EFFECTIVENESS OF MIRROR THERAPY INUPPER EXTREMITY MOTOR FUNCTION IN CEREBRAL PALSY CHILDREN

Nahid Tahlima

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Department of Physiotherapy

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We the undersigned certify that we have carefully read and recommended to the Faculty of Medicine, University of Dhaka, for the acceptance of this dissertation entitle.

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Submitted by **Nahid Tahlima** for partial fulfillment of the requirements for the degree of Bachelor of Science in Physiotherapy (B. Sc. in PT).

.....
Md. Shofiqul Islam
Assistant Professor
Department of Physiotherapy
BHPI, CRP, Savar, Dhaka
Supervisor

.....
Mohammad Anwar Hossain
Associate Professor, Physiotherapy, BHPI
Head of the Department of Physiotherapy
CRP, Savar, Dhaka

.....
Mohammad Habibur Rahman
Assistant Professor
Department of Physiotherapy
BHPI, CRP, Savar, Dhaka

.....
Ehsanur Rahman
Assistant Professor
Department of Physiotherapy
BHPI, CRP, Savar, Dhaka

.....
Md. Obaidul Haque
Associate Professor & Head
Department of Physiotherapy
BHPI, CRP, Savar, Dhaka

DECLERATION

I declare that the work presented here is my own. All sources used have been cited appropriately. Any mistakes or inaccuracies are my own. I also decline that same any publication, presentation or dissemination of information of the study. I would be bound to take written consent from the Department of Physiotherapy of Bangladesh Health Professions Institute (BHPI).

Signature: Nahid Tahlima **Date:** 04/10/2017

Nahid Tahlima
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Acronyms

AWF	Autism Welfare Foundation
BHPI	Bangladesh Health Profession Institute
BPF	Bangladesh Protibhondi Foundation
BMRC	Bangladesh Medical & Research Council
CP	Cerebral Palsy
CRP	Centre for the Rehabilitation of Paralysed
IRB	Institutional Review Board
MT	Mirror Therapy
MF	Motor Function
NGO	Non-Governmental Organization
SPSS	Statistical Package for the Social Sciences
WHO	World Health Organization

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Abstract

Purpose: The purpose of the study was to identify the effectiveness of mirror therapy for upper extremity motor function in cerebral palsy children. *Objectives:* To identify and analyze the effectiveness of mirror therapy for upper extremity motor function in cerebral palsy children, to improve the motor function and upper extremity functional activity in children with cerebral palsy. To improve the upper extremity hand function in cerebral palsy children.

Methodology: Twenty CP children were randomly selected from indoor pediatric unit, CRP and then 10 CP children were randomly assigned for mirror therapy with conventional physiotherapy group and 10 CP children with were randomly assigned for only conventional physiotherapy in this randomized control trial study. As the study was a single blinded study which has been conducted at pediatric department in CRP, Savar. The Pediatric motor activity log scale was used to measure motor function.

Results: Data was analyzed by using unrelated "t" test and Microsoft Excel Worksheet 2013 was used to decorate data according to Pediatric motor activity log scale.

Conclusion: This experimental study shows that mirror therapy with conventional physiotherapy is more effective than only conventional physiotherapy for upper extremity motor function in cerebral palsy children.

Keywords: Mirror therapy , Motor function, Cerebral palsy.

CHAPTER-I INTRODUCTION

Background

Bangladesh is one of the world's most densely populated countries, with its people crammed into a delta of rivers that empties into the Bay of Bengal. Poverty is deep and widespread, but Bangladesh has in recent years reduced population growth and improved health and education. But disability is a major social and economic phenomenon in the country. In this country, disability is the most challenging issue. Cerebral palsy (CP) is the most common condition that is responsible for the child disability. According to world health organization 10% of populations in Bangladesh are disabled. Bangladesh has recently seen an increase number of children diagnosed with cerebral palsy. Most of the population are illiterate and not be aware about health (Ackerman et al., 2005).

Now cerebral palsy is recognizable to most health and social service professionals, as a physically disabling condition, in addition to many members of the common public. Although Cerebral palsy only affects between 2 and 3 per 1000 live births, In actual fact, in childhood it is consideration thought to be the most common cause of serious physical disability (Surveillance of Cerebral Palsy in Europe 2000). Historically, in relation to the pathology and cause of the impairment Cerebral palsy was studied predominantly. During the nineteenth century Cerebral palsy was first recorded in medical literature discussion about the definition and categorization of cerebral palsy, predominately in French, German, and English language publications. However the term cerebral palsy has been debated for more than 150 years (Morris, 2007).

In cerebral palsy the appearance can be global psychological and physical dysfunction or isolated disturbances in gait, cognition, development, or sensation. In the United States cerebral palsy affects 2 to 2.5 children per 1,000 born and It is the most common physical disability in childhood. Cerebral palsy is characterized by impairment of motor function and can present with global mental and physical dysfunction. In 2001, the United Cerebral Palsy Foundation estimated that 764,000 children and adults in the United States carried the diagnosis of cerebral palsy. In addition, an estimated every year in the United

States 8,000 babies and infants, plus 1,200 to 1,500 preschool-age children are diagnosed with cerebral palsy (Karen et al., 2006).

In approximately 90 percent of cases, cerebral palsy results from destructive processes that injure healthy brain tissue rather than from abnormalities in brain development (Bax et al., 2006). Hypoxia and ischemia have traditionally been proposed as causes of brain injury. Pathological and imaging studies of cerebral palsy have demonstrated varying combinations of lesions in the cerebral cortex, the hemispheric white matter, the basal ganglia and the cerebellum (Dan et al., 2014).

From World cerebral palsy day organization..In worldwide 17 million people are affected with cerebral palsy. In which Most common form Spastic: 70- 80 percent, and its symptom include muscle appear stiff and tight, and it arises from due to motor cortex damage. Dyskinesia percent, that is characterized by involuntary movements, and arises from Basal ganglia damage. Ataxic: 6 % and characterized by shaky movements which Affects balance and sense of positioning in space, and arises from cerebellum damage. Mixed type of Cerebral palsy that occurs due to combination damage. In Cerebral palsy different parts of the body are affected. Quadriplegia or bilateral in which both arms and legs are affected even the muscles of the trunk, face, mouth frequently affected. Diplegia or bilateral in which both legs are affected and the arms may be affected to a lesser extent. Hemiplegia or unilateral in which one side of the body is affected (one leg and one arm). At least two thirds of children with cerebral palsy will have movement difficulties affecting one or both arms. Almost every daily activity can be impacted (Novak et al., 2012)

Most known classifications are based on anatomic or topographic considerations, and on movement abnormality. Rosenbaum et al. (2006) proposed a classification based on several components at the international working group in 2005, including motor abnormalities, accompanying impairments, anatomical and neuro-imaging findings, cause and timing of the disorder. Motor abnormalities are assessed based on the following: nature and typology of the motor disorder such as spasticity, dyskinesia, and ataxia. Spasticity, the most common type of motor dysfunction, refers to a velocity-dependent increase in the muscle tone (Scholtes et al .,2006) .Spasticity is usually associated with

involvement of pyramidal tracts, the basal ganglia, or reticular formation, with upper motor neuron signs.

Dyskinesia is usually connected with an involvement of an extra pyramidal tracts, which may be either dystonic and includes hypertonia and reduced activity, or associated with chorea athetosis which includes irregular spasmodic even involuntary movements of the limbs or facial muscles. Ataxia refers to loss of orderly muscular coordination and usually caused by a cerebella deficit (Cans, 2000).

Most children have pseudo bulbar signs with swallowing and drooling problems. In many children Mental retardation is common (Menkes & Sarnat , 2000).The most common anatomical type is Diplegia, in which the lower limbs are more severely affected than the upper limbs, Often there is periventricular leukomalacia and it is associated with prematurity and low birth rate (Wu & Colford, 2000).

As Cerebral palsy is a static neurologic condition and it occurs due to brain injury that occurs before development of cerebral is complete. Because development of brain continues for the period of the first two years of life, So cerebral palsy can occur from injury of brain and that occur during the prenatal, perinatal, or post-natal periods (Kigger et al.,2006). In Prenatally almost Seventy to 80 percent of cerebral palsy causes are acquired and largely arises from unknown causes. Birth complications, including asphyxia, are currently anticipated that patients with congenital cerebral palsy for about 6 percent (Taylor, 2006)**.** Risk factors for cerebral palsy in neonatal include birth after fewer than 32 weeks' gestation, birth weight of less than (2,500 gram), retardation of intrauterine growth, intracranial hemorrhage, and trauma. In about 10 to 20 percent of patients, cerebral palsy is acquired post-nataly, mainly because of brain damage occur from bacterial meningitis, viral encephalitis, hyperbilirubinemia, motor vehicle collisions, falls, or child abuse (Taylor, 2006).

Only 10% to 15% of cerebral palsy are associated with hypoxia or birth trauma. At full term almost Sixty percent of the children affected with Cerebral palsy, and for cerebral palsy prematurity is not the only cause; on the other hand, low birth weight (less than 1500 gram) and prematurity are familiar risk factors for Cerebral palsy (Msall, 2004) .as many as 28% of premature infants Chorioamnionitis was found to be a risk factor for CP (Wu & Colford ,2000). Postnatal causes include head trauma, meningitis, encephalitis,

and brain infarcts (Sankar & Mundkur, 2005) .Genetic causes that are known to be a risk factor for Cerebral palsy that involve a gene on chromosome 19 (Meirelles et al.,2000) .

Patients with cerebral palsy have spastic clinical features which is 70 to 80 percent. In which Affected limbs may show increased deep tendon reflexes, tremors, muscular hypertonicity, weakness, and also show a characteristic of scissors gait with toe-walking (Karen et al ., 2006). Around 10 to 20 percent of patients are affected with athetoid or dyskinetic type of cerebral palsy which is characterized by abnormally slow, writhing movements of the hands, feet, arms, or legs that are exacerbated during periods of stress and that are absent during sleep (Taylor , 2006)**.** Ataxic cerebral palsy which is The rarest form and it's affects 5 to 10 percent of patients and it's predominately impairs balance and coordination and These type of patients walk with a wide-based gait and also have intention tremors that complicate daily activities performance and also requiring fine-motor function (Taylor , 2006). About two thirds of patients with cerebral palsy Intellectual impairment occurs. Seizures also present About one half of pediatric patients. Growth problems are common, as well as neurologic abnormalities such as impaired vision or hearing and abnormal touch and pain perceptions (Taylor, 2006).

In cerebral palsy motor sign also present and it include primary neuromuscular deficits, such as spasticity, muscle weakness and reduced selective motor control, and secondary musculoskeletal problems, such as bony malformations and contractures. Although cerebral palsy primarily classified as a motor disorder, and it is often associated with disturbances of sensation, perception, cognition, communication, and behavior. Limitation of activity that are presumed to result from these combined factors (Siri et al., 2009).Complications of cerebral palsy include spasticity and contractures; difficulties infeeding drooling, difficulties in communication, osteopenia, osteoporosis, fractures, pain, and gastrointestinal function abnormalities which are contribute to obstruction of bowel, vomiting, and constipation (Krigger et al ., 2006).

A figures estimated from the million Bangladesh Bureau of the Census and the World Health Organization in Bangladesh that indicate parasitic infections, malnutrition, and diseases are major contributors for disabilities. And Most indicate physical disabilities have the greatest reported incidence (41.5 percent). In descending order of incidence are visual disabilities (19.7 percent), speech and hearing (19.6 percent), intellectual

disabilities (7.4 percent), cerebral palsy (7.0 percent), multiple disabilities (3.4 percent) and mental illness (1.4 percent). The overall prevalence rate for preschool and primary-aged children (ages 3-10) with disabilities, according to, is approximately 2.6 (2,559,222), or almost 10 percent of the childhood population and also estimated 2.6 million children with disabilities in Bangladesh, among them less than 1,500 have admission to an education in special schools sponsored by the Government of Bangladesh (Ministry of Social Welfare) of those who do have access to day or residential programs in the special schools, only children with selected disabilities such as (hearing, vision, and intellectual disabilities) are served. It is reported that children with intellectual disabilities and those with physical handicaps have been the most marginalized and neglected.

To the extent that children with these and other disabilities such as cerebral palsy, autism, physical disabilities, and multiple disabilities have right of entry to an education, and it is provided by NGOs, many started and sustained with international donor support. In Bangladesh NGOs are major players. More than 40,000 NGOs are present in Bangladesh and approximately 400 NGOs state to be working in the area of disability.

The major NGOs in the area of education for children with disabilities in Bangladesh are the Center for the Rehabilitation of the Paralyzed (CRP) in Savar, including children with cerebral palsy, the Bangladesh Protibhondi Foundation (BPF) for the children with intellectually disabled and children who are multiply disabled; the Society for the Welfare of the Intellectually Disabled Bangladesh (SWIDB); HI-CARE and the Society for support to Hearing Impaired Children (SAHIC) for the hearing impaired; Baptist Sangha School for Blind Girls (BSSBG); and the Autism Welfare Foundation (AWF) for children with autism spectrum disorders (Ackerman et al., 2005).

The types of treatment for patients with cerebral palsy depend on the patient’s specific symptoms and range from physical therapy to medication use and surgery. Physical therapy (PT) plays a vital role in managing the condition; as it focuses on movement, function and optimal use of the child's potential. Physiotherapist uses physical approaches to encourage, maintain and restore psychological, physical and social welfare. Physiotherapists also teach parents how to handle their child at home for bathing,

feeding, dressing and other activities, and give advice on mobility devices (Anttila et al., 2008).

For children with Cerebral Palsy therapeutic interventions include various methods such as bilateral therapeutic exercises, constraint-induced movement therapy, sensory integration therapy, neuro-developmental treatments and mirror-mediated therapy (Hong , 2013).Among these, mirror-mediated therapy which is based on activation of the mirror neuron system (Bhasin et al ., 2012). In the premotor cortex and inferior parietal cortex Mirror neurons are present and they are nerve cells that are activated when an individual performs a specific movement or a specific movement of another person is observed (Rizzolatti & Craighero,2004).In mirror-mediated therapy, mirror neurons are activated by the patient's observing movement of his or her own upper limb (empty hand), which is reflected in a mirror (Park et al ., 2009). This method was first introduced by Rogers-Rama chandran and it was used in an amputee patient in 1996 in the treatment of phantom pain but since then, therapeutic effects of mirror therapy have been confirmed in various disorders including complex regional pain syndrome (CRPS), cerebral vascular accident (CVA, stroke), and Cerebral Palsy (Nojima et al.,2012).

Mirror-mediated therapy is effective in inducing activation of the motor cortex. To date, it has been applied mostly in adult patients with stroke in South Korean studies, and most studies have involved upper limb exercises. As a result, research supporting the use of this therapeutic intervention in children with CP is so far inadequate. Thus, the purpose of this study was to objectively assess the value of mirror-mediated therapeutic interventions applied to children with Cerebral palsy.

1.2 Rationale

Cerebral palsy is the commonest condition encountered by pediatric physiotherapists. All over the world physiotherapists treatment and rehabilitation about with the children with cerebral palsy their own method of treatment. Physiotherapy is a newly introduced health care profession in Bangladesh. In CRP pediatric unit, physiotherapist use different treatments for cerebral palsy children. A large number of children with Cerebral Palsy needs better physiotherapy treatment, for their survival in the community. In CRP Pediatric unit, physiotherapist use different treatment for improvement of upper extremity motor function in children with cerebral palsy. But there is no valuable research to evaluate the effectiveness of mirror therapy on upper extremity motor function for cerebral palsy children in Bangladesh. This study was to investigate the effectiveness of mirror therapy on motor function commonly used by physiotherapists practicing in CRP for the management of cerebral palsy children. Since physiotherapy is a new profession and vitally important to apply evidence based treatment techniques to patient for better treatment. This will help the physiotherapist to modify red sign and continue the service of children with cerebral palsy. Moreover to develop an evidence to help stronger the physiotherapy profession in Bangladesh and for special interest researcher would like to do the study. It is very important to practice evidence based practice to establish physiotherapy properly in Bangladesh. Also the world is now turning to evidence based practice from traditional treatment. So it is our duty to create evidence on different branches of physiotherapy profession. This study will generate evidence for the physiotherapist and it will add evidence based knowledge for physiotherapy profession. There is limited evidence on mirror therapy and no one who can conduct this type research in Bangladesh. So researcher would like to conduct this study.

1.3 Research question

What are the effectiveness of mirror therapy for upper extremity motor function in cerebral palsy children?

1.4 Aim of the study

To identify the effectiveness of mirror therapy for upper extremity motor function in cerebral palsy children.

1.5 Objectives of the study

1.5.1 General Objectives

- To study the effectiveness of mirror therapy in upper extremity motor function in cerebral palsy children.

1.5.2 Specific Objectives

- To improve the motor function and upper extremity functional activity in children with cerebral palsy.
- To improve the upper extremity hand function in cerebral palsy children.

1.6Hypothesis

Null Hypothesis

H0: μ1 - μ2 = 0 or μ1 ≥ μ2, where the experimental group and control group mean difference is same or control group is higher than experimental group.

Alternative Hypothesis

Ha: μ1 - μ2 ≠ 0 or μ1 ≠ μ2, where the experimental group and control group mean difference is not same.

