

Official Title of Study: -

**EFFICACY OF LOWER EXTRIMITY MIRROR
THERAPY ON BALANCE IN CHILDREN WITH
HEMIPLEGIC CEREBRAL PALSY: A Randomized
Controlled Trail**

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**EFFICACY OF LOWER EXTRIMITY MIRROR THERAPY ON BALANCE
IN CHILDREN WITH HEMIPLEGIC CEREBRAL PALSY: A
Randomized Controlled Trail**

Abstract

Background: Hemiplegic cerebral palsy is the most common type of cerebral palsy that has permanent motor disorders and associated with life-long disability. **Aim:** To assess the efficacy of mirror therapy on balance in children with hemiplegic cerebral palsy. **Methods:** Seventy child with hemiplegic cerebral were enrolled in this study and were assessed for eligibility. Their aged ranged from eight to twelve years. The children were assigned randomly into two equal groups. Group (a) control group received traditional physical therapy program. And group (b) study group received the same traditional physical therapy program in addition to mirror therapy three times / week for three successful months. Biodex balance system was used to assess balance pre and post treatment. All children were assisted before and after three months of intervention. **Results:** Post treatment, significantly improvement was in overall stability index, antro-posterior stability index, and Medio-lateral stability index only in study group ($P < 0.05$). **Conclusion:** Lower extremity mirror therapy has significant effect on balance in children with hemiplegic cerebral palsy.

Key words: cerebral palsy, balance, mirror therapy.

Introduction:

Cerebral Palsy (CP) is a group of motor disorders resulting from damage to the brain of child, affects motor system, and leads to poor balance, poor coordination, or abnormality in patterns of movement (**Miller and Bachrach, 2017**). The most common type of CP is hemiplegic CP that

affecting one person per thousands of live births, that characterized by a clinical pattern of unilateral motor impairment, movement disabilities and postural disturbance(**Robert J., Steven 2010**).Hemiplegic CP has impaired postural balance that contributes to their gait abnormalities (**Chen et al., 2013**).All balance parameters affected in hemiplegic CP due to musculoskeletal asymmetry show significant differences than those of typically developing children (**Kenis-Coskun et al., 2016**).

Mirror therapy (MT) is a simple, effective and low cost technique used to improve the mobility of affected limbs by visual feedback induced by of the non-affected limb movement in the mirror (**McInnes and Friesen 2016**).MT explained by three main mechanisms 1) it facilitates locomotion recovery by visual feedback of the normal side movement that reflect stimulation of movement in affected side (**Funase et, al. 2007**). 2) Activation of mirror neurons that facilitate movements of affected limb (**Cattaneo & Rizzolatti 2009**). 3) Simultaneous motion of normal and affected limbs that stimulate the affected cerebral cortex by interactions with the stimulation of non-affected cerebral cortex (**Summers et, al. 2007**).

Subjects and methods:

This randomized controlled study was conducted in the outpatient clinic in faculty of physical therapy, Cairo University. The Informed consent was submitted for each child by their parents. The procedures that followed were approved by the Institutional Ethical Committee Clearance of the Faculty of Physical Therapy Cairo University No: P.T.REC/012/002423.The study was registered on Clinicaltrial.gov and registration number wasNCT04187027.

Study population:

Children who were diagnosed as having hemiplegic CP based on careful clinical assessment by physiotherapist. After screening, children had ability in the investigation with these criteria: (i) Children's aged ranged from eight to twelve years. (ii) Children participated in this study will from both sexes. (iii) Their degree of spasticity will ranged from mild to moderate according to Modified Ashworth Scale. (iv) Children with stable medical and psychological status. (v) Children able to follow the verbal commands or instructions. Children excluded from study if they exhibited any of the following criteria: (i) children with visual or auditory problems. (ii) Children with history of epilepsy. (iii) Children with history of surgical interference in lower limbs less than one year. (iv) Medically unstable children especially with cardiovascular disorders. (vi) Mentally retarded children. (vii) Un-cooperative children.

Randomization:

A total of seventy children with hemiplegic CP evaluated to eligibility. Six did not meet the study criteria, and four declined to participate. Sixty participants were assigned randomly in two groups of equal numbers. Random allocation software was used to minimize selection bias (**Saghaei 2004**). A diagram of children retention and randomization throughout the study is shown in fig (1).

Random assigned was into studying groups. Group (a) control group received traditional physical therapy program. And group (b) study group received the same traditional physical therapy program in addition to mirror therapy three times / week for three successful months. All children were assisted using Biodex balance system before and after three months of intervention.

Materials for evaluation:

The Bidex Balance System (BBS) is an important therapeutic tool that used for evaluating and training of patients with balance deficits. (**El-Shamy and Abd El-Kafy, 2014**)

The Bidex balance system is a valid and reliable device that used to assess the child's ability to maintain static and dynamic postural stability on the unstable tilting platform; clinicians could assess neuromuscular control by quantifying the ability to maintain dynamic unilateral and bilateral posture stability on an unstable surface. During posture stability test, patient ability to control the platforms angle of tilt is quantified as a variance from center. (**Gstöttner et al., 2009 and Arifin et, al. 2014**).

