

The Effect of Mirror Therapy on Daily Living Activities in Children with Cerebral Palsy: A Single Case Study

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Abstract

Purpose: To find the effectiveness of Mirror Therapy along with conventional physiotherapy on improvement of arm function in children with cerebral Palsy.

Methodology: A 6 old female child with spastic hemiplegic cerebral Palsy was included in the study. AB case design was used. It consisted of a baseline phase (A) and an intervention phase (B). Baseline and Post treatment measures were Modified Ashworth Scale (MAS), Fugl- meyer Assessment Upper extremity (FMA-UE) Assessment of Sensorimotor function and Besta scale. During intervention phase, Mirror Therapy was used with 10 Exercises to improve Arm function along with conventional therapy 5 days a week for 12 weeks.

Results: The results of the study showed beneficial effect of Mirror Therapy with conventional physiotherapy in the child with hemiplegic cerebral palsy.

Conclusion : It can be concluded from our study that the Mirror Therapy along with conventional treatment not only improves arm function but also joint position sense in the hemipegic arm.

Keywords: Cerebral palsy, Hemiplegic, Spasticity, Mirror therapy, Functional activity

INTRODUCTION

The principle of mirror therapy (MT) is the use of a mirror to create a reflective illusion of an affected limb to trick the brain into thinking movement has occurred without pain. (1)

Mirror therapy is a promising rehabilitation technique for children with cerebral palsy (CP) that uses the visual illusion of a healthy limb to encourage movement in the affected arm. By watching their non-paretic hand's reflection in a mirror, children activate their mirror neuron system, which supports motor learning. (2,4,5) Studies have shown that this therapy can lead to improvements in hand strength, movement speed, and overall functional abilities, while also boosting self-esteem and motivation.(3).The history of the discovery of mirror neurons back to 1992,when Rizzolatti and his team recorded the mirror activity of brain neurons in mammals using implanted electrodes. They discovered that while conducting and watching an activity, a small number of nerve cells in the ventral premotor cortex were activated (7). However, today several studies have shown that those mirror neurons, although primarily located in the frontal lobe (ventral premotor cortex) and parietal lobe, are found throughout the human

cerebral cortex; due to this wide distribution, the network of these neurons is called the "mirror neuron system".^{7,8} Scientists believe that mirror therapy works in three ways: it facilitates motor pathways, prevents learning disuse of affected limbs, and activates mirror neurons (8)(10). The purpose of these studies is to evaluate mirror therapy's effectiveness in improving motor skills and daily activities in children with cerebral palsy. They explore how the therapy activates neural pathways to enhance recovery.

MATERIALS & METHODS

A 6 yr old female child with spastic cerebral Palsy was included in the study. AB case design was used. It consisted of a baseline phase (A) and an intervention phase (B). The independent variable was the intervention which is Mirror Therapy and the Dependent variable was Arm function in hemiplegic Upper limb, for which the outcome measure used is Fugl Mayer Assessment Upper Extremity (FMA-UE), Besta Score and Modified Ashworth Scale. A consent form was signed by the parent before assessing the patient. The complete neurological Paediatric physiotherapy assessment was performed and through that it was analysed that spasticity, abnormal synergy was present in hemiplegic arm leading to difficulty in performing gross and fine motor functions. Before intervention was started, Baseline variable (A) was measured. Pre test assessment and post test Assessment was done by Modified Ashworth Scale for assessment of Spasticity, Fugl mayer Assessment Scale and Besta Scale for measuring the arm Function. Mirror Therapy was given for 5 days a week for 12 weeks, which consisted of 10 Exercises with 10 repetition each along with Conventional Therapy. Following Set of 10 exercises with 10 repetition each focusing on Arm functions was given using mirror Therapy along with Conventional Therapy for 5 times a week for 12 weeks. Child was made to sit on the chair with hands on the table.

1. Individual Finger up and down
2. Wrist up and down
3. Finger stretch and close (Finger abduction and Adduction)
4. Palm up and down (Forearm supination and Pronation)
5. Fist open and close
6. Thumb Extension “ Thumbs up”
7. Thumb opposition with fingers
8. Pressing and releasing Smiley ball
9. Holding and releasing cylindrical grasp like tumbler
10. Simulated activity of eating food with a spoon



Figure:1 Mirror Therapy Exercises



Figure 2: Hand grasp before and after Intervention

RESULT

Following tables indicates the Pre test and post test results

Modified Ashworth Scale	Pre- Test	Post-Test
	1+	1+

Table 1: Modified Ashworth Scale

FMA- UE	Pre- Test	Post- Test	% Improvement
Upper Extremity	12/36	24/36	100%
Wrist	0/10	4/10	100%
Hand	4/14	8/14	100%
Coordination/ Speed	2/6	5/6	150%
Sensation	10/12	12/12	20%
Passive Joint Motion	19/24	24/24	26.3%
Joint Pain	21/24	24/24	14.3%
Total	68/126	101/126	48.5%

Table 2: Fugl Meyer Assessment Upper Extremity (FMA- UE)

Besta Scale	Pre - test	Post test	% Improvement
Global Score A	8	8	0%
Global Score B	5	9	80%
Global Score C	9	18	100%
Total	22/ 57	35/ 57	59.1%

Table 3: Besta Scale

The percentage change was calculated for each outcome measure using the formula: Percentage Improvement= $\frac{\text{Post-test Score} - \text{Pre-test score}}{\text{Pre-test score}} \times 100$

DISCUSSION

The present case study was carried out to evaluate the effectiveness of Mirror Therapy for improving motor skills and daily activities with conventional physiotherapy technique to reduce spasticity and

improve arm function in child with cerebral palsy.

The results of the study showed beneficial effect of Mirror Therapy and conventional physiotherapy technique in the child with hemiplegic cerebral palsy.

There was drastic improvement in Fugl Meyer score (FMA-UE) pre and post intervention not only in the component of Motor functions which included Upper extremity movements within synergy, mixing synergy, out of synergy, Wrist movements, Hand movements and grasps, coordination but also in Joint position Sense after 12 weeks of Mirror Therapy Intervention. Mirror therapy can help improve proprioception, the sense of body position and movement, in individuals with Musculoskeletal injuries and neurological deficits. By promoting sensorimotor integration and reorganization, mirror therapy can help restore normal sensory processing and motor control in affected limbs. (Waworuntu Daniel (2024)(9). There is also drastic improvement in Besta Scale for Assessment of performance and Capacity of Hand function in children with improvement seen in bimanual Manipulative activities and activities of Daily living and scoring being same in grasp functions. Mirror-mediated therapy was generally effective in enhancing muscle strength, motor speed, muscle activity, and the accuracy of both hands (Eom-ji Park et al 2016)(11). Mirror movement changes were associated with improvements in bimanual performance and activities of daily living (Rodrigo Araneda et al 2022) (12)

CONCLUSION / SUMMARY:

CONCLUSION

The study suggests that Mirror Therapy along with conventional therapy has shown to improve motor skills in arms and daily activities in children with cerebral palsy.

Authors' Biography

Anusha Sampath working as Assistant Professor in Physiotherapy (GF) at National Institute of Empowerment of persons with Intellectual Disability Regional Centre Navi Mumbai, having 11 years of Academic and clinical experience in the field of Physiotherapy.

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