Where,

$H_{\circ}$= Null hypothesis

Ha =Alternative hypothesis

μ_1 =mean difference in initial assessment

μ_2 = mean difference in final assessment

1.7 Operational definition

Cerebral Palsy

Cerebral palsy is the term used to refer to a non-progressive group of brain disorders resulting from a lesion or developmental abnormality in fetal life or early infancy. It is the diagnostic term used to describe a group of motor syndromes resulting from disorders of early brain development. It is caused by a broad group of developmental, genetic, metabolic, ischemic , infectious and other acquired etiologies that produced a common group of neurologic phenotypes. Cerebral palsy (CP) is one of the most common causes of physical disability in children.

Mirror therapy

The child views a mirror image of functional hand while attempting to do mirror activities with each hand. The image of the successful function portrayed as if it is the weaker arm is thought to help the brain reorganize and change.

CHAPTER-II LITERATURE REVIEW

Cerebral palsy (CP) is a group of permanent disorders of the development of movement and posture due to non-progressive lesion that occurred in the developing fetal or infant brain (Rosen baum et al., 2006) .The prevalence of CP is about 2 – 2.5 per 1,000 live births (Odding et al., 2005). Spastic hemiplegia accounts for more than a third of all cases of Cerebral palsy and the resulting impairments to extremities affect functional independence and quality of life (Sankar & Mukundur, 2005).

Children with impaired function of one of their arms can have disabling symptoms that affect play, school, and self-care. Hand and arm function may be affected by abnormal muscle tone, flexion synergies, decreased strength, decreased active and passive range of motion, altered sensation, and neglect ion (Eliasson et al., 2006) .Children with Cerebral palsy rarely use their affected hand for unimanual tasks. The impaired hand is typically used when there is need for bimanual task performances. Bimanual tasks are more complicated than unimanual tasks as the movements of both arms and hands must be coordinated temporally and spatially to complete a task or achieve a desired goal, but many everyday tasks require coordinated use of both arms and hands (Greaves et al., 2010).

It describes "group of disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain (Hoare et al., 2007).It involves affection of both sensory motor function and is manifested by atypical muscle tone, posture and movement. It can be classified as spastic hemiplegic cerebral palsy, monoplegia, diplegia, quadriplegia as per the topographical presentation of the disease. Cerebral Palsy is primarily a disorder of movement and posture (Sankar & Mundkur et al.,2005).

The resulting movement impairments are largely localized to one side, with the upper extremity usually being affected more than the lower extremity in children with hemiplegic cerebral palsy (Duque et al., 2003) .Abnormal muscle tone with posturing into wrist flexion, ulnar deviation, elbow flexion, and shoulder internal or external rotation in addition to reduced strength, as well as tactile and proprioceptive disturbances are the resulting impairments to upper extremities. All the previous impairments can

result in abnormal development of hand skills and consequently affect functional independence and quality of life as well as skilled independent finger movement (Nour et al., 2016). Impaired hand control is a major disability in children with hemiplegic cerebral palsy, so children often prefer to not use the involved upper extremity and learn to perform most tasks exclusively with their less affected upper extremity (Duff & Gordon, 2003).Abnormal neurologic control and complication is Lack selective control of muscle activity and anticipatory regulation. Abnormal sensation and perception and complication in some children have impaired sensations to touch and pain with or without astereogenosis. Gastrointestinal problems (vomiting, constipation, or bowel obstruction) Caused by delayed gastric emptying, abnormal autonomic control of gastrointestinal mobility, immobilization, inadequate oral intake, and prolonged colonic transit. Hearing and vision Abnormalities and complication is Children may present with strabismus or hemianopia. Visual defects occur in 25 to 39 percent of adult patients. Eight to 18 percent of adults with cerebral palsy have hearing problems.

Impaired oral-motor Functions that can cause hypoxemia, temporomandibular joint contractures, vomiting, and aspiration pneumonia associated with gastroesophageal reflux, poor nutrition, failure to thrive, drooling, and communication difficulties.

Markedly reduced bone mass in non-ambulatory adults and children can cause osteopenia, osteoporosis, fracture, scoliosis, or pain. Mental health in which cognitive impairment is present in two thirds of patients with cerebral palsy. Neurosis and psychosis also can occur. Seizures in which one half of children with cerebral palsy demonstrate seizure activity. Spasticity and contractures in which Spasticity prevents the stretching of muscles and tendons. Consequently, they do not grow at the same rate as lengthening bones, forming contractures and difficulty with ambulation and fine- or gross-motor movements. Pain is created by hip dislocations, repetitive use syndromes, and degenerative joint disease. Urinary incontinence Caused by impaired control of bladder muscles (Krigger., 2006).

Cerebral palsy (CP) is the commonest cause of neurological disability in children. The upper limbs are often affected, with significant wrist and hand involvement from an early age .Persisting from infancy, affected children may have abnormal hand postures such as thumb adduction and/or flexion with limited wrist extension, as well as more proximal

abnormalities of upper limb tone, posture, and function, which also impact on hand use. The particular focus of this article is on the factors influencing hand structure and function in cerebral palsy and the options for early intervention (Arner et al., 2008).

One of the most important activities of daily life is the gripping function of the hand. The measurement of hand grip strength is used in physical therapy to assess the functional ability and the extent of rehabilitation of patients following injury or illness (Shemy et al., 2009)**.** Hand grip is one of the most important functions of the hand. The hand may be used in a multitude of postures and movements in which most cases involves both the thumb and the other digits (Barr et al.,2001). Wrist motion is essential for augmenting the fine motor control of the fingers and hand. Positioning the wrist in the direction opposite that of the fingers alters the functional length of the digital tendons so that maximal finger movement can be attained. Wrist extension is synergetic to finger flexion and increases the length of the finger flexors muscles and maximizing the contractual force of the digital flexors. Conversely, a posture of wrist flexion will markedly weaken grasping power (Exner, 2001).

The major problem facing hemiplegic children is their inability to use their hands for reaching, grasping and manipulation. These problems affect many of the activities performed in their daily life such as dressing, eating, grooming and hand writing. In addition, upper extremity function plays an important role in gross motor skills like crawling, walking, recovering balance and protecting the body from injury when recovery is not possible (Duff et al., 2001)**.** Hand skills are vital to the child's interaction with the environment. Engagement in most occupations requires object handling, almost all of which is accomplished with the hands. Children with a wide variety of types of disabilities are likely to have difficulty with hand function. These disabilities include cerebral palsy (Fedrizzi et al.,2003)**.**

More proximal upper limb deficits in cerebral palsy also affect hand use. Increased muscle tone is noted predominantly in the upper limb flexor muscles with extensor weakness. Dynamically increased muscle tone is particularly clear in biceps brachii during physical activity such as walking, running, and even moving the dominant hand. Pectoralis major, the forearm flexors, and pronetor teres exhibit hypertonia in some

children, pulling the shoulder into flexion, adduction, and internal rotation, the forearm into pronation, and the wrist into flexion, often withulnar deviation. Active forearm supination and wrist extension are limited (Basu et al., 2014).

Children with cerebral palsies often lack of opportunity to learn or practice motor skills because of static pathology of their brains in development of movement and posture (Papavasiliou,2009)**.** The central nervous system dysfunction is a major problem of those children causing loss of communication between the brain and body. This results in uncontrolled movements and posturing. Motor learning is one of strategies to maximize motor function in children with cerebral palsy. Motor learning, the acquisition of new skills with practice, is based on practice of goal-oriented motor function tasks that matched to the children's abilities, for successful retention and transfer to other motor activities or environments by stimulating sensory motor experience (Barhaim et al., 2010)**.** Recently, human mirror neuron system has been discovered. It is involved in action understanding, imitation, learning of novel complex actions, and internal rehearsal of actions (Rizzolatti & Craighero, 2004)**.**

Mirror therapy is a pioneering, non-invasive treatment for the rehabilitation of musculoskeletal and neuromuscular deficits. As the term implies, the primary tool of this therapy is a mirror from which the patient receives visual feedback in order to train the brain to configure a new body map. The ultimate goal of mirror therapy is to correct misrepresentations in the body map that develop when an injury or loss of limb occurs. Mirror therapy may hold promise as an effective treatment for other conditions. For instance, it is being explored as a potential treatment to facilitate recovery and help cortical reorganization following stroke, surgery, repetitive strain injuries, nerve injuries and other conditions (Shemy et al ., 2009) **.**The idea of mirror therapy is to use the mirror to produce the illusion for the patient that both limbs are intact. The effects of mirror therapy on upper-extremity motor recovery, and hand-related functioning of patients with sub-acute stroke were evaluated. It was found that hand functioning improved more after mirror therapy in addition to a conventional rehabilitation program compared with a control treatment immediately after 4 weeks of treatment and at the 6-month follow-up (Yavuzer et al ., 2008)**.**

Mirror therapy has been used in patients suffering from stroke, cerebral palsy, complex regional pain syndrome, phantom limb pain and fracture rehabilitation. Three particular conditions that have been studied the most are stroke, CRPS and phantom limb pain. During mirror therapy, a mirror is placed in the patient's mid sagittal plane, thus reflecting movements of the non-paretic side as if it were the affected side. This arrangement is suited to create a visual illusion whereby movement of or touch to the intact limb may be perceived as affecting the paretic or painful limb. The underlying mechanisms of the effects in these three patient groups have mainly been related to the activation of 'mirror neurons', which may also be activated when observing others perform movements and also during mental practice of motor tasks. Mirror neurons were found in areas of the ventral and inferior premotor cortex associated with observation and imitation of movements and in somatosensory cortices associated with observation of touch. These cortical areas are supposed to be activated by Mirror therapy . Until now, direct evidence for the mirror-related recruitment of mirror neurons is lacking. Other potential mechanisms such as enhanced self-awareness and spatial attention by activation of the superior temporal gyrus pernicious and the posterior cingulate cortex have been proposed. The superior temporal gyrus is also thought to play an important role in recovery from neglect, and is activated by observation of biological motion (Najiha et al.,2015).

MT is a non-pharmacological and alternative treatment strategy that has been proposed as a means of managing phantom limb pain. It is a neuro rehabilitation technique designed to remodulate cortical mechanisms. With this technique, patients perform movements using the unaffected limb whilst watching its mirror reflection superimposed over the (unseen) affected limb. This creates a visual illusion and provides positive feedback to the motor cortex that movement of the affected limb has occurred. The approach is thought to offer potential relief through the visual dominance upon motor and sensory processes (Bowering et al., 2013).

Mirror movements are simultaneous involuntary movements that accompany voluntary movements of homologous muscles on the opposite side of the body**.** They are more frequently observed in the less-affected hand (LAH) when actively moving the affected

hand and are reported to be stronger compared to mirror movements in the affected hand (Kuhtz-Buschbeck et al.,2000). For example, when one hand moves voluntarily, the other hand involuntarily performs the same action. Even though mirror movements are considered to be a normal feature of motor behavior in young children due to immaturity of the central nervous system, they are known to gradually disappear during the first decade of life. However, in many children with unilateral CP these mirror movements are more pronounced and persistent (Zielinski et al., 2017).

Mirror therapy is a simple, inexpensive, and patient-oriented treatment. Functional brain imaging studies conducted on healthy individuals have shown that the ipsilateral primary cortex excitability increases when observing the mirror image of the hand during unilateral hand movements (Garry et al., 2005). Mirror therapy involves the superimposition of the reflections of healthy extremity movements on the affected extremity for the patient to observe them as if their extremity is moving (Tong & Fong,2012) **.**A mirror is placed at the midsagittal plane of the patient so that the healthy side image will be superimposed on the projection of the affected extremity (Dohle et al .,2009) .Thus, there is a visual illusion of increased movement ability of the paretic extremity (Steven & stoykov , 2003).

Mirror therapy has been excessively used and searched as a method to treat the upper extremities of hemiplegic patients. Mirror therapy involves performing movements of the less affected limb while watching its mirror reflection superimposed over the (hidden) affected limb, thus creating a visual illusion of enhanced movement capability in the affected limb(Steven & stoykov,2003) This is a therapeutic intervention that uses visual feedbacks for neuroplasticity and triggers motivation through visual feedbacks during training (Ji et al., 2014) .Voluntary movement of the affected upper extremity and hand using a mirror stimulate the bilateral cortex and causes rearrangement in other areas around the lesioned part of the brain, thus allowing for replacement of its function and thereby influence motor function recovery (Thirumala et al., 2002).Mirror visual feedback was expected to enhance reorganization and stimulate plasticity of the premotor cortex Through modified vision and perception (Altschuler et al., 1999) .Mirror therapy involves repetitive bimanual, symmetrical movement practice in which the patient moves

the affected limb as much as she/he could while watching the reflective illusion of the unaffected limb from a mirror (Michielsen et al., 2011).

The effect of visual information on bimanual coordination in children with cerebral palsy. The study incorporated two additional visual feedback conditions by placing a glass or opaque screen between the arms. During bilateral symmetric circular arm movements mirror visual feedback induced lower neuromuscular intensities in the shoulder muscles of the less impaired arm of children with Spastic hemiplegic cerebral palsy compared to the other visual conditions. In addition, the mirror lead to shorter relative durations of eccentric and concentric activity in the elbow muscles of the more impaired arm, whereas no effects of visual feedback were found in a matched control group. These results suggest that replacing veridical visual information of the more impaired arm with a mirror reflection of the less impaired arm improves the motor control of children with SHCP during inter limb coupling (Feltham et al ., 2010).

It is thought that the homologous region to F5 in humans is the pars opercularis of the inferior frontal gyrus (Rizzolatti & Matelli, 2003).Single- neuron recording studies are typically not conducted in humans for experimental purposes. Therefore, there is little direct evidence of the existence of mirror neurons at the cellular level (Rizzolatti ,2005) . Mukamelet (2010) stated that mirror neurons in humans in the supplementary motor area, hippocampus, parahippo-cam- pal gyrus, and entorhinal cortex when recording at sites in the medial frontal and temporal cortices. Brain imaging and neurophysiological studies have provided indirect evidence for a putative MNS in human frontal and parietal brain regions. Specifically, these areas include the IFG and adjacent PMv and the IPL .For a review of the brain imaging data and how these brain regions were determined to be functionally equiva- lent to monkey areas F5 and PF (Rizzolatti & Craighero, 2004).

In a seminal study, monitored brain function in human frontal and parietal mirror regions while participants in an scanner were shown finger tapping actions or control stimuli. Participants passively observed the actions, imitated them, or executed a finger movement to a given cue. The researchers predicted that the inferior frontal gyrus and inferior parietal lobule, components of the putative human MNS, would follow an increasing pattern of signal activity. That is, these regions would be active during action

observation, more for action execution, and when observation and execution are combined, as in the case of imitation, the highest signal intensity would be observed. The data validated these hypotheses (Lacoboni et al., 1999).

The ability of the brain to be modulated by experience is called neural plasticity**.** Ramachandran and Rogers Ramachandran were the first to introduce the use of the visual illusions created by a mirror for treatment of phantom limb pain. By superimposing the intact arm on the phantom limb using a mirror reflection, patient reported the sensation that they could move and relax the often cramped phantom limb and experienced pain relief. Previous studies in stroke, although undersized and non-sufficiently control suggested that mirror therapy may be beneficial for motor function recovery in the paretic hand. Mirror visual feedback has previously been found to reduce disproportionate inter-limb variability and neuromuscular activity in the arm muscles in children with Cerebral Palsy (Gygax et al.,2011).

In mirror therapy patients sit in front of a mirror that is placed parallel to the person midline preventing the view of the affected limb positioned behind the mirror. When the patient looks into the mirror sees the reflection of unaffected limb. This creates a visual illusion whereby movement or touch to the intact limb may be perceived as affecting the paretic or painful limb. (Yavuzer et al., 2008).

CHAPTER-III: METHODOLOGY

3.1 Study design

The study was conducted by using Randomized Control Trail (RCT). From the indoor pediatric unit children with Cerebral palsy, 20 CP children randomly selected and then 10 children with CP were randomly assigned to mirror therapy with conventional physiotherapy group and 10 children with CP to the only conventional physiotherapy group for this randomize control trial study. The study was a single blinded study which has been conducted at pediatric department of CRP, Savar, Dhaka.

3.2 Study site

The researcher is a 4th year B.Sc in physiotherapy student of Bangladesh Health Professions Institute (BHPI) and the research was conducted as part of the course curriculum. For this reason the researcher had to collect data within short time to maintain the contrasts of the course module time. The study was conducted in pediatric unit of Center for the Rehabilitation of the Paralyzed (CRP). It is a non-government organization working for the development of health care delivery system of Bangladesh through providing Physiotherapy, Occupational therapy, Speech and Language therapy services in indoor and outdoor programs. Pediatric unit provides service for child with different types of disability.

3.3 Study population

A population refers to the entire group of people who meet the criteria set by the researcher. The populations of this study were the cerebral palsy children who were admitted at pediatric unit in CRP.

3.4 Sample size

Researcher has taken 20 participants as sample. Due to time limitation the researcher has to choose 20 participants to conduct this study; within the short time it could not be possible to conduct the study with a large number subjects.

3.5 Sample selection

Subjects, who met the inclusion criteria, were taken as sample in this study. 20 patients with CP were selected from indoor pediatric department of CRP, (Savar) and then 10 patients with CP were randomly assigned to mirror therapy with conventional physiotherapy group and 10 patients to the only conventional physiotherapy group for this randomize control trial study. The study was a single blinded study. When the samples were collected, the researcher randomly assigned the participants into experimental and control group, because it improves internal validity of experimental research. The samples were given numerical number C1, C2, C3 etc for the control and E1, E2, E3 etc. for experimental group. Total 20 samples included in this study, among them 10 patients were selected for the experimental group (received mirror therapy with conventional physiotherapy) and rest 10 patients were selected for control group (conventional physiotherapy only).

