Faculty of Medicine

University of Dhaka

EFFECTIVENESS OF MODIFIED CONSTRAINT INDUCED MOVEMENT THERAPY ALONG WITH CONVENTIONAL PHYSIOTHERAPY ON UPPER EXTREMITY FUNCTION FOR CHILDREN WITH HEMIPLEGIC TYPE OF CEREBRAL PALSY

By

Ehsanur Rahman

Master of Science in Physiotherapy

Session: 2013-2014

Registration No: 1475

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Department of Physiotherapy

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Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Science in 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 acceptance of this thesis entitled, **"Effectiveness of modified constraint induced movement therapy along with conventional physiotherapy on upper extremity function for children with hemiplegic type of cerebral palsy",** submitted by Ehsanur Rahman, for the partial fulfillment of the requirements for the degree of Master of Science in Physiotherapy.

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Declaration Form

- This work has not previously been accepted in substance for any degree and is not concurrently submitted in candidate for any degree
- This dissertation is being submitted in partial fulfillment of the requirements for the degree of M.Sc. in Physiotherapy.
- This dissertation is the result of my own independent work/investigation, except where otherwise stated. Other sources are acknowledged by giving explicit references. A Bibliography is appended.
- I confirm that if anything identified in my work that I have done plagiarism or any form of cheating that will directly awarded me fail and I am subject to disciplinary actions of authority.
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- In case of dissemination the finding of this project for the future publication, research supervisor will highly concern and it will be duly acknowledged as graduate thesis.

Signature:……..

Name: Ehsanur Rahman……

Date:……...

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List of Abbreviations

BHPI	:	Bangladesh Health Professions Institute
BMRC	:	Bangladesh Medical Research Council
CRP	:	Center for the Rehabilitation of the Paralysed
WHO	:	World Health Organization
IRB	:	Institutional Review Board
CP	:	Cerebral Palsy
SPSS	:	Statistical Package for the Social Science
IFB	:	Impact Foundation Bangladesh
PT	:	Physiotherapy
QUEST	**:**	Quality of upper extremity skills test
PMAL	:	Paediatric motor activity log test

Abstract

Introduction: From the last few years constraint induced movement therapy (CIMT), as an intervention, has received a great deal of attention for children with Hemiplegic cerebral palsy (CP). To date, evidence on this treatment has been very poor and limited so additional research required. For various reasons, traditional form of therapy was neither considered feasible nor do child and family friendly for that we had use a modified form of CIMT. ***Objective:*** To determine the effectiveness of modified CIMT on upper extremity function of hemiplegic CP children characterized by restraining the unaffected hand with short sling up to wrist. ***Methodology:*** 12 children (age: 2 to 8 years) from pediatric physiotherapy clinics from Savar, CRP with hemiplegic CP were included in the study. Modified constraint was applied to unaffected hand. The intervention was given for 3 hrs/day including 30 minutes of therapy time and home program which could split into different sessions of no less than 30 minutes duration for consecutive 2 weeks. Pre and Post outcome measure by using QUEST (Quality of upper extremity skill test) and PMAL (pediatric motor activity log) were taken. ***Result:*** Significant difference between Pre and Post values of all components of PMAL and QUEST ($P<0.05$) showing the effectiveness of MCIMT in improving upper extremity function and in ADL activities. ***Conclusion:*** MCIMT yields statistically as well as clinically significant improvements in both motor function and functional use of the affected upper extremity in children between the ages of 2 and 8 years with hemiplegic CP.

Key words: Hemiplegic CP, Modified CIMT, upper extremity function.

CHAPTER-I: INTRODUCTION

1.1. Background

Cerebral palsy (CP), defined broadly as "a non-progressive motor impairment syndrome caused by a problem in the developing brain,"1 affects at least 2 in 1000 children in the United States and more than one million children under the age of 21 in the industrialized world (Hagberg, et al., 2001). Hemiplegia accounts for 35% (1 in 1300) of the children with CP and upper limb (UL) involvement is usually more pronounced than the lower limb. If hemiplegic stroke occurs in-utero, or any time between birth and two years of age, it is considered hemiplegic CP (Thakkar, 2014).

