessment tools. Almost in all studies patients had shown improvement after Mirror Therapy.
Conclusions: Almost 90% of review studies had shown the positive result proving that mirror therapy was effective in improving hand and leg motor and sensory activities in stroke patients. So Mirror Therapy found to be effective in stroke rehabilitation.

Keywords: Mirror therapy, stroke rehabilitation, brain spasticity

Introduction
Human body is structured in a bony frame work called skeleton. Skeleton not only gives a shape to human body, it protects all vital organs of our various systems. Brain which is a part of nervous system and a very important vital organ is protected in skull as it is a very delicate in nature. Nerves cells, fibers, and neurons which are parts of nervous system linked with brain cells and maintain body functions like sensations, movements, thoughts, etc. Damage and infection of any part of nervous system may lead to temporary or permanent disability, psychiatric disorders or even death. [1]

Description of the disease condition
Stroke or brain attack is the effect of lack of blood circulation to brain. Deficient blood delivery to brain results in lack of oxygen and nutrients. Brain cells are very sensitive to hypoxia. They stop working within 3-5 minutes if they are not getting oxygen and nutrients. This cell death results in stroke. Stroke is a medical emergency. Immediate treatment can reduce injury to brain and possible complications. There may be stroke due to lack of blood supply from blockage of cerebral arteries or may be due to cerebral hemorrhage. [3]
First three months after stroke is very important for recovery. Early recovery of first month will enhance the functional outcome in chronic phase. So providing an intensive physiotherapy earliest may lead to better & quicker progress in doing Activities of Daily Living. A number of optimistic physiotherapy methods have been now in practice for improving motor activities and balance in stroke patients such as virtual reality, mirror therapy, music therapy etc.

Description of the intervention
Mirror therapy is an intervention that uses a mirror to create mirror image of the non paretic upper or lower limb and make the patient to think that his paretic limb is moving. Mirror therapy can be used for a different type of pain and disability conditions mainly for problem such as complex regional pain syndrome, phantom limb pain, paralysis and focal dystonia.

Mirror therapy is successful in relieving pain and so used by many individuals. But while giving mirror therapy patient's needs to show that he is able to follow the instruction to some extent. Than only the mirror therapy may be successful. [48]
Ramachandran and Rogers Ramachandran first designed and planned to use the technique and tried to help patients with 'phantom limb'. Mirror Therapy affect the mirror neuron system in the brain, and it is found that there by it enhances cortical & spinal motor actions. 20% of total neurons present in brain are Mirror Neurons. Mirror neurons in the brain are responsible to distinguish between the right and left side of human body. When Mirror box is used, mirror neurons get excited and help in the improvement of injured parts. It is believed that this structure make use of observation of activities to excite the motor process which would be included in the movement. Brain's natural learning power to prioritize visual response had made Mirror Therapy a more effective tool **[48]**.

Aim of the systemic literature review

The aim of the author to conduct this review was

1. To explore the literature that high light the effectiveness of mirror therapy on motor and sensory functions of paralysed limbs of patients with stroke
2. To identify the studies proving the effect of mirror therapy on hand functions of paralysed limbs in patients with stroke.
3. To high light the use of mirror therapy as stroke rehabilitation.

Methodology: A systemic review of the literature was chosen to be done by the author as it is one of the best methods available to effectively analyze the available research studies and bring out definitive answers to the questions than one single study. The literature search was performed during September 2014 to December 2015. The electronic databases using which the search done were Cumulative index to nursing, and Allied Health Literature (CINHAL), Medical Literature Online (Medline), Pubmed, CCRCT, AMED.
The search terms include Mirror Therapy, stroke rehabilitation, motor and sensory functions. Though evidences were effectively searched using the key words the authors also used the bibliographic searching method from the obtainable literatures to spot out similar studies meeting the objectives. The investigator focused on identifying studies on effectiveness of Mirror Therapy. Total number of searches using the search terms were about 300. Out of which 220 studies were eliminated due to irrelevance. 80 titles and abstracts were screened and out of which 20 studies were included.