3.6 Inclusion criteria

- Age between 2 – 8 years.
- Children with diaplegic and quardriplegic cerebral palsy.
- Both gender eligible for study (boys and girls).
- Parent's consent for participation.
- Whose career are willing to participate.
- Children with muscle tone 1, 1+ & 2 according to Ashworth Scale

3.7 Exclusion criteria

- Children age more than 8 years
- Children with congenital bone deformities
- Children mother who are not interested to participate.
- Children with fracture bone.
- Children with visual and auditory problem.

3.8 Method of data collection

The study procedure was conducted through assessing the patient, initial recording, treatment and final recording. After screening the patient at department, the patients were assessed by qualified physiotherapist. Ten sessions of treatment was provided for every subject. 20 subjects were chosen for data collection according to the inclusion criteria. The researcher divide all participants into two groups and coded C1,C2,C3 (10) for control group and E1, E2,E3 (10) for experimental group. Experimental group received conventional physiotherapy with mirror therapy and control group received only conventional physiotherapy. Data was gathered through a pre-test, intervention and post-test and the data was collected by using a written questionnaire form which was

formatted by the researcher. Pre-test was performed before beginning the treatment and measure of the level motor function according to pediatric motor activity log scale on questionnaire form. The same procedure was performed to take post-test at the end of ten session of treatment. The researcher collected the data both in experimental and control group in front of the qualified physiotherapist in order to reduce the biasness. At the end of the study, specific test was performed for statistical analysis.

3.9 Intervention

After randomization subjects were assigned into two groups that are control group and experimental group. The entire subjects were given intervention according to their groups. Both the groups received 50 min of physiotherapy per day, ten sessions for each patient within 2 weeks indoor pediatric unit.

Control group:

There were 10 subjects in control group. Ten sessions of treatment the control group received a conventional physiotherapy program include: stretching both upper limb and lower limb 1 set / 10 rep, sitting to standing practice 1 set / 10 rep, long sitting practice 5 min, toilet sitting practice 5 min, weight bearing practice 5 min, horse riding practice 5 min, staring practice 5 min, standing in standing frame 10 min.

Experimental group:

There were 10 subjects in experimental group. Ten sessions they were received mirror therapy in addition with conventional physiotherapy. The mirror therapy and conventional physiotherapy both were given by clinical physiotherapist. Picking up the top of a pen and putting it down again 1 set / 10 rep. Holding a pencil, making rapid dots on a sheet of a paper in 1 set / 10 rep. Patient picks pencil up and positions it without assistance for 5 minutes. Patient hold pen as for writing for 5 minutes. Take a dessert spoon to the mouth in 1 set / 10 rep. Holding comb and combing hair at back of head for 5 minutes. Functional task practice for 5 minutes. Transfer cube from one place to

another while seeing reflection in the mirror. Squeezing sponge ball, each child was encouraged to hold a small sponge ball and try to squeeze while seeing reflection in the mirror. Drawing a circle, the subject was asked to draw a circle while seeing reflection in the mirror, turning cards, transfer cubes from one place to another, reaching to mouth (eating lollipop), squeezing ball (sponge ball), catching the ball, throwing the ball, transfer cubes from one hand to the other hand, opening and closing a jar and clapping with both hands. Patient stretches arm forward, picks up pen top, and releases it on table close to body.

3.10 Measurement:

To conduct this study the researcher collected data through using different types of data collection tools. The researcher has used pediatric motor activity log scale for measurement of upper extremity motor function.

3. 10 .1 Data collection tools:

A written questionnaire, pen, paper and the pediatric motor activity log scale were used as data collection tools in this study.

3. 10 .2 Questionnaire:

The questionnaire was developed under the advice and permission of the supervisor following certain guidelines. There were close ended questions with pediatric motor activity log scale with some objective questions which were measured by examiner and each question was formulated to identify the level of upper extremity motor function.

3. 11 Measurement tool:

In case of materials the researcher was used pediatric motor activity log scale.

3. 11. 1 The pediatric motor Activity log scale:

The purpose of this scale is to assess Childs ability to use impaired arm. There is a list of 22 questions and to rate each question by 6 point scale, which range from 0 to 5(how well and how often).

3. 12 Ethical consideration:

It should be ensured that it would maintain the ethical consideration at all aspects of the study. It is the crucial part of the all form of research. The study was approved by ethical committee of the research project before conducting the research project. Ethical issues will follow by World Health Organization (WHO) and Bangladesh Medical and Research Council (BMRC). At first to conduct this study, the research project was submitted to the Institutional Review Board (IRB) and obtained approval. For conducting this research ethics committee have checked the proposal and allowed to carry out the research project. The formal permission was taken from the head of the physiotherapy department and in charge of pediatric unit to collect the data. Data collection was started and complete within the allocated time frame. All the data was reviewed in strict secure and maintained confidentiality. The assessment files were strictly secured and it was not open in front others without researcher. Written consent (appendix) was given to all participants prior to completion of the questionnaire. The researcher explained to the participants about his or her role in this study. The researcher received a written consent form every participants including signature. So the participant assured that they could understand about the consent form and their participation was on voluntary basis. The participants were informed clearly that their information would be kept confidential. The discontinue participation at any time without prejudice to present or future treatment at the pediatric unit of CRP.

The researcher obtained consent to participate from every subject. A signed inform consent form was received from each participants. The participants were informed that they have the right to meet with outdoor doctor if they think that the treatment is not enough to control the condition or if the condition become worsen. The participants were also informed that they were completely free to decline answering any question during the study and were free to withdraw their consent and terminate participation at any time. Withdrawal of participation from the study would not affect their treatment in the physiotherapy department and they would still get the same facilities. Every subject had the opportunity to discuss their problem with the senior authority or administration of CRP and have any questioned answer to their satisfaction.

3.13 Data analysis:

In order to ensure that the research have some values, the meaning of collected data has to be presented in ways that other research workers can understand. In other words the researcher has to make sense of the results. As the result came from an experiment in this research. Data are analyzed with the software named Statistical Package for the Social Science (SPSS) version 20 and Microsoft office Excel- 2013.

All participants were coded according to group to maintain participant's confidentiality. All subjects of both experimental and control group score their motor function on Pediatric motor activity log scale before starting treatment and after completing treatment.

Experimental studies with the different subject design where two groups are used and each tested in two different conditions and the data is interval or ratio should be analyzed with unrelated "t" test. As it was experimental study and unmatched groups of different subjects, who was randomly assigned to conventional physiotherapy with Mirror therapy and only conventional physiotherapy group and the measurement of the outcome came from Pediatric motor activity log scale with considering interval or ratio data, so the parametric unrelated "t" test was used in this study to calculate the level of significance.

3.14 Significant level:

In order to find out the significance of the study, the researcher calculated the "p" value. The p values refer the probability of the results for experimental study. The word probability refers to the accuracy of the findings. A p value is called level of significance for an experiment and a p value of <0.05 was accepted as significant result for health service research. If the p value is equal or smaller than the significant levels, the results are said to be significant.

Unrelated t test

Unrelated t test was used to compare difference between two means of independent variables. Selection of test was two independent mean differences under independent t distribution.

Formula: test statistic t is follows:

The "t" formula –

$$t = \frac{\bar{x}_1 - \bar{x}_2}{s\sqrt{\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

Where,

$\bar{x}_1$= Mean of the Experimental Group,

$\bar{x}_2$ = Mean of the Control Group,

n_1 =Number of participants in the Experimental Group,

n_2= Number of participants in the Control Group,

S = Combined standard deviation of both groups.

CHAPTER-IV: RESULTS

4.1: Socio-Demographical variables

4.1.1. Age of the participants

Among the 20 participants 15% participants were in age group between 24-41 months, 20% participants were in age group between 42- 5 months, 25% participants were in age group between 60-77 months and 40% participants were in age group between 78-96 months.

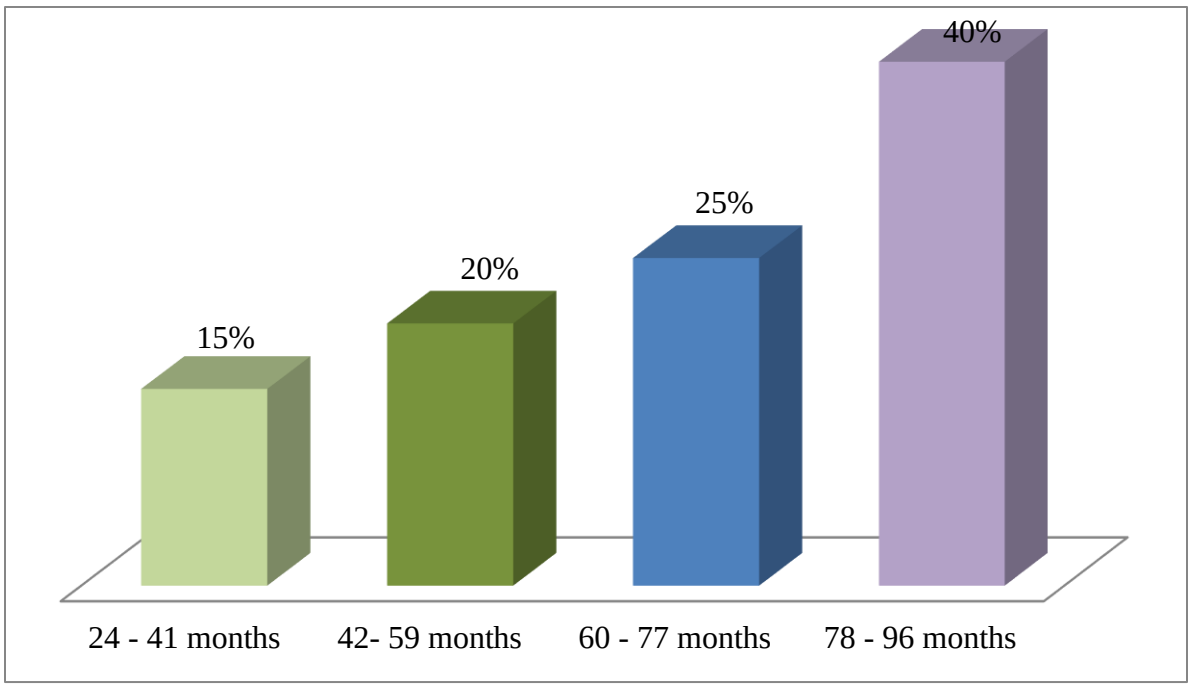

Figure 1: Age of the participants

4.1.2 Sex of the participants

Among all participants 55% was girl and 45% was boy.

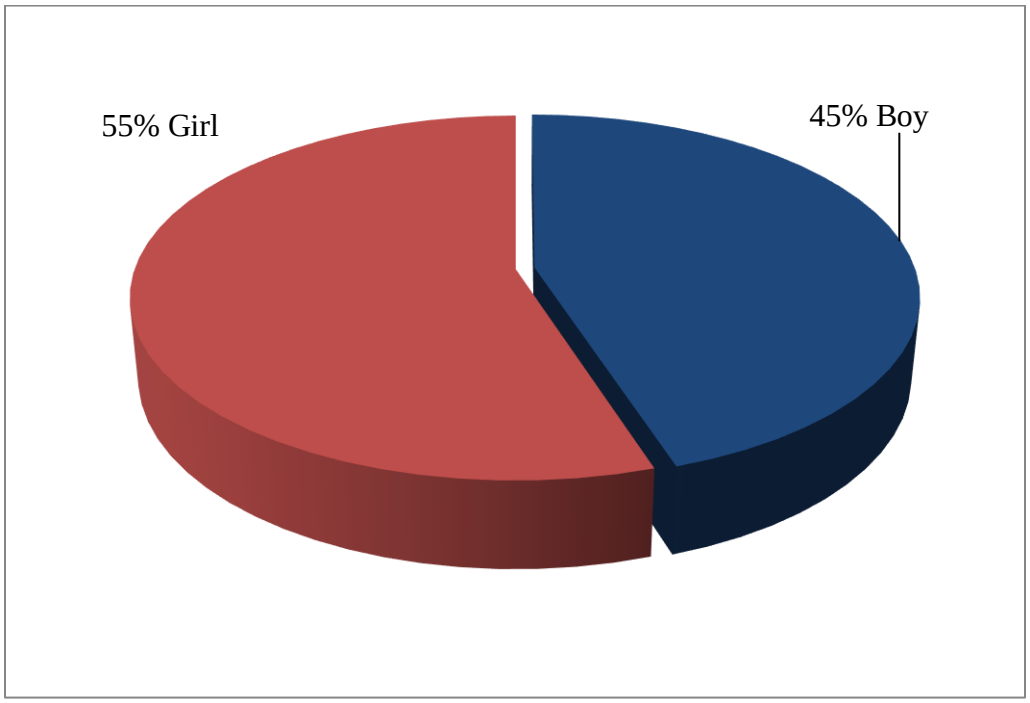

Figure 2: Sex of the participants

4.1.3 Diagnosis of the participants

In this study 35% was diplegic CP and 65% was quadriplegic CP.

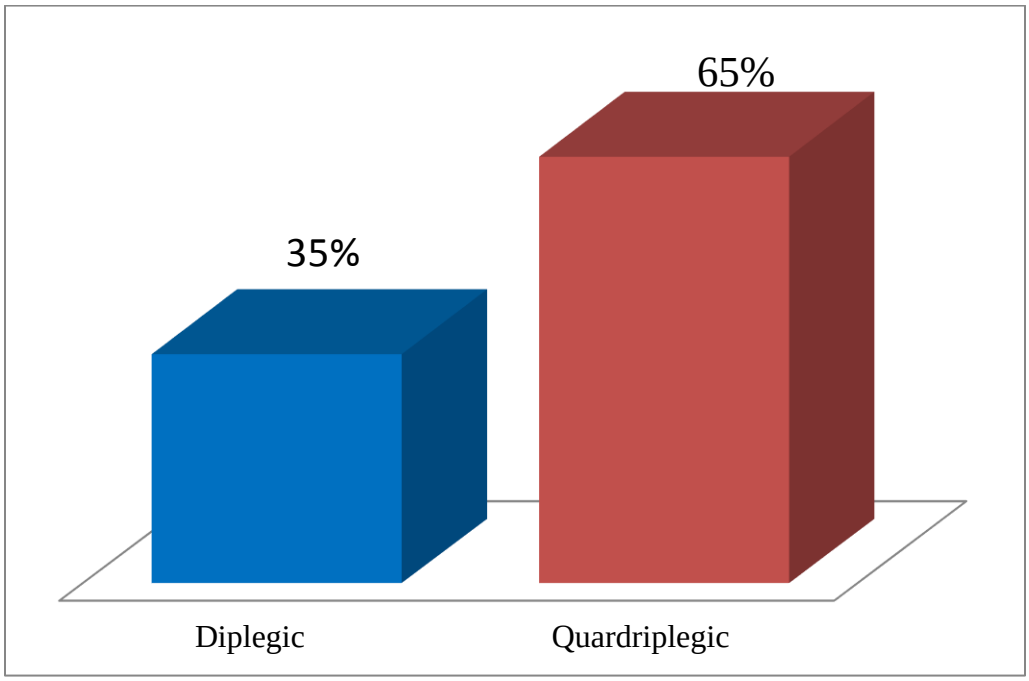

Figure 3: Diagnosis of the participants

Unrelated t test

Unrelated t test was used to compare difference between two means of independent variables. Selection of test was two independent mean differences under independent t distribution.

Formula: test statistic t is follows:

The "t" formula –

$$t = \frac{\bar{x}_1 - \bar{x}_2}{s\sqrt{\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

Where,

$\bar{x}_1$= Mean of the Experimental Group,

$\bar{x}_2$ = Mean of the Control Group,

n_1 =Number of participants in the Experimental Group,

n_2= Number of participants in the Control Group,

S = Combined standard deviation of both groups.

Table 1: Unrelated t test

Variables	**t**	**Df**	**Significant level**
Hold a bottle or cup	4.800	18	0.000*
Pick up and hold small item	5.824	18	0.000*
Pick up and hold large item	1.852	18	0.081
Eat finger foods	1.200	18	0.246
Pick up an object out of arm reach	7.637	18	0.000*
Push a button	2.060	18	0.054*
Self feed with spoon	2.714	18	0.014*
Point to a picture	3.13	18	0.004*
Take off shoes or socks	2.250	18	0.037*
Pull a toy with a string	0.342	18	0.736
Turn a knob	1.124	18	0.276
Pick up a cylindrical object	0.000	18	1.000
Throw a ball or similar objects	1.500	18	0.151
Hold a handle on a riding, pulling or push toy	1.987	18	0.062
Turn a page in a book	0.447	18	0.660
Hold an item while in standing position	4.583	18	0.000*
Carry an item from place to place	4.714	18	0.000*
Stop or roll a ball	1.414	18	0.174
Pop bubbles	1.500	18	0.151
Push into sitting position	0.775	18	0.449
Reach for an object above head	10.286	18	0.000*
Push arm through sleeve or clothing	0.287	18	0.777

This bar chart shows the unrelated t-test – calculated values where we have found that tabulated values <2 that's indicate non-significant.