The most common cause of hemiplegic CP is a CVA (Cerebrovascular accidents) commonly known as a stroke. Children with hemiplegia have unilateral involvement of upper and lower extremities opposite to the side of cerebral injury, often characterized as muscle weakness and spasticity (WHO, 2001). These factors may decrease movement efficiency, especially in the use of the upper extremity, which can also limit performance in functional activities at home and school (Charles and Gordon, 2005). They often learn to perform many tasks exclusively with their non-involve extremity. This results in failure to use the involved extremity (i.e. developmental disuse). The impairment of the hand is often the result of damage to the motor cortex and cortico spinal pathways responsible for the fine motor control of the fingers and hand (Gordon, et al., 2005). Constraint induced movement therapy (CIMT) is a relatively new intervention derived from the basic sciences. In1995, however, it was suggested that a promising new therapy for adults with hemiparesis consequent to stroke, known as Constraint-Induced Movement therapy (Taub and Uswatte, 2003). CIMT is a method of teaching a child to use his/her affected upper

limb through use of a restraint on the non-affected limb and massed practice of movements of the affected limb (Hoare, et al., 2007).

One hand functions well and other hand function has some degree of dysfunction for hemiplegic type of cerebral palsy (CP) children (Uvebrant, 1998). All forms of human activity like self-care, school or work and engagement in play or leisure activities are affected due to impairment of the upper limb (Exner, 2001). Slow and weak, with uncoordinated movements, incomplete finger fractionation, spasticity and impaired tactile sensibility are common characteristics of the hemiplegic hand (Brown and Walsh, 2000). The cause of hemiplegic CP is heterogeneous: timing, location, and extent of the brain damage vary from one child to another (Cioni, et al., 2012). The prognosis of the hemiplegic CP depends upon different forms of lesion in the brain. The lesions are divided into three main groups based on literatures. Cerebral malformation-a lesion of early fetal origin. Periventricular lesions which occur in the most vulnerable part of the brain between 24th and 34th weeks of gestation; and Cortical and subcortical lesions which occur in areas that is most vulnerable at term. Hand function was mildly affected in cerebral malformation compared to periventricular lesions and hand function was severely affected in cortical and subcortical lesions (Wiklund and Uvebrant, 1991).

One study showed that the prevalence of cerebral palsy is 1.2 - 2.5 per 1000 live births although, the rates vary from country to country and also within the countries (Wolraich, et al., 2008). In United States, there are living almost 800,000 children and adults in with one or more of the symptoms of cerebral palsy estimated the Foundation of the United Cerebral Palsy (UCP). Every year about 10,000 babies born in the United States will develop cerebral palsy according to the federal government's (Elkamil, et al., 2011).

In New Zealand approximately 7000 children are affected by some degree of Cerebral palsy. Cerebral palsy has a prevalence of 2 to 2.5 per 1000 live births and affects males and females in equal numbers (Damiano, 2004). In the Norwegian counties there were 494 children with CP born between 1st January 1996 and 31st December 2003, corresponding to a prevalence of 2.65 per 1000 live births (Elkamil, et al., 2011).

In developed countries, International assessments propose that CP affects between 1.2 to 3.0 per 1000 children (Hustad, et al., 2011). In developing countries the incidence of CP children is 2 per 1000 children (Serdaroglu, et al., 2006). The incidence of CP is considered to be 2 to 2.5 in 1000 live births and the prevalence of CP in the developing countries tends to be in a similar range (Bialik and Givon, 2009). In one study found that prevalence of cerebral palsy in Bangladesh was 6.1/1000 children (Tabib, 2009). Bangladesh has recently seen an increase in the number of children diagnosed with cerebral palsy. Most of the population are illiterate and not be aware about health (Ackerman, et al., 2005). Cerebral palsy (CP) is now familiar to most health and social service professionals, as well as to many members of the general public, as a physically disabling condition. In fact, although CP only affects between 2 and 3 per 1000 live births, it is thought to be the most common cause of serious physical disability in childhood (Morris, 2007).

According to disability profile, the client assess in the Shishu Bikash Clinic (Rural Centre) during January to December 1998 showed a report of child disability were 42% of total disability was cerebral palsy, among these Spastic cerebral palsy is 9%, Athetoid cerebral palsy is 2%, Ataxic cerebral palsy is 3% and rest of the patient is other type of cerebral palsy (Khan & Rahman, 2000). Service for disabled children is meagre in relation to their needs. A large number of children with cerebral palsy need

better physiotherapy treatment for better survival in the community. Cerebral palsy cannot be cured but treatment can improved child capability. The earlier treatment can be made more improvement of the child with cerebral palsy. In realizing this truth some NGO's such as CRP (Centre for Rehabilitation of the Paralysed), Bangladesh Protibondhi Foundation (BPF), BRAC Inclusive Education Programme, ABC(Assistant for Blind Children), IFB (Impact Foundation Bangladesh), Shishu Bikash, Shishu pally, Shishu hospital, ICMH (Institute of child and mother health) and also some other organization have taken step to provide physiotherapy service (Tanner & Harpham, 2013). Among these NGO's only CRP have an individual pediatric unit for the children with cerebral palsy which provide Physiotherapy, Occupation therapy and Speech and language therapy service.