The outcome measures were: Over All Stability Index (OASI) that refers to the ability of child to maintain his balance in all directions, Anteroposterior Stability Index (APSI) that refers to the ability of child to maintain his balance from forward to backward direction and Mediolateral Stability Index (MLSI) that refers to the ability of child to maintain his balance from side to side directions.

Flow chart

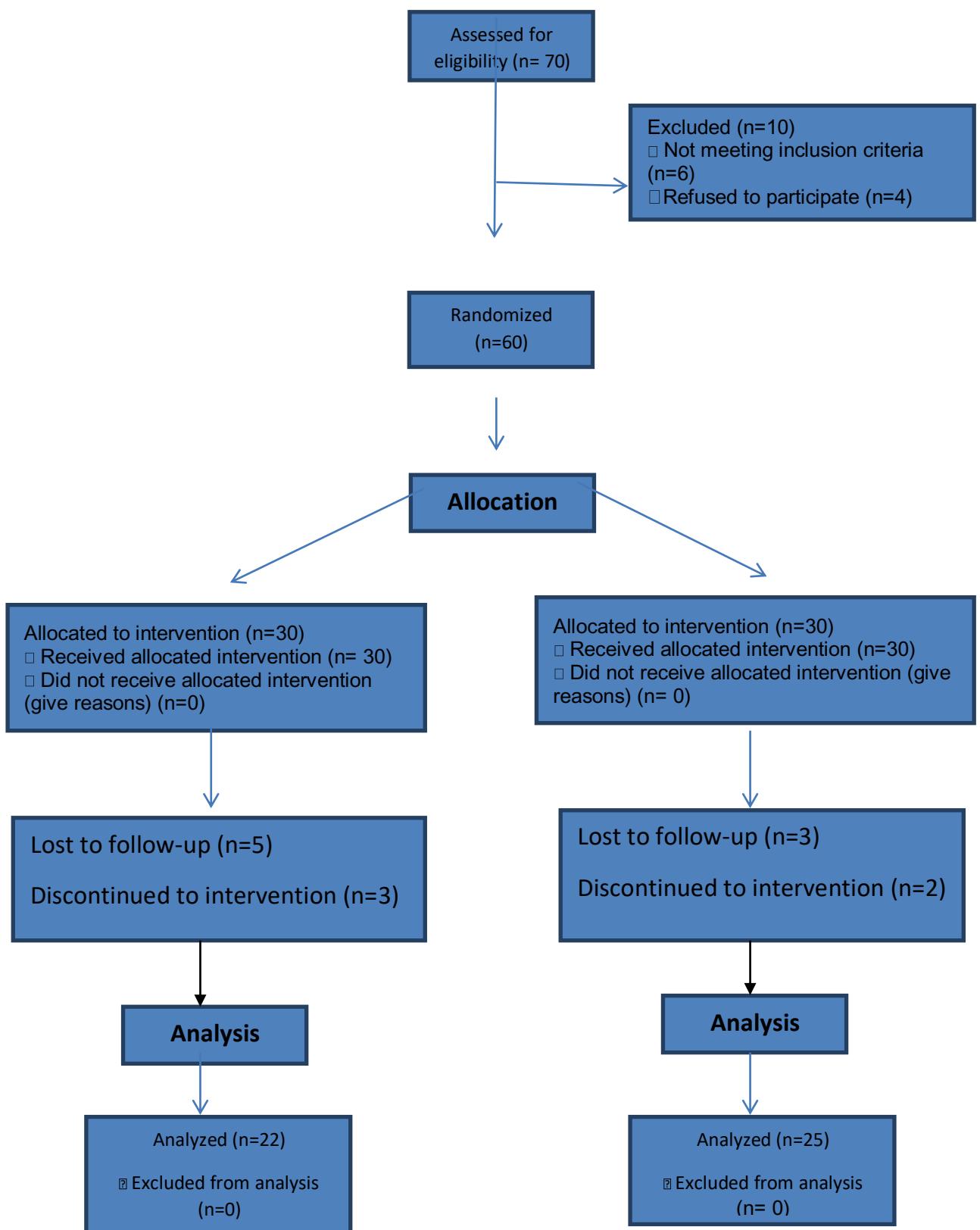


Fig 1, flow chart

Methods of Treatment

Group (a) control group received traditional physical therapy program. And group (b) study group received the same traditional physical therapy program in addition to mirror therapy three times / week for three consecutive months. The children were instructed to sitting on chair and a mirror is placed in midsagittal plane of the child, with the normal limb in front of mirror and the affected limb is blocked so the patient see only the reflected movement of the sound limb (non affected).

Statistical analysis

For analysis of data in the present study, Using SPSS version 21 in results analysis. Descriptive statistics was used to identify the mean and standard deviation for each variable. Paired t-test was used to test pre and post changes.

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