Df	T- value	P -value
18	2.101	≤0.05

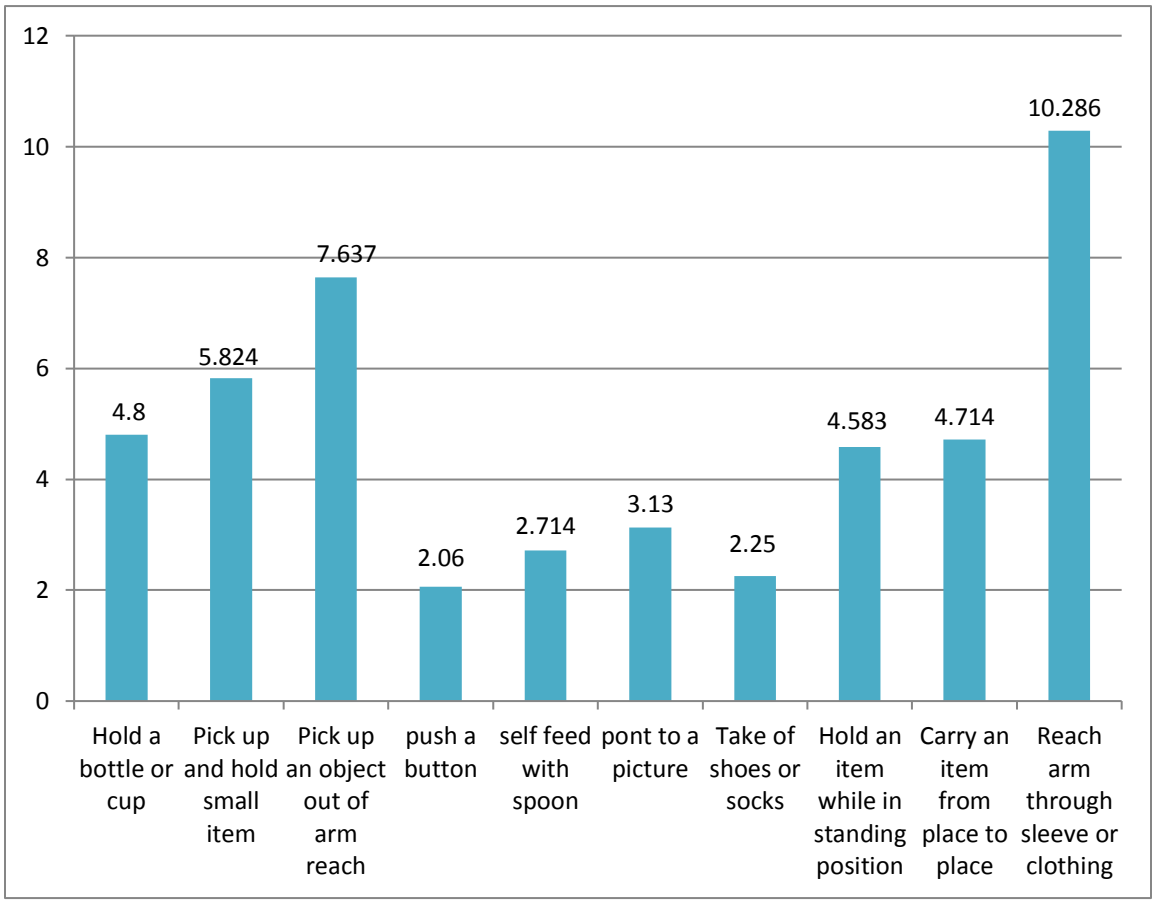

Figure 4: Unrelated t test – Calculated valued

Significant values pre-test and post-test differences:

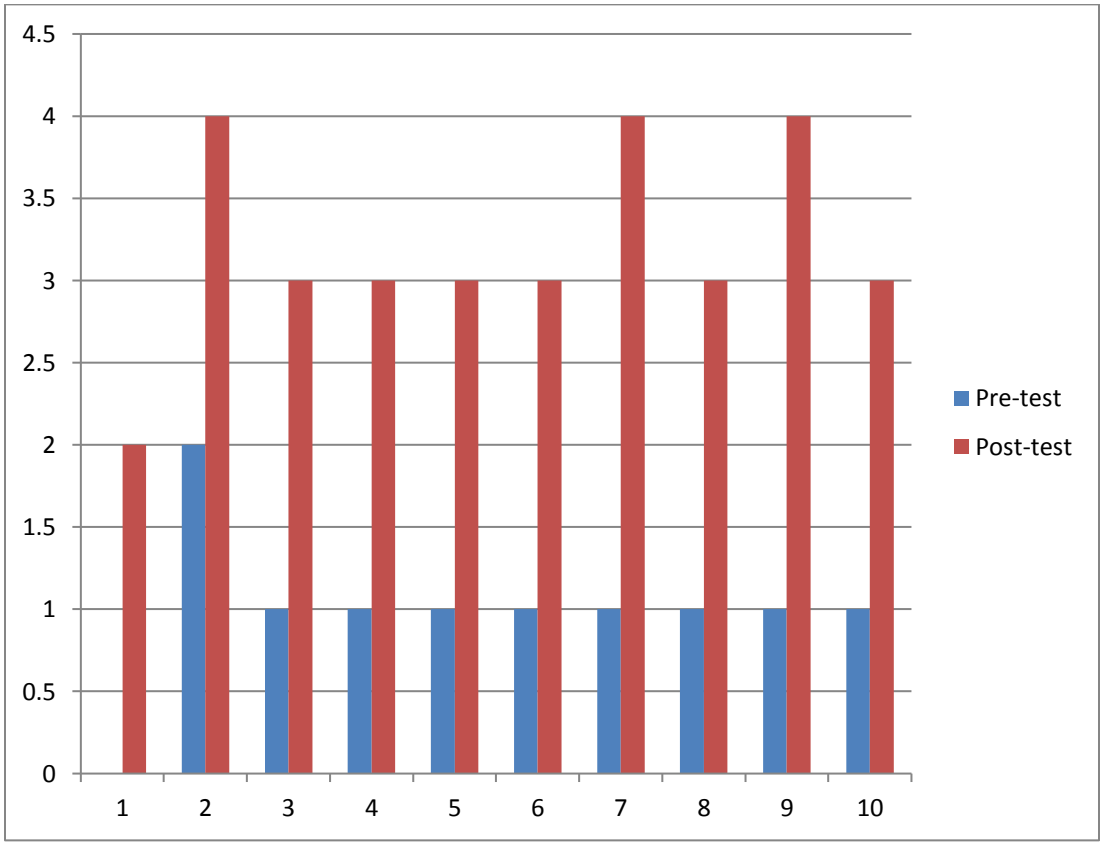

Figure-5: Hold a bottle or cup

Hold a bottle or cup: It is obvious that post test measurements are always greater than the pre test out of 10 participants, 1 participant pre-test value was nil. The Unrelated/independent t test in between group at 5% level of significant and 18 degrees of freedom, standard table value was 2.101 and at the same significant level and same degree of freedom observed t value was 4.800. The observed t value was greater than the table value that indicate null hypothesis was rejected and alternative hypothesis was accepted that means Mirror Therapy was effective in upper extremity motor function cerebral palsy children.

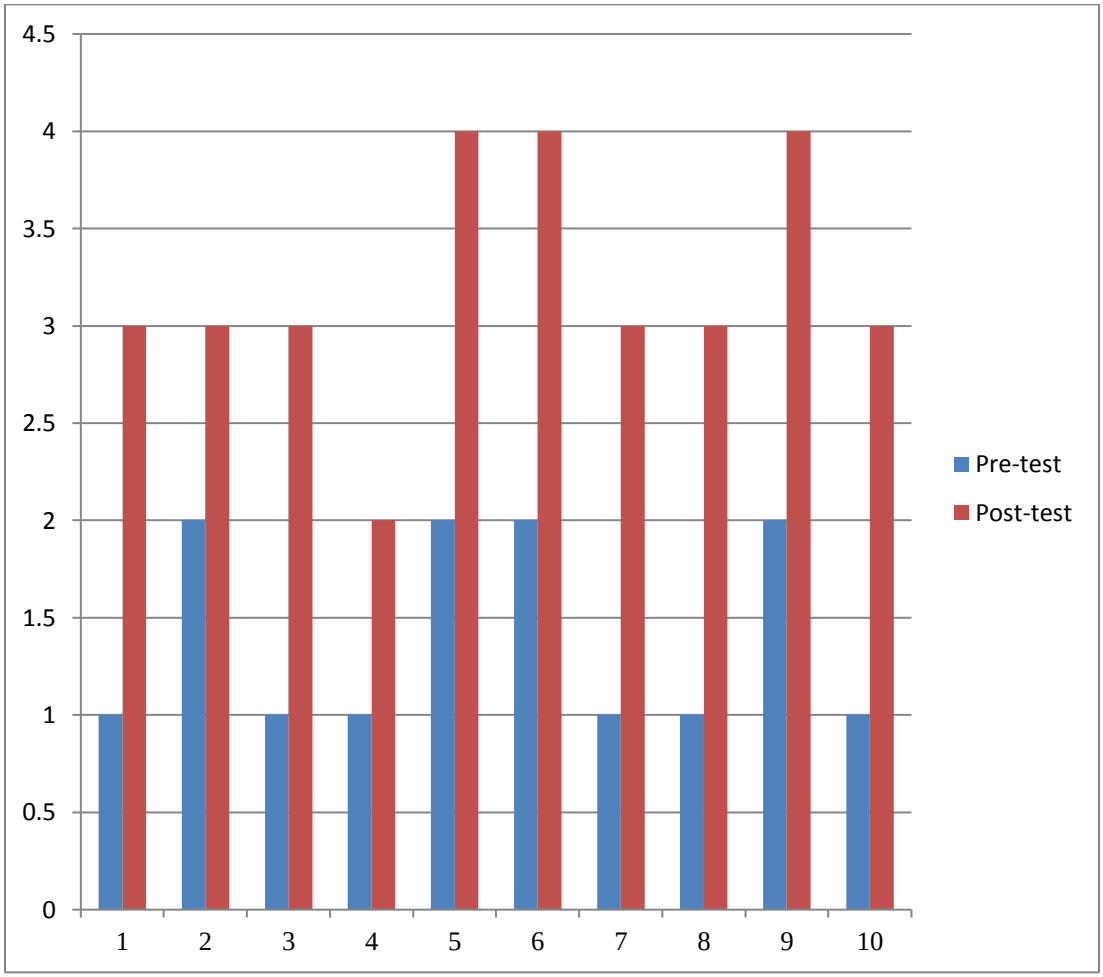

Figure-6: Pick up and Hold small item

Pick up and Hold small item: It is obvious that post test measurements are always greater than the pre test out of 10 participants. The Unrelated/independent t test in between group at 5% level of significant and 18 degrees of freedom, standard table value was 2.101 and at the same significant level and same degree of freedom observed t value was 5.824. The observed t value was greater than the table value that indicate null hypothesis was rejected and alternative hypothesis was accepted that means Mirror Therapy was more effective than conventional physiotherapy in upper extremity motor function cerebral palsy children.

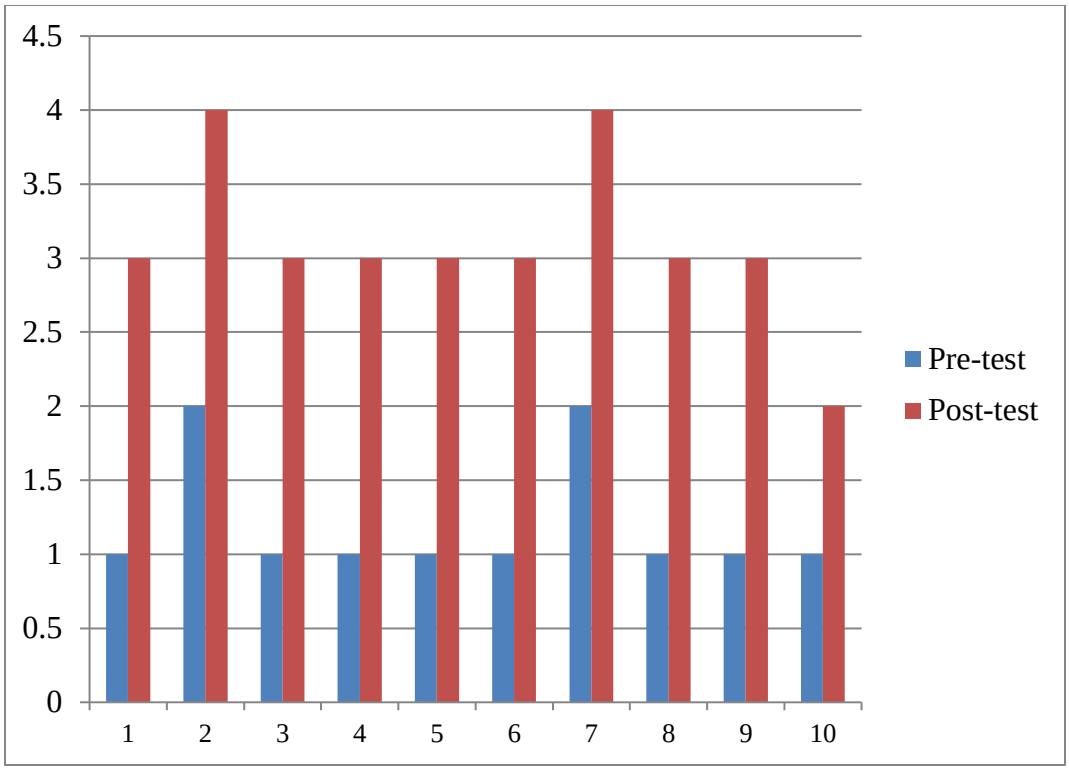

Figure-7: Pick up an object out of arm reach

Pick up an object out of arm reach: It is obvious that post test measurements are always greater than the pre test out of 10 participants. The Unrelated/independent t test in between group at 5% level of significant and 18 degrees of freedom, standard table value was 2.101 and at the same significant level and same degree of freedom observed t value was 7.637. The observed t value was greater than the table value that indicate null hypothesis was rejected and alternative hypothesis was accepted that means Mirror Therapy was more effective than conventional physiotherapy in upper extremity motor function cerebral palsy children.

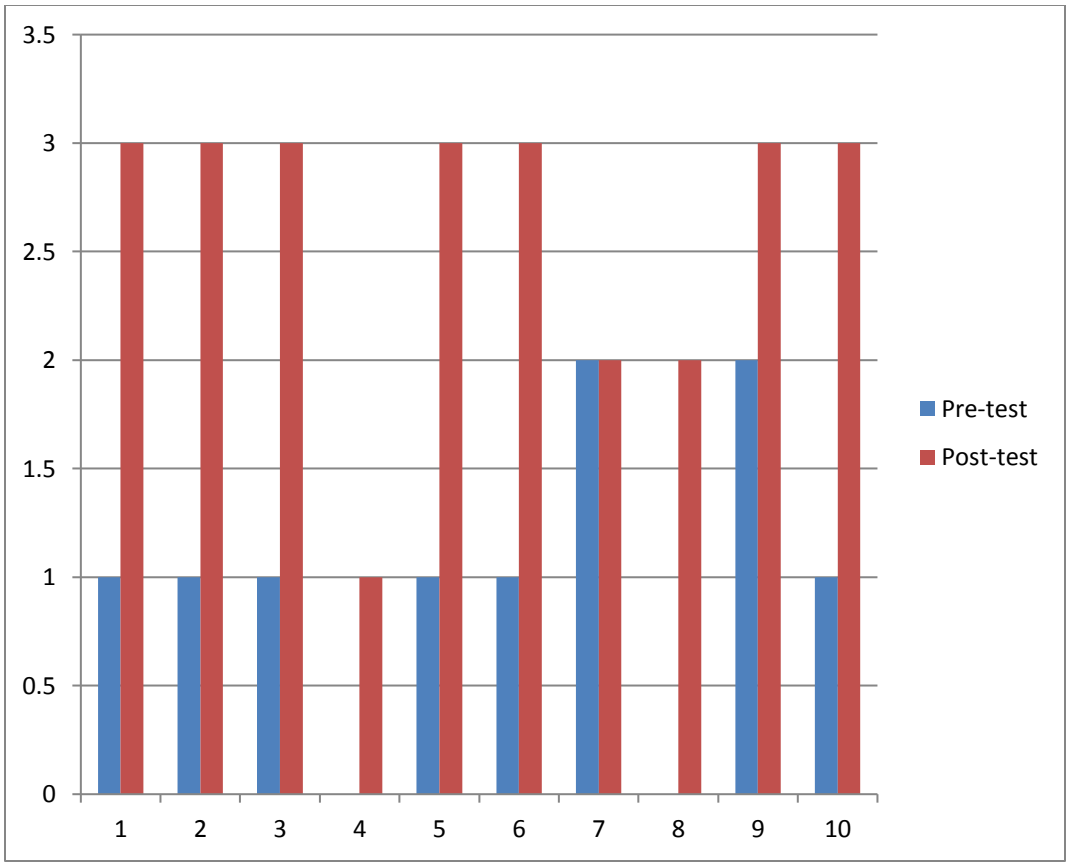

Figure-8: Self feed with spoon

Self feed with spoon: It is obvious that post test measurements are always greater than the pre test out of 10 participants. The Unrelated/independent t test in between group at 5% level of significant and 18 degrees of freedom, standard table value was 2.101 and at the same significant level and same degree of freedom observed t value was 2.714. The observed t value was greater than the table value that indicate null hypothesis was rejected and alternative hypothesis was accepted that means Mirror Therapy was more effective than conventional physiotherapy in upper extremity motor function cerebral palsy children.