Perinatal asphyxia has long been believed to be a major cause of CP. Advances in perinatal care have led to decreased mortality rates among newborns. However, recent epidemiologic assessments indicate that the incidence of CP is stable or increasing in some industrialized countries. The pathology of CP in term newborns is very different from preterm infants. Brain maldevelopments are seen in 16% of term and 2.5% of preterm infants with CP and gray matter lesions are more often seen in term (33%) than preterm (3.5%) CP infants. However periventricular white matter lesions occur significantly more often in preterm (90%) than in term (20%) infants (Krageloh Mann, 2008).

Early brain injury in CP frequently results life-long disability, with serious adverse effects and implications for the child, family, and society (Bax, et al., 2007). In the absence of a known pathophysiological mechanism, only supportive care is provided; there is no evidence for the effectiveness of preventive strategies. Even if the pathology of neonatal encephalopathy is well-recognized, numerous questions remain

regarding the causes and risk factors for pre-, peri-, and postnatal predictors of outcome. Because risk factors for CP in term infants differ from premature infants (Andersen, et al., 2008) and in order to conduct preventive measures, it is necessary that the risk factors, etiology and the pathophysiology of the insult in this group be determined.

Gage's study stated that cerebral palsy is primarily characterized by central nervous system abnormalities, such as loss of selective motor control and abnormal muscle tone. As a result of growth these primary characteristics often lead to secondary deficits, including bony deformities, muscle contractures and gait abnormalities, and among all type of cerebral palsy spastic cerebral palsy is the most common type of cerebral palsy (Behrman, 2004). Andersen, et al. (2008) reported that risk factors for CP in term infants differ from premature infants and in order to conduct preventive measures, it is necessary that the risk factors, etiology and the pathophysiology of the insult in this group be determined.

In occupational therapy, Neuro Developmental Therapy, Roods Approach, Biomechanical Approach and Visuomotor Priming (Sankar and Bismi, 2014) are used to train the upper extremity functions in Hemiplegic cerebral palsy. The effect of different types of hand function intervention program is uncertain due to lack of randomized controlled studies (Boyd, et al., 2001). Researchers found that constraint induced movement therapy (CIMT) has been supported as an effective intervention program for adults who have had a stroke resulting in upper-limb-dysfunction (Hoare and Imms, 2004). The fundamentals of CIMT are: constraint of the unaffected hand to encourage the use of the affected hand; massed practice of the affected hand, and use of intensive techniques to train the affected hand (Sankar, 2015). Literature found that CIMT is effective method of treatment in hemiplegic cerebral palsy.

Risk factor using CIMT are: Some temporary loss of independence as the child will be using the affected arm to complete daily activities; There may be possible increase in frustration; Possible increase risk of injury to the involved arm and hand because the child is using the affected arm more but has decreased sensory awareness and motor control; In some children if a cast was used there have been reports of mild stiffness of the uninvolved hand upon cast removal (Sankar, 2015). In order to avoid risk factors in CIMT, current study modified the CIMT method and conducted the study to identify effectiveness of Modified Constraint Induced Movement Therapy (mCIMT).

1.2. Justification of the study

Cerebral palsy is one of the most commonly occurring long time disability conditions around the globe that causes functional limitation in our day to day life. Considering the variety of proposed therapeutic and the limited evidence for their clinical efficacy, it is often difficult to make light of the actual treatment approach. To develop evidence based study to strengthen physiotherapy practice as well as the betterment of the patients. As a student of M.Sc. in Physiotherapy and being a researcher, my interest is to work in this area and to establish an evidence based physiotherapy treatment technique for Hemiplegic type of cerebral palsy. To date evidence argues and proves different theories and concepts regarding treatment of CP based on its different types and their complexity. However, one therapy technique recently reflected most in the management of hemiplegic types of CP but in limited research there is controversy in its efficacy.

Constraint induce therapy (CIT) has been successfully used by Paediatric physiotherapists in management of hemiplegic CP child in many developed and developing countries. But in our country few paediatric physiotherapists know about this effective technique. But for evidence based physiotherapy, there should be an absolute guideline in which hemiplegic cerebral palsy child will get proper treatment. It has been suggested that modified constraint induce therapy (MCIT) can be used to treat diseases like hemiplegic type of Cerebral Palsy however there is a lack of evidence. Some research articles have been published about physiotherapy interventions of children with hemiplegic type of cerebral palsy but there's no well-developed research on this area in our country. On the other hand this study will be helpful for professions and professionals of physiotherapy & with this connection with other professionals will have a chance to gather their knowledge from this study.

1.3. Operational Definition

1.3.a. Modified constraint induced therapy: A method that is applied to unaffected hand. This intervention was given for 3 hrs/day including 30 minutes of therapy time and home program which could split into different sessions of no less than 30 minutes of duration.