The studies selected were categorized in to following headings

1. Effect of mirror therapy on upper extremity motor function in stroke patients: a randomized controlled trial [4, 7]
2. Examine the effects of mirror therapy on upper extremity function and activities of daily living in chronic stroke patients [5, 8]
3. Synaesthesia in Phantom Limbs Induced with Mirrors **[2, 9]**
4. Motor Recovery and Cortical reform after Mirror Therapy in Chronic Stroke Patients [3]
5. Effectiveness of Mirror Therapy to Improve Hand Functions in Acute and Subacute Stroke Patients [6]
6. Mirror therapy is a priming technique to improve motor function of the affected arm after stroke. [7]
7. Study to prove that Unilateral strength training not only strengthens muscles on the trained side but also the homologous muscles on the untrained side. [12]
8. Mirror Therapy Promotes Recovery From Severe Hemiparesis [10]
9. Unilateral strength training not only strengthens muscles on the trained side but also the homologous muscles on the untrained side [11]

Type of outcome measures

1. The main outcomes assessed in the studies were motor and sensory functions of upper limb. Some studies assessed balance, Activities of Daily Living, strength upper limb muscles.
2. Tools used to measure outcome: Fugl Mayer assessment scale, Brunnstrom Stages of the upper extremity, Modified Ashworth scale, Nottingham Sensory Assessment, Motor Activity Log, ABILHAND questionnaire, Functional Independent Measure, Barthel Index Scale.
3. Duration of interventions: in maximum studies the interventional period was 4 to six weeks.

Search results: Studies were identified after a vigorous search through Cumulative index to nursing, and Allied Health Literature (CINHAL), Medical Literature Online (Medline), Pubmed, CCRCT, AMED. After screening of duplicate references 200 studies are selected as possible eligible trials. Out of 200 180 studies are excluded as were not meeting eligibility criteria. 12 studies were selected for review study.

List of studies included in the review: 12 trials found to be fitting in the criteria of selection.
All 12 studies were meeting inclusion criteria (Kim M.K. 2016, Ramachandran VS, 1996, **Michielsen ME 2011,** Gurbuz N 2016, Park J-Y 2015, Waghavkar SN 2015, Dohle C 2009, Harmsen WJ 2015, Zult T 2016, Christian D 2009, Wu C-Y 2013, Thieme H 2013, Yavuzer G 2008.)

Study Design: Pretest – post test control group design [1, 4, 10, 3, 5, 7, 8] single blinded, randomnized controlled trial [11, 12]. Selection of the samples was done randomly in maximum studies [1, 4, 6, 3, 5, 7, 9]
Maximum studies in the review had used SPSSS software for statistical analysis.

Discussion

The main purpose of this review was to evaluate the effect of mirror therapy for improving motor function, ADL, and reducing pain and vasospatial neglect for stroke patients. 12 Studies were included in this review study with total 210 participants that compared mirror therapy with either routine treatment or with other conventional therapies. It is found from all the reviews that mirror therapy was more effective when it is given with routine treatment to improve ADL, pain and viuospatial neglect compared with routine treatment and other interventions. Six studies of the studies reviewed evaluated the effect of mirror therapy on upper extremity, two for motor recovery and cortical reforms, three for both the extremities. Mirror therapy was considered to be effective in all the above situations. The results of the review indicate that there Mirror Therapy can be included in daily nursing care

protocol of stroke patients as many studies have already proven the positive effect of this. Mirror therapy can be used as an additional intervention for stroke patients in rehabilitation centers. It is also proven by the study that mirror therapy helps to improve Activities of Daily Living in stroke patients. Still there is a need foe well designed RCT studies with large sample sizes to generalize the study findings more effectively. New researches can be conducted comparing mirror therapy with other alternative therapies to see the outcome.

Conclusion

Almost 90% of review studies had shown the positive result proving that mirror therapy was effective in improving hand and leg motor and sensory activities in stroke patients. So Mirror Therapy found to be effective in stroke rehabilitation.

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