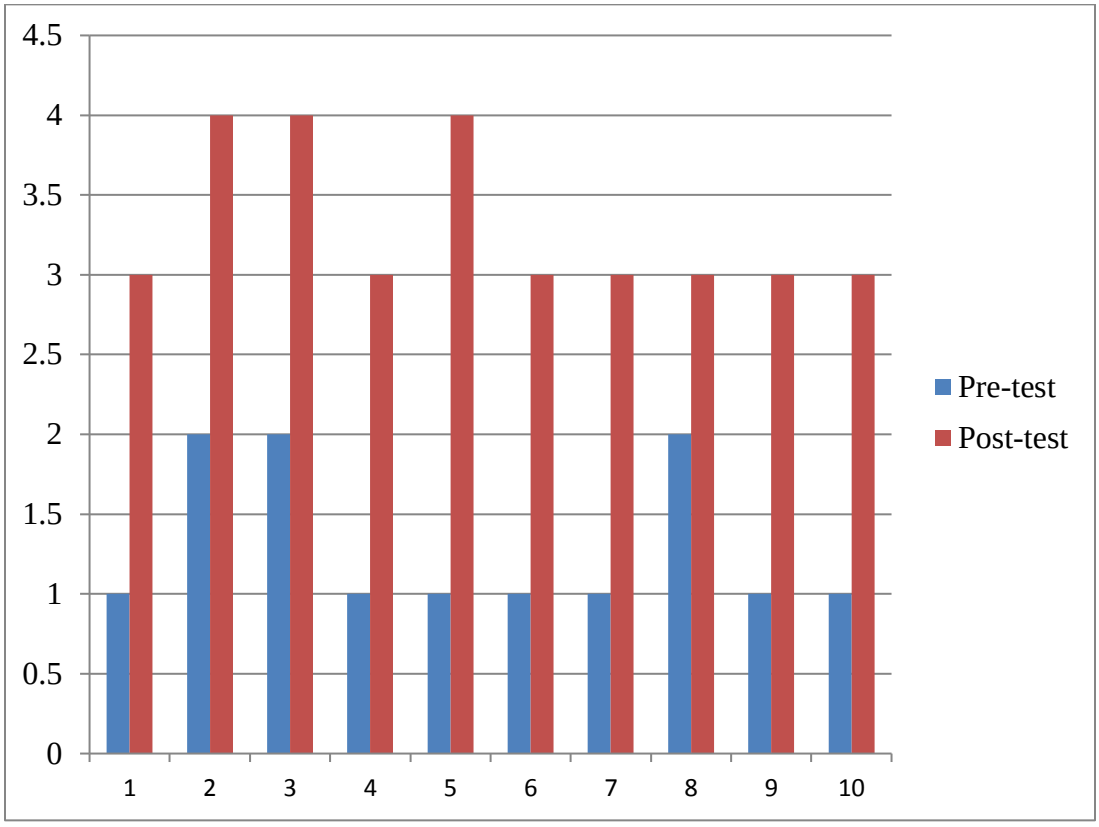

Figure-9: Point to a picture

Point to a picture: It is obvious that post test measurements are always greater than the pre test out of 10 participants. The Unrelated/independent t test in between group at 5% level of significant and 18 degrees of freedom, standard table value was 2.101 and at the same significant level and same degree of freedom observed t value was 3.13. The observed t value was greater than the table value that indicate null hypothesis was rejected and alternative hypothesis was accepted that means Mirror Therapy was more effective than conventional physiotherapy in upper extremity motor function cerebral palsy children.

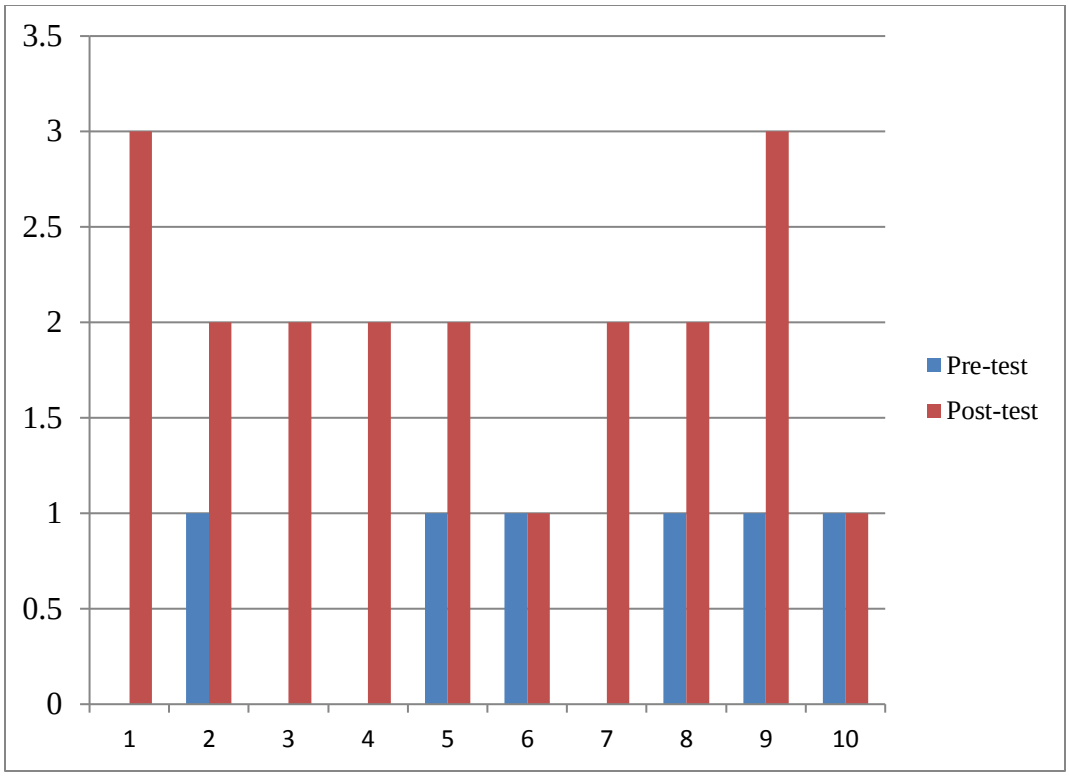

Figure-10: Take off shoes or socks

Take off shoes or socks: It is obvious that post test measurements are always greater than the pre test out of 10 participants. The Unrelated/independent t test in between group at 5% level of significant and 18 degrees of freedom, standard table value was 2.101 and at the same significant level and same degree of freedom observed t value was 2.250. The observed t value was greater than the table value that indicate null hypothesis was rejected and alternative hypothesis was accepted that means Mirror Therapy was more effective than conventional physiotherapy in upper extremity motor function cerebral palsy children.

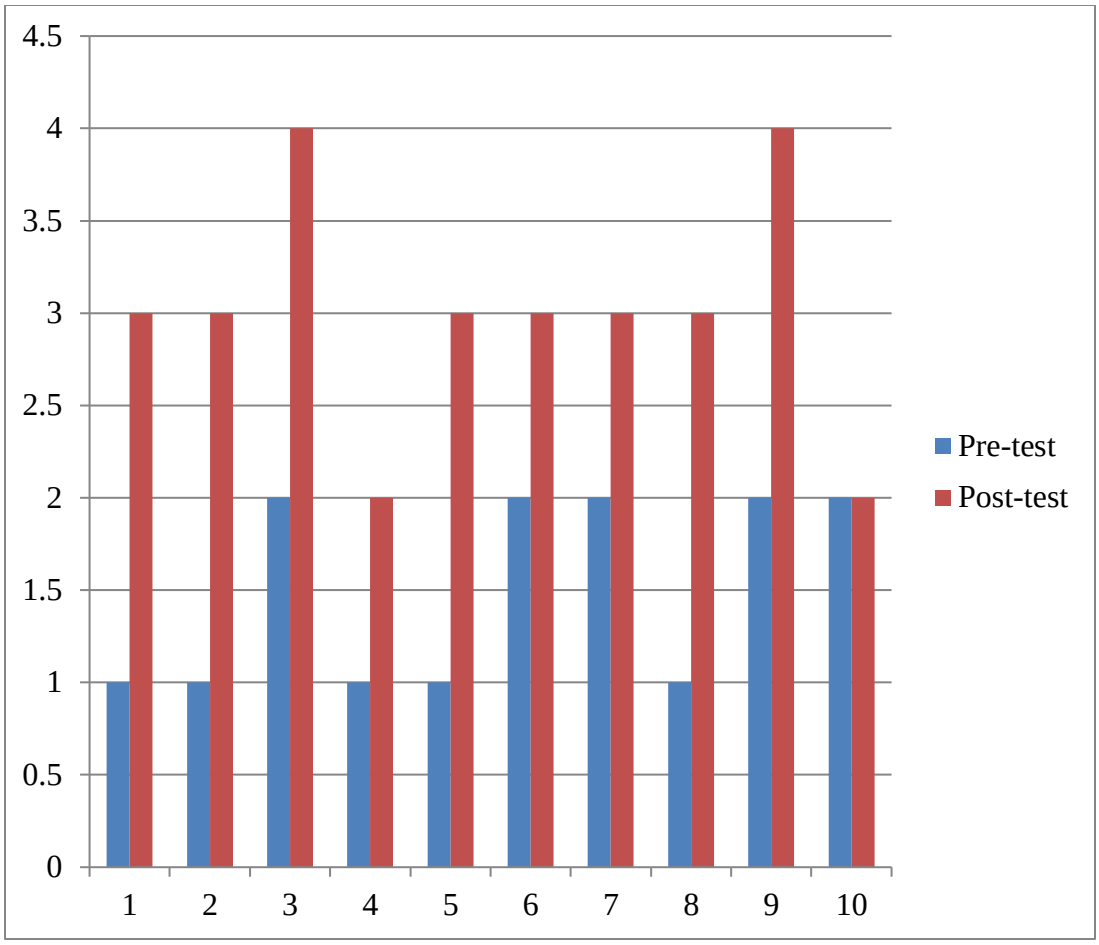

Figure-11: Hold an item while in standing position

Hold an item while in standing position: It is obvious that post test measurements are always greater than the pre test out of 10 participants. The Unrelated/independent t test in between group at 5% level of significant and 18 degrees of freedom, standard table value was 2.101 and at the same significant level and same degree of freedom observed t value was 4.583. The observed t value was greater than the table value that indicate null hypothesis was rejected and alternative hypothesis was accepted that means Mirror Therapy was more effective than conventional physiotherapy in upper extremity motor function cerebral palsy children.

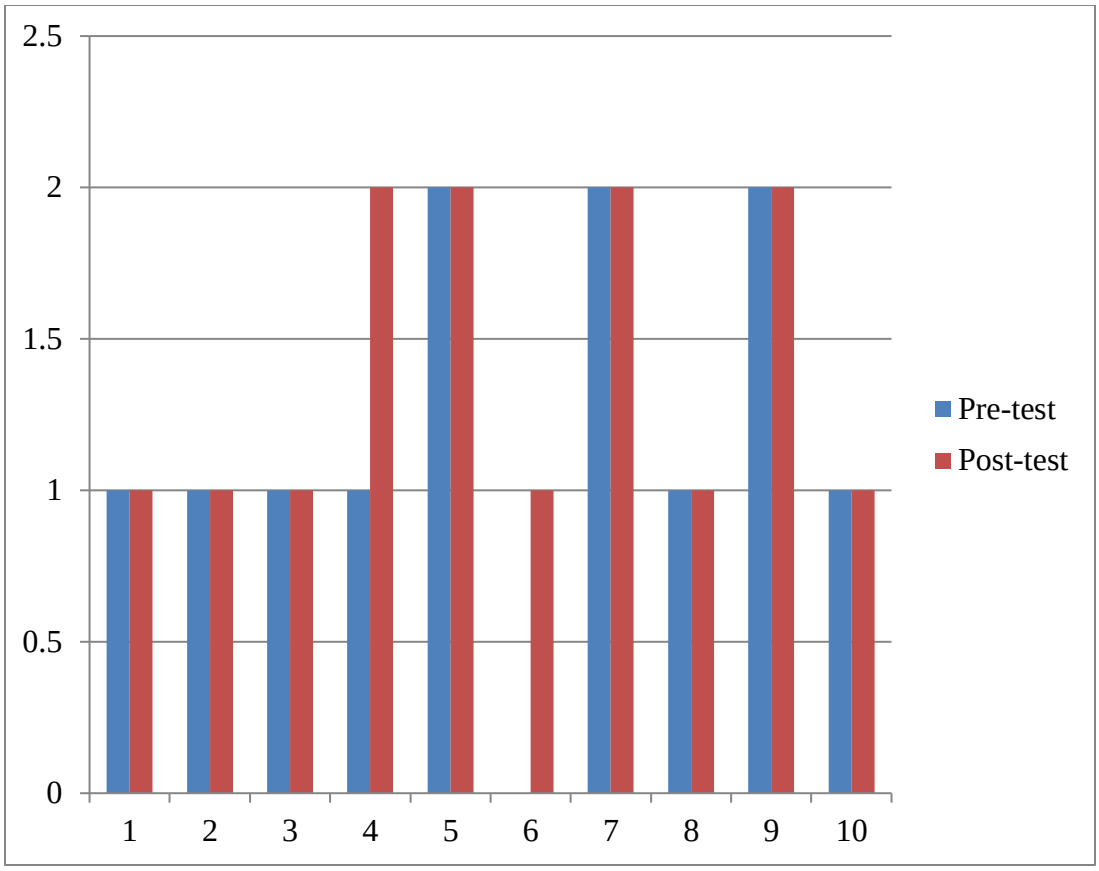

Figure-12: Carry an item from place to place

Carry an item from place to place: It is obvious that post test measurements are always greater than the pre test out of 10 participants. The Unrelated/independent t test in between group at 5% level of significant and 18 degrees of freedom, standard table value was 2.101 and at the same significant level and same degree of freedom observed t value was 4.714. The observed t value was greater than the table value that indicate null hypothesis was rejected and alternative hypothesis was accepted that means Mirror Therapy was more effective than conventional physiotherapy in upper extremity motor function cerebral palsy children.

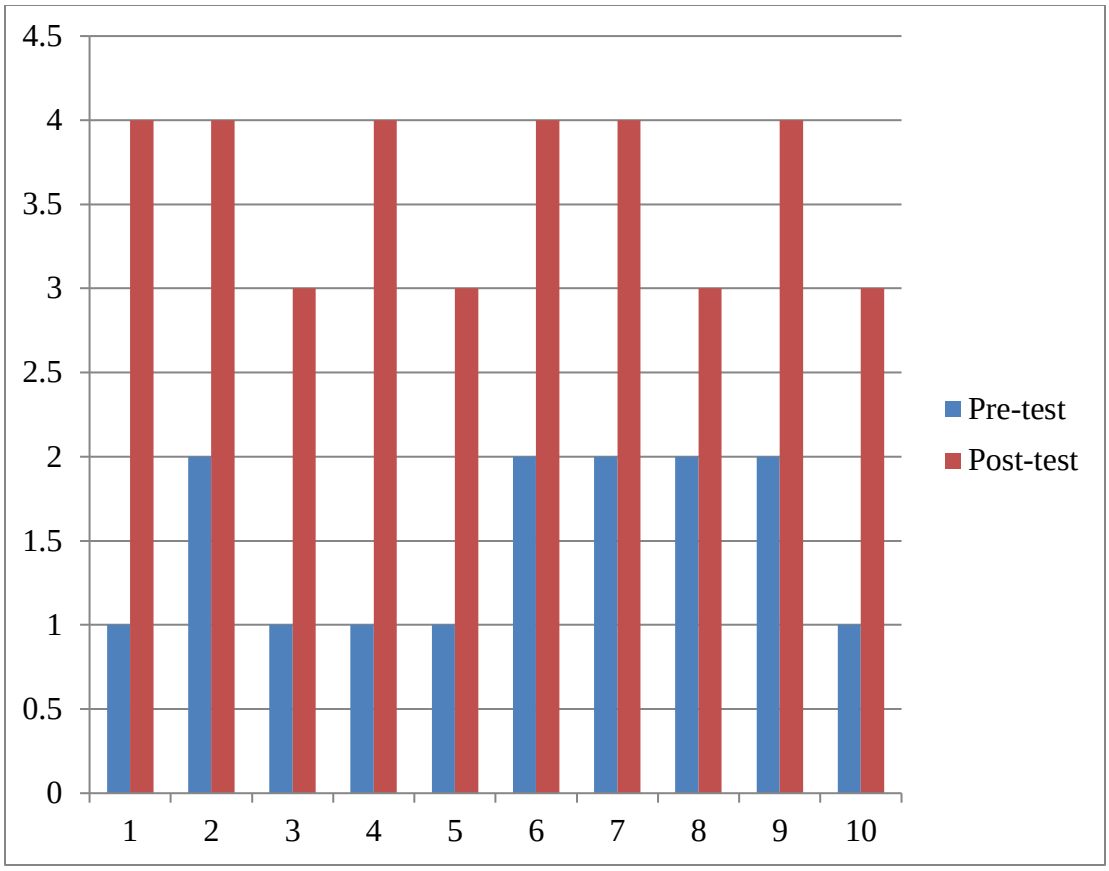

Figure-13: Reach for an object above head

Reach for an object above head: It is obvious that post test measurements are always greater than the pre test out of 10 participants. The Unrelated/independent t test in between group at 5% level of significant and 18 degrees of freedom, standard table value was 2.101 and at the same significant level and same degree of freedom observed t value was 10.286. The observed t value was greater than the table value that indicate null hypothesis was rejected and alternative hypothesis was accepted that means Mirror Therapy with conventional physiotherapy was more effective than conventional physiotherapy in upper extremity motor function cerebral palsy children.