1.3.b. Cerebral Palsy: Cerebral Palsy is defined as a group of non-progressive, but often changing, motor impairment syndromes secondary to lesions or anomalies of the brain arising in the early stages of its development. It occurred before birth, during birth or after birth at the age of 2 years of child age.

1.3.c. Hemiplegic: Children with hemiplegia have unilateral involvement of upper and lower extremities opposite to the side of cerebral injury, often characterized as muscle weakness and spasticity.

1.3.d. Conventional physiotherapy: Treatment techniques that are conventionally preferred by physiotherapist in a particular settings.

1.4. Research question

What is the effectiveness of Modified Constraint Induced Movement Therapy along with conventional physiotherapy on upper extremity function for Children with hemiplegic type of Cerebral Palsy?

1.5. Aim of study

The aim of the study was to assess the effectiveness of Modified Constraint Induce movement therapy along with conventional physiotherapy on upper extremity function for children with hemiplegic type of cerebral palsy.

1.6. Objectives

1.6.1. General objective

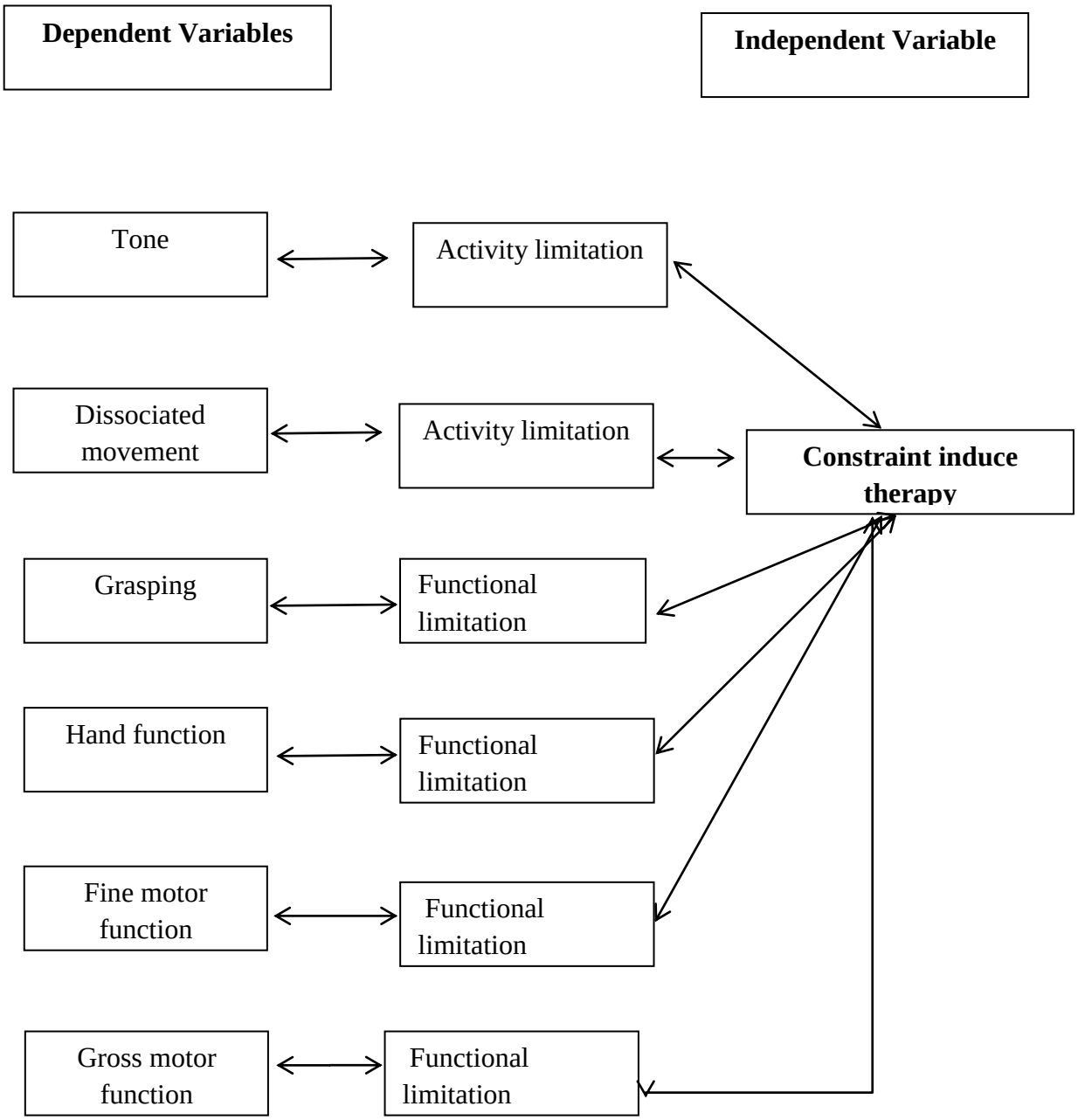
To identify the effectiveness of constraint induce movement therapy on upper extremity function for children with hemiplegic type of cerebral palsy.

1.6.2. Specific Objectives

- To explore sociodemographic characteristics of the participants.
- To identify the effect of upper extremity function at pretest and posttest after introducing of Modified Constraint induced movement therapy (MCIT).
- To find out the rate of improving in upper limb function after completed sessions.
- To determine the effect of upper limb function at QUEST and PMAL scale test, after introducing MCIT therapy.

1.7. List of Variables

Conceptual Framework



1.8. Hypothesis

Modified constraint induced movement therapy is more effective than only conventional physiotherapy on improving of upper extremity function for hemiplegic type of Cerebral palsy.

1.9. Null hypothesis

Modified constraint induced movement therapy is no more effective than only conventional physiotherapy on upper extremity function for hemiplegic type of Cerebral palsy.

CHAPTER-II : LITERATURE REVIEW

Cerebral palsy is the most common neuro developmental motor disability in children. The condition requires medical, educational, social, and rehabilitative resources throughout the lifespan (Hurley, et al., 2011). Amin, et al. (2015) stated cerebral palsy (CP) describes a group of permanent disorders of the development of movement and posture, causing activity limitations that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain. There is no definite cause of cerebral palsy rather some risk factors contribute to the development of CP during prenatal, natal or postnatal period (Tatla, et al., 2013). 70 to 80% of cerebral palsy cases are acquired prenatally with unknown causes and birth complications, including asphyxia, are currently estimated to account for about 6 % of patients with congenital cerebral palsy, on the other hand neonatal risk factors for cerebral palsy include first cousin marriage birth after fewer than 32 weeks gestation, birth weight of less than 5 lb with intrauterine growth retardation, intracranial haemorrhage and trauma and about 10 to 20% patients (Chen, et al., 2013), Pre-eclampsia affects 3-5% of pregnant women and is characterized by maternal hypertension and proteinuria occurring after 20 weeks of gestation (Melheim, et al., 2013). The pathological changes start when the specific causes resulting in neural damage and ending up with impaired neural connectivity as well as transmission. 10-15% of cerebral palsy cases are found during birth including prolongs labour, sudden birth, birth asphyxia, baby did not cry immediate after birth or by forcep delivery (Bangash, et al., 2014). Postnatal causes include toxic, infectious meningitis, encephalitis, traumatic such as drowning. There is also a relation between coagulopathies causing cerebral infarction and particularly hemiplegic type of CP.

Postnatal events account for 12% – 21% of CP. But in a large number of cases, the causes of CP remain unknown (Kułak, et al., 2014).

Russell, et al. (2011) stated that there are 4 predominant motor types of CP such as spastic, ataxic, dyskinetic and mixed types of CP. Spastic CP is the commonest and accounts for 70%-75% of all cases, dyskinetic – 10% to 15% and ataxic is less than 5% of cases. Spasticity occurs when muscles have increased tone and appear stiff. This is the most common type of CP. In contrast to spastic ataxia affects balance and coordination. Children with ataxic CP may appear shaky and unsteady. In addition, dyskinesia causes a person to have involuntary movements, which generally increase when they try to move and the person can present with any combination of motor types. CP can also be classified according to the part of the body affected: quadriplegia (affects all four limbs), diplegia (affects both legs) and hemiplegia (one side of the body is affected). Mcintyre, et al. (2012) stated that quadriplegic CP is the most severe form involving all four limbs, and the trunk upper limbs are more severely involved than the lower limbs. Voluntary movements are few; vasomotor changes of the extremities are common. Most children have psuedobulbar signs with difficulties in swallowing and recurrent aspiration of food material. In hemiplegic CP, spastic hemiparesis is a unilateral paresis with upper limbs more severely affected than the lower limbs. It is seen in 56% of term infants and 17% of preterm infants. Voluntary movements are impaired with hand functions being most affected. Pincer grasp of the thumb, extension of the wrist and supination of the forearm are affected. In the lower limb, dorsiflexion and aversion of the foot are most impaired. There is increased flexor tone with hemiparetic posture, flexion at the elbow and wrist, knees and equines position of the foot. Palmer grasp may persist for many years. Sensory abnormalities in the affected limbs are common. Seizures occur in more than 50%.