CHAPTER –V DISCUSSION & LIMITATION

The purpose of this study was to test the hypothesis "Effect of mirror therapy for upper extremity motor function in children with cerebral palsy". In this study, 20 Cerebral palsy children's were randomly assigned as experimental group and the others as in control group. Among these children, the 10 children were experimental group received mirror therapy with conventional physiotherapy and rest of the 10 children included in the control group who received only conventional physiotherapy. Both the groups attended the 10 sessions of treatment at the pediatric indoor unit physiotherapy department of CRP, Savar in order to identify the improvement. The motor function was measured by using the Pediatric motor activity log scale and questionnaire.

In this study it was tried to explore the effectiveness of mirror therapy for children with cerebral palsy to improve their upper extremity motor function and other hand functional activities. The findings of the study showed that following ten session of intervention there was a marked difference in pre test and post test score. Initial score was measured at the beginning of patient management to get idea about the participants motor functional ability as selective movement of upper limb, grasping , holding , pick up and manipulating object. After completion of ten session of intervention the post test score was measured.

Age is a factor that provokes the test result. In this study, it was found that, Among the 20 participants 15% participants were in age group between 24-41 months, 20% participants were in age group between 42- 5 months, 25% participants were in age group between 60-77 months and 40% participants were in age group between 78-96 months. Among all participants 55% was girl and 45% was boy. In other hand one study showed thatthere was 60% male and 40% female *(*Rosenbaum et al.,2006).In the study the average amount of time spent on the mirror therapy was 50 minutes (±10).

By the age of six years; the grasp patterns become fully matured confirmed that by the age ranging between five and seven years, the child can assume hand grip with regular

force either to grasp or to lift the object without letting it slipping through the fingers (Berk,2015). Mirror-mediated therapy is based on activation of mirror neurons in a relevant area of the motor cortex. In South Korea, most reported studies have focused on visual perception ability, upper limb function, Activities of daily living, and unilateral neglect in adult patients after stroke and mirror-mediated therapy in children with CP. According to study participants were assigned to a 2 week program entailing mirror therapy .In other study shows that, children were assigned to a 4-week program entailing either mirror therapy (kim & Lim, 2015). According to study in case of holding a bottle or cup in which p value was 0.001(<0.05) but another shows that the most important activities of daily life is the gripping function of the hand.

Children diagnosed with hemi paresis suffer from abnormalities of posture, tone and gait, and impaired hand function. The impaired upper limb function results in difficulties with reaching, grasping, releasing and manipulating objects. It can impair self-care and restrict participation in school, leisure activities and professional education.

The measurement of hand grip strength is used in physical therapy to assess the functional ability and the extent of rehabilitation of patients following injury or illness (Shemy et al., 2009).Grasping activity of upper limb is also significant where the p-value was 0.000(<0.05) .The different study shows that hand grip is one of the most important functions of the hand. The hand may be used in a multitude of postures and movements in which most cases involves both the thumb and the other digits (Barr et al.,2001).

The major problem facing hemiplegic children is their inability to use their hands for reaching, grasping and manipulation. These problems affect many of the activities performed in their daily life such as dressing, eating, grooming and hand writing. In addition, upper extremity function plays an important role in gross motor skills like crawling, walking, recovering balance and protecting the body from injury when recovery is not possible digits (Bull et al ., 2009).According to my study self-feeding with spoon where the significant level was p value was 0.009(<0.05).

Wrist motion is essential for augmenting the fine motor control of the fingers and hand. Positioning the wrist in the direction opposite that of the fingers alters the functional length of the digital tendons so that maximal finger movement can be attained. Wrist extension is synergetic to finger flexion and increases the length of the finger flexors muscles and maximizing the contractual force of the digital flexors. Conversely, a posture of wrist flexion will markedly weaken grasping power (Exner, 2001).The impaired hand is typically used when there is need for bimanual task performances. Bimanual tasks are more complicated than unimanual tasks as the movements of both arms and hands must be coordinated temporally and spatially to complete a task or achieve a desired goal, but many everyday tasks require coordinated use of both arms and hands (Greaves et al., 2010). Another study shows that, the cerebral palsy children received a mirror therapy program as follows: The mirror group patients were put on a practice schedule of an additional 30 minutes of mirror therapy program 3 days a week moving both hands and arms symmetrically. Another study shows that, the study of 3 months structured, Mirror therapy had shown improvement in Cerebral palsy gains were observed in prognosis of upper limb hand function but according to my study the time duration was 15 days.

Children with impaired function of one of their arms can have disabling symptoms that affect play, school, and self-care. Hand and arm function may be affected by abnormal muscle tone, flexion synergies, decreased strength, decreased active and passive range of motion, altered sensation, and neglection (Eliasson et al., 2006). According to study Pick up an object out of arm reach where the significant level was 0.000(<0.05).

Children with hemiplegic CP rarely use their affected hand for unimanual tasks. The impaired hand is typically used when there is need for bimanual task performances. Bi-manual tasks are more complicated than unimanual tasks as the movements of both arms and hands must be coordinated temporally and spatially to complete a task or achieve a desired goal, but many everyday tasks require coordinated use of both arms and hands(Greaves et al.,2010).

The main limitation of this study was its short duration. The study was conducted with 20 cerebral palsy children for management of upper extremity motor function, which was a small number of samples in both groups and was not sufficient enough for the study to generalize the wider population of this condition. It was limited by the fact daily activities of the subject were not monitored, which could have influenced.

Researcher only explored the effect of mirror therapy after 10 sessions, so the long-term effect of treatment was not explored in this study. The research was carried out in CRP, Savar such a small environment, so it was difficult to keep confidential the aims of the study for blinding procedure. Therefore, single blinding method was used in this study.

There was no available research done in this area in Bangladesh and worldwide. So, relevant information about with mirror therapy for Bangladesh was very limited in this study.

CHAPTER VI: CONCLUSION & RECOMMENDATION

Conclusion

Cerebral Palsy is the most common condition that is responsible for disability. In cerebral palsy children, Impairment of upper extremity motor function is a common problem that occurs due to problem and damage of basal ganglia and cerebral cortex. Impairment of upper extremity motor function that causes problem in posture, Activities of daily living, Create problem in hand activities, gripping, holding object, efficient movement and functional activities. It can be seen that use of mirror therapy in children with cerebral palsy is beneficial.

Improving upper extremity motor function is importance for cerebral palsy children and physically disabled children. In mirror therapy a child views a mirror image of functional hand while attempting to do mirror activities with each hand. The image of the successful function portrayed as if it is the weaker arm is thought to help the brain reorganize and change. By doing so it not only improves motor function but also improve movement capacity and functional capabilities and may contribute to an improved quality of life especially for a child with cerebral palsy and a child who gains the ability to perform motor function properly. From this research the researcher explore the effectiveness of Mirror Therapy along with conventional physiotherapy to reduce the features of children with cerebral palsy, which will be helpful to facilitate their rehabilitation and to enhance motor function and other functional activities.

By conducting the study the researcher found effectiveness of mirror therapy with conventional therapy among the children with cerebral palsy. But it is not always possible to gain complete achievement from every treatment session work. Same things happened in the study, what the researcher wanted to gain from the study not achieved fully.So, some further steps that might be taken for better accomplishment for further research. The researcher recommended the following things -the next generation of physiotherapy members continues regarding this area which may involve outcome of mirror therapy followed by cerebral palsy children and should take more samples for generalizing the result and make the research more valid and reliable. Sample should collect from

different hospital, clinic, institute and organization in different area of Bangladesh to generate the result. This is an undergraduate study, and suggests to do the same study at graduate education level will give more precise output.

Recommendation

For future studies, the following recommendations may be made:

The effect of mirror therapy on motor function, posture, fine motor skills and functional activities. After completing the study, the researcher found some recommendations like professionals can make mirror therapy more effective by providing a class on mirror therapy and by providing resourceful information on mirror therapy and can show some techniques by using video clip according professional need. A booklet on mirror therapy and strategies for children with CP can be provided. It will be better if it is possible to conduct the same study by using different method and also a large number of participants. Further study can be done about effectiveness of mirror therapy. It is recommended to do further study with more number of subjects and with a longer time frame. A larger sample size may improve the statistical significance of some of the results. A longer time frame and long-term follow-up examination may prove valuable in showing the long-term effect of the treatment. It is also recommended to include the functional outcome assessment of patient and to identify the average number of sessions that are needed to be discharged from treatment to validate the treatment technique.

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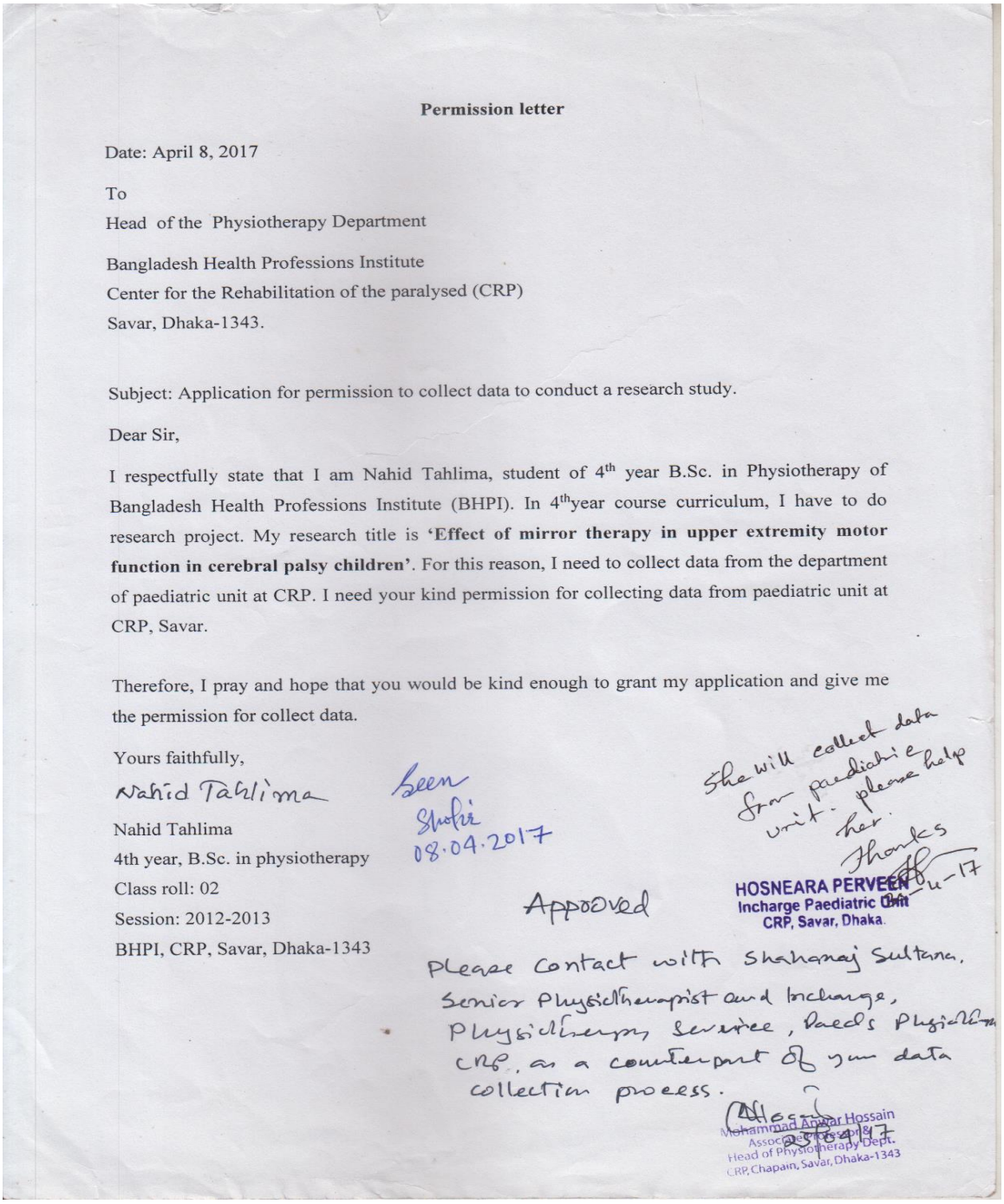
Appendix

Appendix-1



Permission letter

Date: April 8, 2017

To
Head of the Physiotherapy Department

Bangladesh Health Professions Institute
Center for the Rehabilitation of the paralysed (CRP)
Savar, Dhaka-1343.

Subject: Application for permission to collect data to conduct a research study.

Dear Sir,

I respectfully state that I am Nahid Tahlima, student of 4th year B.Sc. in Physiotherapy of Bangladesh Health Professions Institute (BHPI). In 4thyear course curriculum, I have to do research project. My research title is **'Effect of mirror therapy in upper extremity motor function in cerebral palsy children'**. For this reason, I need to collect data from the department of paediatric unit at CRP. I need your kind permission for collecting data from paediatric unit at CRP, Savar.

Therefore, I pray and hope that you would be kind enough to grant my application and give me the permission for collect data.

Yours faithfully,
Nahid Tahlima

Nahid Tahlima
4th year, B.Sc. in physiotherapy
Class roll: 02
Session: 2012-2013
BHPI, CRP, Savar, Dhaka-1343

Seen
Shafi
08.04.2017

She will collect data from paediatric unit. please help her.
Thanks
8-4-17

HOSNEARA PERVEEN
Incharge Paediatric Unit
CRP, Savar, Dhaka.

Approved

Please contact with Shahanaj Sultana, Senior Physiotherapist and Incharge, Physiotherapy Services, Paed's Physiotherapy CRP, as a counterpart of your data collection process.

Mohammad Anwar Hossain
Associate Professor
Head of Physiotherapy Dept.
CRP, Chapain, Savar, Dhaka-1343

বাংলাদেশ হেল্‌থ প্রফেশন্স ইনষ্টিটিউট (বিএইচপিআই)
BANGLADESH HEALTH PROFESSIONS INSTITUTE (BHPI)
(The Academic Institute of CRP)

Ref: CRP-BHPI/IRB/04/17/92 *Date:* 15/04/2017

To
Nahid Tahlima
B.Sc.in Physiotherapy
Session: 2012-2013, Student ID 112120002
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

Subject: "Effect of Mirror therapy for upper extremity motor function in cerebral palsy children".

Dear Nahid Tahlima,

The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application on 14/08/2016 to conduct the above mentioned thesis, with yourself, as the Principal investigator. The Following documents have been reviewed and approved:

Sr. No.	Name of the Documents
1	Thesis Proposal
2	Questionnaire (English and Bengali version)
3	Information sheet & consent form.

Since the study involves Pediatric motor activity log scale that takes 20 to 30 minutes, have no likelihood of any harm to the participants and have possibility of benefit of patients to design appropriate rehabilitation program. The members of the Ethics committee have approved the study to be conducted in the presented form at the meeting held at 09:00 AM on August 17, 2016 at BHPI.

The institutional Ethics committee expects to be informed about the progress of the study, any changes occurring in the course of the study, any revision in the protocol and patient information or informed consent and ask to be provided a copy of the final report. This Ethics committee is working accordance to Nuremberg Code 1947, World Medical Association Declaration of Helsinki, 1964 - 2013 and other applicable regulation.

Best regards,

Millat Hossain

Muhammad Millat Hossain
Assistant Professor, Dept. of Rehabilitation Science
Member Secretary, Institutional Review Board (IRB)
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

Appendix-2

Consent Form

Assalamualaikum

I am Nahid Tahlima, Final Year B.Sc. in Physiotherapy student of Bangladesh Health Professions Institute (BHPI) under the Faculty of Medicine, University of Dhaka. To obtain my Bachelor degree, I have to conduct a research project and it is a part of my study. The participants are requested to participate in the study after a brief of the following. My research title is **"Effectiveness of mirror therapy in upper extremity motor function in cerebral palsy children."** Through this study I will find the effectiveness of Mirror Therapy in upper extremity motor function along with other physiotherapy for the treatment of Children with diplegic type of Cerebral Palsy. If I can complete this study successfully, patients may get benefits who are suffering from diplegic type of Cerebral Palsy. To fulfil my research project, I need to collect data. So, you can be a respected participant of this research. I want to meet you a couple of sessions, during your regular therapy schedule. Given that exercises would be pain free and safe for you.

I would like to inform you that this is a purely academic study and will not be used for any other purposes. I assure that all data will be kept confidential. Your participation will be voluntary. You may have the rights to withdraw consent and discontinue participation at any time of the experiment. You also have the rights to answer a particular question that you don't like.

Do you have any questions before I start?

So, may I have your consent to proceed with the interview?

Yes ☐ No ☐

Signature of parents and date ……..

Signature of the researcher and Date……..

Signature of the witness and Date……..

Signature of data collector and Date.....

Questioner (English)

Subjective Information

This questionnaire is developed to measure Efficacy of Mirror Therapy for Children with Cerebral Palsy with Asymmetric Motor Impairment in CRP and this section will be filled by tick (V) mark in the left of point by patients but in special consideration physiotherapist using a black or blue pen.