Visual field defects, homonymous hemianopia, cranial nerve abnormalities most commonly facial nerve palsies are seen. Spastic diplegia is associated with prematurity and low birth weight.

Spastic cerebral palsy is the most common type of CP. Spastic cerebral palsy refers to the increased tone, or tension, in a muscle when normal muscles work in pairs. Allowing free movement in the desired direction when one group contracts and the other group relax. The flow of muscle tensionis disrupted, due to complications in brain-to-nerve-to-muscle communication. Muscles affected by spastic cerebral palsy become active together and restricted in actual movement. This causes the muscles in spastic cerebral palsy patients to be constantly tense or spastic. Mild cases of spastic cerebral palsy patients may have affect only a few movements or severe cases that can affect the whole body (Darsaklis, et al., 2011). The second most common type of cerebral palsy is athetoid or dyskinetic. Injuries to the basal ganglia can result in athetoid cerebral palsy, which causes involuntary muscle movements. The movements often interfere with speaking, feeding, grasping, walking and other skills requiring coordination. Now-a-days about 4% of people have cerebral palsy. Inability to activate the correct pattern of muscles during movement ataxia is defined. Injuries to the cerebellum can result in ataxic cerebral palsy, which causes poor coordination. That, in turn, affects balance, posture and controlled movements. Ataxic cerebral palsy can cause unsteadiness when walking and difficulties with motor tasks. Other type of CP is mixed CP. Injuries to multiple brain areas usually the cerebral cortex and basal ganglia can result in more than one kind of abnormal muscle tone. For example, someone could have spasticity and dystonia, or dystonia and rigidity.

Cerebral palsy is a neurological disorder the signs or symptoms of cerebral palsy may appear soon after birth or may take several months (Mandal, 2013). The most common early sign of cerebral palsy is developmental delay. Delay in reaching key growth milestones such as rolling over, sitting, crawling and walking are cause for concern. Physicians will also look for signs such as abnormal muscle tone, unusual posture, persistent infant reflexes and early development of hand preference (My child, 2013). Common signs of severe CP that may be noticed shortly after birth include: problems sucking and swallowing, weak or shrill cry, seizures and unusual positions. Often the body is either very relaxed or floppy or very stiff. In some severe cases many signs and symptoms are not readily visible at birth except and may appear within the first three to five years of life as the brain and child developed (My child, 2013). Severe motor and coordination impairment also occur (Mandal, 2013). Drooling is another but common symptom among children with CP. Children has movement and postural disorder associated with many disabilities such as- including intellectual disability, hearing and visual deficits, nutrition, feeding and swallowing problems, respiratory infections and epilepsy. Cerebral palsy suffers for long term and it affect activities of daily living and quality of life (Bell, et al., 2010). The symptoms of cerebral palsy include: excessive drooling, difficulty swallowing, sucking or speaking, tremors, and trouble with fine motor skills such as fastening buttons or holding a pencil, stiff or tight muscles, low muscle tone, exaggerated reflexes, uncontrolled body movement, toe walking, limping or dragging a foot while walking, walking with a scissor gait, turning in their legs as they walk. Children with cerebral palsy can also have feeding problems, mental retardation, seizures, learning disabilities and problems with their vision and hearing. The symptoms don't worsen with age but symptoms can range from mild to

severe (Iannelli, 2008). Signs can appear during several stages of early life. They include: neonatal early Infancy (0-3 Months): high pitched cry, poor neck control, excessive lethargy or irritability, weak suck or tongue thrust or tonic bite, oral hypersensitivity, decreased interest in surroundings, stiff or floppy posture, abnormal or prolonged reflexes. Later infancy-inability to perform motor skills control of hand grasp by 3 months, rolling over by 5 months and independent sitting by 7 months. Abnormal developmental patterns: hand preference by 12 months, excessive arching of back, prolonged or abnormal parachute response, and logrolling. Abnormal developmental patterns after 1 year of age: W sitting means both knee flexion, legs extremely rotation, bottom shuffling means scoots along the floor, tiptoe walking or hopping (Gershon, et al., 2013).

Muscle tone is defined as the tension of a muscle due to involuntary contractions of its motor units; it is determined both by the passive elasticity of muscular tissues, the viscoelastic properties of the fibrillaryproteins contained within each muscle fibre and by the active (though not continuous) contraction of muscle in response to the reaction of the nervous system (Kassolik, et al., 2009). Muscle tone is a result of both muscular components and neural components: it is the tension in a muscle due to the activity of some muscle fibres, and is controlled by the nervous system (Canning, 2006). Contraction is activated by a stimulatory nerve impulse from the central nervous system (CNS) (Allen, 2008). It triggers an action potential which stimulates the muscle fibre, causing it to contract. A muscle fibre is a single, elongated cell which extends the length of the muscle. A muscle is composed of 10,000 to 450,000 muscle fibres (Gracies, 2005).