Code No:

Date:

1. Patients name:
2. Age:
3. Gender:
    i. Boy
    ii. Girl
4. Address:

Village:	Post office:
Police station:	District:
Mobile number:	E-mail:

Pre-Test Treatment

PMAL Codes:

PMAL Codes for recording "no" responses:

1. "Child used the stronger arm entirely." (Assign "0")

2. "Someone else did it for the child." (Assign "0")

3. "Child never has the opportunity to do that activity." (Assign "0" and ask caregiver to provide an opportunity)

4. "Child sometimes does that activity, but I did not see the child do it since the last time I answered these questions." (Carry-over last assigned score for that activity)

5. Child only did activity in therapy (carry-over last assigned score for that activity)

6. Impossible for child to do/developmentally inappropriate. (Remove item from scoring; to get the mean score for the test, subtract this item from the number of total scores in the denominator)

HOW OFTEN SCALE

0 - Not Used -Your child did not use the weaker arm for the activity.

1 - Very rarely – 5% -10% of the time - Your child occasionally used the weaker arm for the activity, but only very rarely.

2 - Rarely – About 25% of the time - Your child used the weaker arm at times, but did the activity with the stronger arm most of the time.

3 - Sometimes –About 50% of the time - The weaker arm was used in performing the activity, but only about half as much as the stronger arm.

4 - Often – About 75% of the time - The weaker arm was used in performing the activity regularly, but just three-quarters as often as the stronger arm.

5 - Normal – 90%-100% of the time -The weaker arm was used as often as the stronger arm to perform the activity.

HOW WELL SCALE

0 - Not Used - Your child did not use the weaker arm at all for the activity.

1 - Very Poor - Your child had very little functional use of the weaker arm for the activity. The arm may have moved during the activity but was of no real functional help.

2 - Poor - Your child had minor functional use of the weaker arm for the activity. The arm actively participated in the activity, but the stronger arm or caregiver did most of the work.

3 - Fair or Moderate - The weaker arm was used to accomplish the activity, but the performance was very slow and/or involved great difficulty.

4 - Almost Normal - The weaker arm was able to accomplish the activity independently, but did so with some difficulty and/or inaccuracy.

5 - Normal -The weaker arm did the activity normally.

PMAL

The following is a list of activities and the scoring format for use of the more-affected arm in different activities in the life situation. (Note that a revised version of this test is currently in use.)

		HOW OFTEN	**WELL SCALE**
01	Hold a bottle/cup		
02	Pick up and hold a small item while sitting in a chair		
03	Pick up and hold a large item while sitting in a chair		
04	Eat finger foods		
05	Pick up an object out of arm's reach		
06	Push a button		
07	Self feed with spoon		
08	Point to a picture		
09	Take off shoes or socks		
10	Pull a toy with a string		
11	Turn a knob		
12	Pick up a cylindrical object (eg, crayon, marker, or drumstick)		

13	Throw a ball or similar object		
14	Hold a handle on a riding, pulling, or push toy		
15	Turn a page in a book		
16	Hold an item while in standing position		
17	Carry an item from place to place		
18	Stop or roll a ball		
19	Pop bubbles		
20	Push into sitting position		
21	Reach for an object above head		
22	Push arm through sleeve of clothing		

Assessment of tone

This questionnaire is designed for cerebral palsy children's for assessment of muscle tone. The original Ashworth Scale (Ashworth, 1964) was first developed by Ashworth as a 5-point scale for evaluating and grading spasticity, with the purpose of creating a simple clinical tool to test the muscle tone. The scale was later modified to a6-point scale by Bohannon and Smith (1987) with the aim of increasing its sensitivity of grades at the lower end of the scale The Ashworth scale are only moderately reliable and repeatable for assessment of muscle tone (Bohannon and Smith, 1987). This section of questionnaire will be filled by the physiotherapist using a pencil.

This part is designed to determine the effectiveness of mirror therapy.

The Ashworth Scale:

Score	**Ashworth Scale (1964)**	**Modified Ashworth Scale Bohannon & Smith (1987)**
0 (0)	No increase in tone.	No increase in muscle tone.
1(1)	Slight increase in tone giving a catch when the limb was moved in flexion or extension.	Slight increase in muscle tone, manifested by a catch and release or by minimal resistance at the end of the range of motion when the affected part(s) is moved in flexion or extension.

1+ (2)	Slight hyper tonus noticeable catch when limb is moved.	Slight increase in muscle tone, manifested by a catch, followed by minimal resistance throughout the reminder (less than half) of the ROM (range of movement).
2 (3)	More marked increase in tone but limb easily flexed.	More marked increase in muscle tone through most of the ROM, but affected part(s) easily moved.
3 (4)	Considerable increase in tone passive movement difficult.	Considerable increase in muscle tone passive, movement difficult.
4 (5)	Limb rigid in flexion or extension.	Affected part(s) rigid in flexion or extension.

General Instructions to Assessment of muscle tone:

1. All tests should be performed in the supine position except the Quadriceps femoris muscle that should be tested in the prone position as children can become easily distracted and active moving might increase the muscle tone.
2. During the examination of the children make sure that the child is in a normal state of alertness.
3. If the supine position brings the child to a position of increased lordosis, place a pillow under the head.
4. The head of the child should be placed in the mid-position.
5. Make sure that the limb you are about to move is relaxed as much as possible.
6. The passive movement should be performed within one second given the facthat spasticity is characterized by a velocity dependent increase in muscle tone.
7. Repeated movements must be kept to a minimum, since spasticity will decrease with repeated cycles of stretching.
8. It is preferred to perform all movements in lying (supine/prone) position.

Remark:

If the child's situation is not enabling you to perform the movements in supine or prone, try side lying or sitting.

Assessment Form:

Name of muscles	Pre test		Post test	
	Right	Left	Right	Left
Biceps Brachi				
Wrist Flexors				

Post-Test Treatment

PMAL Codes:

PMAL Codes for recording "no" responses:

1. "Child used the stronger arm entirely." (Assign "0")
2. "Someone else did it for the child." (Assign "0")
3. "Child never has the opportunity to do that activity." (Assign "0" and ask caregiver to provide an opportunity)
4. "Child sometimes does that activity, but I did not see the child do it since the last time I answered these questions." (Carry-over last assigned score for that activity)
5. Child only did activity in therapy (carry-over last assigned score for that activity)
6. Impossible for child to do/developmentally inappropriate. (Remove item from scoring; to get the mean score for the test, subtract this item from the number of total scores in the denominator

HOW OFTEN SCALE

0 - Not Used -Your child did not use the weaker arm for the activity.

1 - Very rarely – 5% -10% of the time - Your child occasionally used the weaker arm for the activity, but only very rarely.

2 - Rarely – About 25% of the time - Your child used the weaker arm at times, but did the activity with the stronger arm most of the time.

3 - Sometimes –About 50% of the time - The weaker arm was used in performing the activity, but only about half as much as the stronger arm.

4 - Often – About 75% of the time - The weaker arm was used in performing the activity regularly, but just three-quarters as often as the stronger arm.

5 - Normal – 90%-100% of the time -The weaker arm was used as often as the stronger arm to perform the activity.

HOW WELL SCALE

0 - Not Used - Your child did not use the weaker arm at all for the activity.

1 - Very Poor - Your child had very little functional use of the

Weaker arm for the activity. The arm may have moved during the activity but was of no real functional help.

2 - Poor - Your child had minor functional use of the weaker arm for the activity. The arm actively participated in the activity, but the stronger arm or caregiver did most of the work.

3 - Fair or Moderate - The weaker arm was used to accomplish the activity, but the performance was very slow and/or involved great difficulty.

4 - Almost Normal - The weaker arm was able to accomplish the activity independently, but did so with some difficulty and/or inaccuracy.

5 - Normal -The weaker arm did the activity normally.

PMAL

The following is a list of activities and the scoring format for use of the more-affected arm in different activities in the life situation. (Note that a revised version of this test is currently in use.)

		HOW OFTEN	**WELL SCALE**
01	Hold a bottle/cup		
02	Pick up and hold a small item while sitting in a chair		

03	Pick up and hold a large item while sitting in a chair		
04	Eat finger foods		
05	Pick up an object out of arm's reach		
06	Push a button		
07	Self feed with spoon		
08	Point to a picture		
09	Take off shoes or socks		
10	Pull a toy with a string		
11	Turn a knob		
12	Pick up a cylindrical object (eg, crayon, marker, or drumstick)		
13	Throw a ball or similar object		
14	Hold a handle on a riding, pulling, or push toy		
15	Turn a page in a book		
16	Hold an item while in standing position		
17	Carry an item from place to place		
18	Stop or roll a ball		
19	Pop bubbles		
20	Push into sitting position		
21	Reach for an object above head		
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Biceps Brachi				
Wrist Flexors				

সম্মতিপত্র

আসসালামুয়ালাইকুম,

আমি নাহিদ তাহলিমা ,ঢাকা বিশ্ববিদ্যালয়ের চিকিৎসা অনুষদের অধিভুক্ত বাংলাদেশ হেলথ প্রফেশনস্ ইন্সিটিটিউট এর বি.এস.সি ইন ফিজিওথেরাপি কোর্সের চূড়ান্ত বর্ষের একজন শিক্ষার্থী। অধ্যায়নের অংশ হিসেবে আমাকে একটি গবেষণা সম্পাদন করতে হবে এবং এটা আমার প্রাতিষ্ঠানিক কাজের একটা অংশ। নিম্নোক্ত তথ্যাদি পাঠ করার পর অংশগ্রহণকারীদের গবেষণায় অংশগ্রহনের জন্য অনুরোধ করা হলো।

আমার গবেষণার বিষয় হল **"সেরিব্রাল পালসি সম্বলিত বাচ্চাদের হাতের মোটর ফাংশনের আয়না থেরাপি এর কার্যকারিতা "**এই পরীক্ষামূলক গবেষণার মাধ্যমে আমি একটি অনুমান পরীক্ষা করব যে সি, পি, বাচ্চাদের ক্ষেত্রে শুধুমাত্র প্রচলিত ফিজিওথেরাপি অপেক্ষা প্রচলিত ফিজিওথেরাপির সাথে আয়না থেরাপি বেশি কার্যকরী। আমার গবেষণার উদ্দেশ্য হলো থেরাপি দেবার পূর্বেও পরে বাচ্চাদের কাজ করার ক্ষমতা পরিমাপ করা। আমি যদি আমার গবেষণাটি সার্থক ভাবে সম্পূর্ণ করতে পারি তবে যে সব বাচ্চারা সেরিব্রাল পালসি রোগে ভুগছেন তারা উপকৃত হবেন এবং এটি হবে একটি পরীক্ষামূলক প্রমাণ। গবেষণাটি সম্পাদনের জন্য, আমার তথ্য সংগ্রহ করা প্রয়োজন হবে। গবেষণার ক্ষেত্র বিবেচনা করে আপনার বাচ্চার মাঝে আমার গবেষণায় অংশগ্রহণ করার জন্য প্রয়োজনীয় বৈশিষ্ট্য লক্ষ্য করা গেছে। এজন্য, আপনি আমার গবেষণার একজন সম্মানিত অংশগ্রহণকারী হতে পারেন এবংআমি আপনাকে আমার গবেষণায় অংশগ্রহন করতে অনুরোধ জানাচ্ছি।

আমি প্রতিজ্ঞা করছি যে, এই গবেষণা আপনার জন্য ঝুঁকি পূর্ণ হবে না অথবা আপনার কোন ক্ষতি করবে না। গবেষণা চলাকলীন সময়ে কোন রকম দ্বিধা বা ঝুঁকি ছাড়াই যে কোন সময়ে আপনি এটা কে বাদ দিতে পারবেন। এই গবেষণার প্রাপ্ত তথ্য সম্পূর্ণ ভাবে গোপনীয় থাকবে এবং অংশগ্রহণকারীর ব্যক্তিগত তথ্য অন্য কোথাও প্রকাশ করা হবে না।

শুরু করার আগে আপনার কি কোন প্রশ্ন আছে ?

আমি কি শুরু করতে পারি ?

হ্যাঁ ☐ না ☐

বাচ্চার অভিভাবকের স্বাক্ষর ও তারিখ .....

গবেষকের স্বাক্ষর ও তারিখ .....

সাক্ষীর স্বাক্ষর ও তারিখ .....

তথ্য সংগ্রহকারীর স্বাক্ষর ও তারিখ.....

পর্ব-ক:ব্যক্তিগত তথ্যাবলী

এই প্রশ্নপত্রটি গড়ে তলা হয়েছে ডায়প্লেজিক সেরিব্রাল পালসি সম্বলিত বাচ্চাদের জন্য। ব্যক্তিগত তথ্যাবলী অংশটি রুগী কিন্তু বিশেষ বিবেচনায় ফিজিওথেরাপিস্ট কালো কলমের দ্বারা পূরণ করবেন। সঠিক জবাবটির বাম পার্শে টিক ($\surd$) চিহ্ন দিন।

রোগীর কোড নং: তারিখ :

১। বাচ্চার নাম: রোগীর নাম:

২। বাচ্চার বয়স:

৩। লিঙ্গ: i. ছেলে ii. মেয়ে

৪। ঠিকানা:

গ্রাম: পোস্ট অফিস:

থানা জেলা:

মোবাইল নম্বর:

৫. আপনার বাচ্চা কি প্রতিদিন এক ঘন্টা করে ফিজিওথেরাপি চিকিৎসা পায়?

i. হ্যাঁ

ii. না

চিকিৎসা পূর্ববর্তী উপাত্ত সমূহ

হাতের দক্ষতারপি, এম, এ, এল মাপ কাঠি

কোন প্রতিক্রিয়া না পাওয়াতে PMAL **সংকেতসমূহ**:

১. "শিশু সম্পূর্ণ রূপে শক্তিশালী বাহু ব্যবহার করেছে।"

(নির্দিষ্ট করুন "০")

২. "শিশুর জন্য অন্য কেউ এটা করেছে।"

(নির্দিষ্ট করুন "০")

৩. "ঐ কাজ করার মত সুযোগ শিশুটির ছিলনা।"

(নির্দিষ্ট করুন "০" এবং দেখাশুনাকারী কে বলুন সুযোগ করে দিতে।)

৪. "শিশুটি মাঝে মধ্যে ঐ রকম কাজ করে, কিন্তু আগের প্রশ্নগুলোর উত্তর দেওয়ার পর থেকে আমি তাকে করতে দেখিনি।"

(আগের স্কোরের সাথে যুক্ত করুন।)

৫. শিশুটি শুধু মাত্র থেরাপি দেওয়ার সময় কাজটা করে।

(আগের স্কোরের সাথে যুক্ত করুন।)

৬ . এটা করা শিশুটির জন্য অসম্ভব বা বৃদ্ধিজনিত অনুপযুক্ত।

(স্কোরিং থেকে আইটেম মুছুন; সঠিক স্কোর পেতে মোট স্কোর থেকে আইটেমটি বাদ দিন।)

পুনরাবৃত্তির স্কেল কেমন?

০ – ব্যবহার হয়নি–আপনার শিশু কাজটির জন্য দুর্বল বাহু ব্যবহার করেনি।

১ – খুবই কম – ৫ -১০ ভাগ সময় – আপনার শিশুটি মাঝে মাঝে দুর্বল বাহু ব্যবহার করে,কিন্তু খুব কম।

২ - কম – প্রায় ২৫ ভাগ সময়–আপনার শিশুটি সময়ে দুর্বল বাহু ব্যবহার করে, কিন্তু বেশির ভাগ সময় শক্তিশালী বাহু দিয়ে কাজটি করে।

৩ – কখনো কখনো– প্রায় ৫০ভাগ সময় – দুর্বল বাহু ব্যবহৃত হলেও শক্তিশালী বাহুর অর্ধেক।

৪ -- প্রায়ই – প্রায় ৭৫ ভাগ সময় – দুর্বল বাহুটি ব্যবহৃত হত নিয়মিত, কিন্তু সবল বাহুর তিন-চতুর্থাংশ।

৫ - স্বাভাবিক – ৯০-১০০ ভাগ সময় – দুর্বল বাহুটি সবল বাহুর মতই ব্যবহৃত হয়েছে।

‘ভাল’ এর স্কেল কেমন?