Spastic types exhibit pyramidal involvement with upper motor neuron signs, weakness, hypertonia, hyperreflexia, clonus and positive Babinski. Dyskinesia is

characterized by extra pyramidal involvement in which rigidity, chorea, choreoathetosis, athetoid and dystonic movements are seen. This type of CP is also associated with birth asphyxia. The severity of dystonic postures may vary with body position, emotional state and sleep. Clonus and Babinski are absent. Primitive reflexes are more prominent and persist for a longer time in dyskinetic CP. These movement patterns are eliminated in sleep, with a decrease in tone of the affected limbs. There are also abnormalities of posture control and coordination. Those children who are hypotonic to start with may develop into this type by 1 to 3 yrs of age. In majority of this group, there is no cognitive impairment. Dysarthria, oromotor problems with drooling and swallowing difficulties are seen. 30% of children with CP have a mixed pattern of involvement. While contractures are common in spastic group, they are uncommon in the extra pyramidal group. Hypotonic CP is characterized by generalized muscular hypotonia that persists beyond 2 to 3 yrs of age that does not result from a primary disorder of muscle or peripheral nerve. The deep tendon reflexes are normal or hyperactive, and the electrical reactions of muscle and nerve are normal. More than half the children develop frank cerebellar deficits with incoordination, ataxia and impaired rapid succession of gross motor functional movements (Sankar & Mundkur, 2005).

In Western countries, cerebral palsy is diagnosed in two to three infants in every 1000 live born children. Cerebral palsy is diagnosed on the basis of clinical symptoms only and is defined as "a group of permanent disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing foetal or infant brain." Rosenbaum, et al. (2007) mentioned that perinatal hypoxia was previously considered the major cause of

cerebral palsy, whereas current knowledge suggests that prenatal causes are most important.

Hemiplegia accounts for 35% (1 in 1300) of the children with CP and upper limb (UL) involvement is usually more pronounced than the lower limb (Wiklund, et al., 1991) if hemiplegic stroke occurs in-utero, or any time between birth and two years of age, it is considered hemiplegic CP. One hand functions well and other hand function has some degree of dysfunction for hemiplegic cerebral palsy (CP) children. All forms of human activity like self-care, school or work and engagement in play or leisure activities are affected due to impairment of the upper limb (Exner, et al., 2001). Slow and week, with uncoordinated movements, incomplete finger fractionation, spasticity and impaired tactile sensibility are common characteristics of the hemiplegic hand (Brown & Walsh, 2000). The cause of hemiplegic CP is heterogeneous: timing, location, and extent of the brain damage vary from one child to another. The prognosis of the hemiplegic CP is depends upon different forms of lesion in the brain. The lesions are divided into three main groups based on literatures. Cerebral malformation-a lesion of early fetal origin. Periventricular lesions which occur in the most vulnerable part of the brain between 24th and 34th weeks of gestation (Brown & Walsh, 2000). Cortical and subcortical lesions which occur in areas that is most vulnerable at term. Hand function was mildly affected in cerebral malformation compared to periventricular lesions and hand function was severely affected in cortical and subcortical lesions (Wiklund & Uvebrant, 1991).

Gordon, et al. (2005) stated that the most common cause of hemiplegic CP is a CVA (Cerebrovascular accidents) commonly known as a stroke. Children with hemiplegia have unilateral involvement of upper and lower extremities opposite to the side of cerebral injury, often characterized as muscle weakness and spasticity. These factors

may decrease movement efficiency, especially in the use of the upper extremity, which can also limit performance in functional activities at home and school.

Constraint induced movement therapy (CIMT) is a relative new intervention derived from the basic sciences. In 1995, however, it was suggested that a promising new therapy for adults with hemiparesis consequent to stroke, known as Constraint-Induced Movement therapy (Taub & Uswatte, 2003). Rosenbaum, et al. (2007) mentioned that Optimising participation is seen as the main goal of interventions for children with cerebral palsy (CP). Due to damage of the immature brain, children with CP have disorders of movement and posture development, often accompanied by disturbances of sensation, perception, cognition, communication, behaviour, and by epilepsy and secondary musculoskeletal problems. According to the children and youth version of the WHO's classification (ICF-CY), function can be classified, measured and influenced in several dimensions; like body structureand function, and in activity and participation (WHO, 2007). In addition, environmental factors as well as the child's health and personal factors may influence the functioning. The relationships between all dimensions are not fully understood, and which aspects that should be addressedin physiotherapy to promote participation, is an issue of debate.