০ – ব্যবহার হয়নি – আপনার শিশু কাজের জন্য দুর্বল বাহুটি মোটেও ব্যবহার করেনি।

১ – খুবকম –আপনার শিশুর বাহুতে কাজ করার সামর্থ্য কম। হয়ত কাজের সময় নড়েছে কিন্তু কাজে কোন অবদান নেই।

২- খারাপ কাজটি করাতে দুর্বল বাহুর সামান্য অবদান ছিল। তা সক্রিয়ভাবে কাজটি করতে আসে, কিন্তু শক্তিশালী বাহু বা দেখাশুনা কারী বেশি অংশ করে দেয়।

৩–মোটামোটি- দুর্বল বাহুটি সবসময় কাজে ব্যবহৃত হত, কিন্তু কাজটি ধীরে বা খুব জটিল তার সাথে সম্পন্ন হত।

৪ – প্রায় স্বাভাবিক – স্বাধীণভাবে বাহুটি কাজ করতে পারে, কিন্তু সমস্যা বা জটিলতা দেখা দেয়।

৫ – স্বাভাবিক –দুর্বল বাহুটি স্বাভাবিক ভাবেই কাজটি করে।

পি. এম. এ. এল

জীবনের নিয়মিত কর্মকান্ডে আক্রান্ত হাত ব্যবহারের ক্ষেত্রে সকল কাজ ও স্কোরিং বিন্যাসের একটি তালিকা দেওয়া আছে। (উল্লেখ্য, এই পরীক্ষা একটি সংশোধিত সংস্করণ যা আপাতত ব্যবহার হচ্ছে।)

সিরিয়াল নং	নির্দেশনা	**পুনরাবৃত্তির স্কেল কেমন?**	**‘ভাল’ এর স্কেল কেমন?**
১।	বোতল বা কাপড় ধরতে দিন।		
২।	চেয়ারে বসিয়ে একটি ছোট জিনিস ধরতে ও তুলতে দিন।		
৩।	চেয়ারে বসিয়ে একটি বড় কিছু ধরতে ও তুলতে দিন।		
৪।	আঙুল দিয়ে খেতে দিন।		
৫।	হাতের নাগালের বাইরে কিছু ধরতে দিন।		
৬।	বোতামে টিপ দিতে বলুন।		
৭।	নিজে নিজে চামচ দিয়ে খেতে দিন।		
৮।	নিদিষ্ট ছবির উপর হাত দিন।		
৯।	জুতা বা মোজা খুলতে দিন।		
১০।	তারে বাধা পুতুল উঠাতে দিন।		
১১।	দরজার নব ঘুরাতে দিন।		

১২।	নলাকার বস্তু ধরতে দিন। (যেমন, খড়ি, মার্কার, বাড্রামস্টিক)		
১৩।	বল বা বলের মত কিছু ছুঁড়ে মারতে দিন।		
১৪।	একটি অশ্বচালনা, পোলিং, বাধাক্কা খেলনা একটি হ্যান্ডেল ধরতে দিন।		
১৫।	একটা একটা করে বইয়ের পৃষ্ঠা উলটাতে বলুন ।		
১৬।	দাঁড়িয়ে কোন কিছু ধরতে দিন।		
১৭।	এক জায়গা থেকে অন্য জায়গায় কিছু নিয়ে যেতে বলুন।		
১৮।	বল ঘুরাতে বা ঘুরান থামাতে দিন।		
১৯।	বুদবুদ ফুটাতে দিন।		
২০।	বসে ধাক্কা দিতে বলুন।		
২১।	মাথার উপরের বস্তকে ধরতে বলুন		
২২।	জামার হাতা দিয়ে হাত দিতে বলুন।		

<u>স্বন/টান এর মুল্যায়ন</u>

স্কোর	অ্যাসওয়ারথ মাপকাঠি(১৯৬৪)	পরিবর্তীত অ্যাসওয়ারথ মাপকাঠি বহনন ও স্মিথ (১৯৮৭)
০	টানের বৃদ্ধি নেই	মাংশপেশির টানের বৃদ্ধি নেই
১	অঙ্গের ভাজ বা প্রসার এর ফলে টান হালকা বৃদ্ধি পায়।	আক্রান্ত অংশ ভাজ বা প্রসারের সময় মুক্তি বা সংক্ষিপ্ত প্রতিরোধ এরফলে মাংশপেশীর হালকা টান বাড়ে।
১+(২)	অঙ্গলি সরানোর ফলে উল্লেখযোগ্য টান লক্ষ্য করা যায়।	অঙ্গলির নড়চড়ার সময় সংক্ষিপ্ত প্রতিরোধের ফলে উল্লেখযোগ্য মাংশপেশীর টান লক্ষ্য করা যায়।
২(৩)	অঙ্গলি ভাজ হয় কিন্তু টান খুব বেশি বৃদ্ধি পায়।	আক্রান্ত অংশ সহজে চালিত হয়, কিন্তু মাংশপেশীর টান খুব বেশি বৃদ্ধি পায়।

৩(৪)	টান অতিরিক্ত বৃদ্ধি পায় এবং নিস্ক্রিয় নড়াচড়া কঠিন।	মাংশপেশীর টান অতিরিক্ত বৃদ্ধি পায় এবং নিস্ক্রিয় নড়াচড়া কঠিন।
৪(৫)	ভাজ এবং প্রসারের সময় অঙ্গলি শক্ত হয়ে যায়।	ভাজ এবং প্রসারের সময় আক্রান্ত অংশ শক্ত হয়ে যায়।

এই প্রশ্নাবলী নির্ধারন করা হয়েছে সেরিব্রাল পলসি বাচ্চাদের মাংশপেশীর টান নির্ণয় করার জন্য। প্রথম অ্যাসওয়ারথ মাপকাঠি তৈরী করা হয় ১৯৬৪ সালে ৫ টি ভাগে মাংশপেশীর অনৈচ্ছিক টান মূল্যায়নের জন্য। পরবর্তীতে ১৯৮৭ সালে বহনন ও স্মিথ এই মাপকাঠিকে পরিবর্তীত করে এর সংবেদনশীলতা বাড়ানোর জন্য ৬ টি ভাগে ভাগ করেন।

প্রশ্নাবলীর এই অংশটি ফিজিওথেরাপিস্ট পূরণ করবেন।

এই অংশটি নির্ধারন করা হয়েছে ধ্রুবক প্রয়োগ চিকিৎসা নির্ণয় করার জন্য।

অ্যাসওয়ারথ স্কেলঃ-

মাংশপেশীর টান নির্ধারনের সাধারন নিয়মাবলীঃ-

১। সব পরীক্ষা চিৎ অবস্থায় করা উচিত। শুধুমাত্র কোয়ারডিস্পেস ফেমোরিস মাংশ বাদে যেহেতু সক্রিয় নড়াচড়া মাংশপেশীর টান বৃদ্ধি করে।

২। পরীক্ষার সময় শিশু যেন সাধারন অবস্থায় থাকে এটি নিশ্চিত করতে হবে।

৩। চিৎ করে শুয়ানোর ফলে যদি লরডোসিস বাড়ে তবে মাথার নিচে বালিশ দিতে হবে।

৪। মাথার অবস্থান মাঝ বরাবর হওয়া উচিত।

৫। যতটুকু সম্ভব নড়াচড়ার সময় যেন শরীরের অংশ নিরুদ্বেগ থাকে।

৬। নিস্ক্রিয় নড়াচড়া ১ সেকেন্ডে করা উচিত যেহেতু শক্ত হওয়াটা মাংসপেশীর টানের উপর নির্ভর করে।

৭। নড়াচড়ার পুনরাবৃত্তি কম করতে হবে যেহেতু এর ফলে শক্ত হওয়াটা কমে যেতে পারে।

৮। এই সবগুলো পরীক্ষা শুয়ে (চিৎ/উপুর) করা উচিত।

মন্তব্যঃ-

যদি শিশুকে চিৎ বা উপুর করে শুয়ানো না যায় তবে সাইডে শুইয়ে বা বসিয়ে করতে হবে।

মুল্যায়ন ফরমঃ

মাংশপেশীর নাম	পূর্ববর্তী পরীক্ষা		পরবর্তী পরীক্ষা	
	ডান	বাম	ডান	বাম
বাইসেপ্স ব্রাকাই				
রিস্ট এক্সটেন্সর				

চিকিৎসা পরবর্তী উপাত্ত সমূহ

হাতের দক্ষতারপি, এম, এ, এল মাপ কাঠি

১. "শিশু সম্পূর্ণ রূপে শক্তিশালী বাহু ব্যবহার করেছে।"

(নির্দিষ্ট করুন "০")

২. "শিশুর জন্য অন্য কেউ এটা করেছে।"

(নির্দিষ্ট করুন "০")

৩. "ঐ কাজ করার মত সুযোগ শিশুটির ছিলনা।"

(নির্দিষ্ট করুন "০" এবং দেখাশুনাকারী কে বলুন সুযোগ করে দিতে।)

৪. "শিশুটি মাঝে মধ্যে ঐ রকম কাজ করে, কিন্তু আগের প্রশ্নগুলোর উত্তর দেওয়ার পর থেকে আমি তাকে করতে দেখিনি।"

(আগের স্কোরের সাথে যুক্ত করুন।)

৫. শিশুটি শুধু মাত্র থেরাপি দেওয়ার সময় কাজটা করে।

(আগের স্কোরের সাথে যুক্ত করুন।)

৬ . এটা করা শিশুটির জন্য অসম্ভব বা বৃদ্ধিজনিত অনুপযুক্ত।

(স্কোরিং থেকে আইটেম মুছুন; সঠিক স্কোর পেতে মোট স্কোর থেকে আইটেমটি বাদ দিন।)

পুনরাবৃত্তির স্কেল কেমন?

০ – ব্যবহার হয়নি–আপনার শিশু কাজটির জন্য দুর্বল বাহু ব্যবহার করেনি।

১ – খুবই কম – ৫ -১০ ভাগ সময় – আপনার শিশুটি মাঝে মাঝে দুর্বল বাহু ব্যবহার করে,কিন্তু খুব কম।

২ - কম – প্রায় ২৫ ভাগ সময়–আপনার শিশুটি সময়ে দুর্বল বাহু ব্যবহার করে, কিন্তু বেশির ভাগ সময় শক্তিশালী বাহু দিয়ে কাজটি করে।

৩ – কখনো কখনো– প্রায় ৫০ভাগ সময় – দুর্বল বাহু ব্যবহৃত হলেও শক্তিশালী বাহুর অর্ধেক।

৪ -- প্রায়ই – প্রায় ৭৫ ভাগ সময় – দুর্বল বাহুটি ব্যবহৃত হত নিয়মিত, কিন্তু সবল বাহুর তিন-চতুর্থাংশ।

৫ - স্বাভাবিক – ৯০-১০০ ভাগ সময় – দুর্বল বাহুটি সবল বাহুর মতই ব্যবহৃত হয়েছে।

'ভাল' এর স্কেল কেমন?

০ – ব্যবহার হয়নি – আপনার শিশু কাজের জন্য দুর্বল বাহুটি মোটেও ব্যবহার করেনি।

১ – খুবকম –আপনার শিশুর বাহুতে কাজ করার সামর্থ্য কম । হয়ত কাজের সময় নড়েছে কিন্তু কাজে কোন অবদান নেই।

২- খারাপ কাজটি করাতে দুর্বল বাহুর সামান্য অবদান ছিল। তা সক্রিয়ভাবে কাজটি করতে আসে, কিন্তু শক্তিশালী বাহু বা দেখাশুনা কারী বেশি অংশ করে দেয়।

৩–মোটামোটি- দুর্বল বাহুটি সবসময় কাজে ব্যবহৃত হত, কিন্তু কাজটি ধীরে বা খুব জটিল তার সাথে সম্পন্ন হত।

৪ – প্রায় স্বাভাবিক – স্বাধীণভাবে বাহুটি কাজ করতে পারে, কিন্তু সমস্যা বা জটিলতা দেখা দেয়।

৫ – স্বাভাবিক –দুর্বল বাহুটি স্বাভাবিক ভাবেই কাজটি করে।

পি. এম. এ. এল

জীবনের নিয়মিত কর্মকান্ডে আক্রান্ত হাত ব্যবহারের ক্ষেত্রে সকল কাজ ও স্কোরিং বিন্যাসের একটি তালিকা দেওয়া আছে । (উল্লেখ্য, এই পরীক্ষা একটি সংশোধিত সংস্করণ যা আপাতত ব্যবহার হচ্ছে।)

সিরিয়াল নং	নির্দেশনা	**পুনরাবৃত্তির স্কেল কেমন?**	**'ভাল' এর স্কেল কেমন?**
১।	বোতল বা কাপড় ধরতে দিন।		
২।	চেয়ারে বসিয়ে একটি ছোট জিনিস ধরতে ও তুলতে দিন।		
৩।	চেয়ারে বসিয়ে একটি বড় কিছু ধরতে ও তুলতে দিন।		
৪।	আঙুল দিয়ে খেতে দিন।		
৫।	হাতের নাগালের বাইরে কিছু ধরতে দিন।		
৬।	বোতামে টিপ দিতে বলুন।		
৭।	নিজে নিজে চামচ দিয়ে খেতে দিন ।		
৮।	নির্দিষ্ট ছবির উপর হাত দিন ।		
৯।	জুতা বা মোজা খুলতে দিন।		
১০।	তারে বাধা পুতুল উঠাতে দিন।		
১১।	দরজার নব ঘুরাতে দিন।		
১২।	নলাকার বস্তু ধরতে দিন। (যেমন, খড়ি, মার্কার, বাড্রামস্টিক)		
১৩।	বল বা বলের মত কিছু ছুঁড়ে মারতে দিন।		
১৪।	একটি অশ্বচালনা, পোলিং, বাধাক্কা খেলনা একটি হ্যান্ডেল ধরতে দিন।		
১৫।	একটা একটা করে বইয়ের পৃষ্ঠা উলটাতে বলুন ।		
১৬।	দাঁড়িয়ে কোন কিছু ধরতে দিন।		
১৭।	এক জায়গা থেকে অন্য জায়গায় কিছু নিয়ে যেতে বলুন।		
১৮।	বল ঘুরাতে বা ঘুরান থামাতে দিন।		
১৯।	বুদবুদ ফুটাতে দিন।		

২০।	বসে ধাক্কা দিতে বলুন।		
২১।	মাথার উপরের বস্তুকে ধরতে বলুন		
২২।	জামার হাতা দিয়ে হাত দিতে বলুন।		

স্বন/টান এর মূল্যায়ন

এই প্রশ্নাবলী নির্ধারন করা হয়েছে সেরিব্রাল পলসি বাচ্চাদের মাংশপেশীর টান নির্ণয় করার জন্য। প্রথম অ্যাসওয়ারথ মাপকাঠি তৈরী করা হয় ১৯৬৪ সালে ৫ টি ভাগে মাংশপেশীর অনৈচ্ছিক টান মূল্যায়নের জন্য। পরবর্তীতে ১৯৮৭ সালে বহনন ও স্মিথ এই মাপকাঠিকে পরিবর্তীত করে এর সংবেদনশীলতা বাড়ানোর জন্য ৬ টি ভাগে ভাগ করেন।

প্রশ্নাবলীর এই অংশটি ফিজিওথেরাপিস্ট পূরণ করবেন।

এই অংশটি নির্ধারন করা হয়েছে ধ্রুবক প্রয়োগ চিকিৎসা নির্ণয় করার জন্য।

অ্যাসওয়ারথ স্কেলঃ-

স্কোর	অ্যাসওয়ারথ মাপকাঠি(১৯৬৪)	পরিবর্তীত অ্যাসওয়ারথ মাপকাঠি বহনন ও স্মিথ (১৯৮৭)
০	টানের বৃদ্ধি নেই	মাংশপেশির টানের বৃদ্ধি নেই
১	অঙ্গের ভাজ বা প্রসার এর ফলে টান হালকা বৃদ্ধি পায়।	আক্রান্ত অংশ ভাজ বা প্রসারের সময় মুক্তি বা সংক্ষিপ্ত প্রতিরোধ এরফলে মাংশপেশীর হালকা টান বাড়ে।
১+(২)	অঙ্গলি সরানোর ফলে উল্লেখযোগ্য টান লক্ষ্য করা যায়।	অঙ্গলির নড়চড়ার সময় সংক্ষিপ্ত প্রতিরোধের ফলে উল্লেখযোগ্য মাংশপেশীর টান লক্ষ্য করা যায়।
২(৩)	অঙ্গলি ভাজ হয় কিন্তু টান খুব বেশি বৃদ্ধি পায়।	আক্রান্ত অংশ সহজে চালিত হয়, কিন্তু মাংশপেশীর টান খুব বেশি বৃদ্ধি পায়।
৩(৪)	টান অতিরিক্ত বৃদ্ধি পায় এবং নিস্ক্রিয় নড়াচড়া কঠিন।	মাংশপেশীর টান অতিরিক্ত বৃদ্ধি পায় এবং নিস্ক্রিয় নড়াচড়া কঠিন।
৪(৫)	ভাজ এবং প্রসারের সময় অঙ্গলি শক্ত হয়ে যায়।	ভাজ এবং প্রসারের সময় আক্রান্ত অংশ শক্ত হয়ে যায়।

মাংশপেশীর টান নির্ধারনের সাধারন নিয়মাবলীঃ-

১। সব পরীক্ষা চিৎ অবস্থায় করা উচিত। শুধুমাত্র কোয়ারডিস্পেস ফেমোরিস মাংশ বাদে যেহেতু সক্রিয় নড়াচড়া মাংশপেশীর টান বৃদ্ধি করে।

২। পরীক্ষার সময় শিশু যেন সাধারন অবস্থায় থাকে এটি নিশ্চিত করতে হবে।

৩। চিৎ করে শুয়ানোর ফলে যদি লরডোসিস বাড়ে তবে মাথার নিচে বালিশ দিতে হবে।

৪। মাথার অবস্থান মাঝ বরাবর হওয়া উচিত।

৫। যতটুকু সম্ভব নড়াচড়ার সময় যেন শরীরের অংশ নিরুদ্বেগ থাকে।

৬। নিষ্ক্রিয় নড়াচড়া ১ সেকেন্ডে করা উচিত যেহেতু শক্ত হওয়াটা মাংসপেশীর টানের উপর নির্ভর করে।

৭। নড়াচড়ার পুনরাবৃত্তি কম করতে হবে যেহেতু এর ফলে শক্ত হওয়াটা কমে যেতে পারে।

৮। এই সবগুলো পরীক্ষা শুয়ে (চিৎ/উপুর) করা উচিত।

মন্তব্যঃ-

যদি শিশুকে চিৎ বা উপুর করে শুয়ানো না যায় তবে সাইডে শুইয়ে বা বসিয়ে করতে হবে।

<u>মূল্যায়ন ফরমঃ</u>

মাংশপেশীর নাম	পূর্ববর্তী পরীক্ষা		পরবর্তী পরীক্ষা	
	ডান	বাম	ডান	বাম
বাইসেপ্স ব্রাকাই				
রিস্ট এক্সটেন্সর				