Ahl, et al. (2005) suggested that whether an intensified training program would accelerate motor development and improve the children's function more than one hour of weekly physiotherapy training as often afforded in Norway is questioned by parents and professionals. Christiansen, et al. (2008) mentioned that Improvement in gross motor function has been indicated after periods of intensive physiotherapy for non-ambulatory children and in children who have practiced functional tasks intensively in their everyday environments. No difference in change of gross motor function has been demonstrated, neither between different intensive approaches nor

between training offered in intensive periods versus spread over time. Intensive physical training for children has been defined in several ways in recent studies e.g. five sessions a week over six months (Blundell, et al., 2003). Five sessions a week over four weeks, or several daily sessions over five months. There is no consensus regarding the optimal dose of training, and there are only a few studies examining the outcome of intensive physiotherapy training in a group setting (Crompton, et al., 2007). In physiotherapy approaches like neurodevelopmental therapy (NDT), quality of movement has traditionally been considered important. As a reaction to the earlier major focus on quality of movement, a functional task-oriented treatment approach has evolved and is now the preferred therapy. However, other interventions like pharmacological, orthoses or surgery, often aim to improve aspects of movement quality. In clinical practice it is often presumed that improvements in quality of movement are developed secondary toimprovements in basic motor abilities. The importance of quality in movement development has, however, scarcely been investigated although it has been suggested to prevent secondary impairments, decrease effort and increase safety in physical performance (Law, et al., 2007).

Taub, et al. (2003) suggested that the CIMT protocol stems directly from basic research with monkeys, CIMT has been adopted as a method of teaching a child to use his/her affected upper limb through use of a restraint on the non-affected limb and massed practice of movements of the affected limb the elements of CIMT are:

1) Constraint of the unaffected arm to encourage the use of the affected hand

2) Practice of the affected arm and

3) Use of intensive techniques to train the affected arm.

A Cochrane review concluded that there was emerging evidence supporting CIMT for children with hemiplegia. Therapy accompanied in CIMT is constraint given for 6

hours per day. For various reasons, traditional form of therapy was neither considered feasible nor do child and family friendly for that we had use a modified form of CIMT (Eliasson, et al., 2005). In occupational therapy, Neuro Developmental Therapy, Roods Approach, Biomechanical Approach and visuomotor priming are used to train the upper extremity functions in hemiplegic cerebral palsy. The effect of different types of hand function intervention program is uncertain due to lack of randomized controlled studies. Researchers found that constraint induced movement therapy (CIMT) has been supported as an effective intervention program for adults who have had a stroke resulting in upper-limb-dysfunction. The fundamentals of CIMT are: constraint of the unaffected hand to encourage the use of the affected hand; massed practice of the affected hand, and use of intensive techniques to train the affected hand (Ganapathy and Sankar, 2015). Literature found that CIMT is effective method of treatment in hemiplegic cerebral palsy.

Liepert, et al. (2000) mentioned that Constraint-induced movement therapy (CIMT) has been used to promote functional gains in individuals with neurological dysfunctions. CIMT consists of constraining movement of the non-affected upper extremity and providing intensive training to the involved upper extremity. Intensive training is based on shaping principles, which include the selection of activities suited to the client's individual abilities, with progressive increase in difficulty and complexity. Procedures also involve providing assistance and support when the individual is unable to perform the task independently, as well as verbal rewards for observed improvements. One of the main objectives of the intervention is to overcome the learned non-use, defined as the diminished use of the affected extremity due to the perception of failure during the performance of manual tasks. The original CIMT protocol consistsof 2 or 3 weeks of daily intensive training of the affected

extremity for 6 hours in association with restriction of the non-affected extremity for 10 hours a day. According to Gordon, Charles and Wolf, the original CIMT protocol consisting of six hours of daily training and use of restraint for 90% of waking hours could be tiring for children. Thus, modifications in specific aspects of the original CIMT protocol have been proposed by some authors. These adaptations include decreased training time and/or decreased use of the restriction which are often compensated for with increased protocol lengths. Charles, et al. (2001) investigated a protocol in which the use of the restriction occurred only during the intensive training of 6 hours daily, for 12 days. They documented significant improvements in children's manual dexterity and parents reported improvements in the amount and quality of use of the affected extremity.

Eliasson, et al. (2006) studied the effects of a two-month intervention protocol with two hours of training and restriction use every day in young. Similarly, as children with hemiplegic cerebral palsy grow and develop they learn strategies and techniques to manage daily tasks (for example play) with one hand. Performance of tasks is discovered to be more efficient and effective using the non-affected hand, even if there is only mild impairment in the affected limb (Kuhtz-Buschbeck, 2000). Recently, (DeLuca, 2002) introduced the term developmental disregard to describe a child with hemiplegia who may disregard, or learn not to use, the affected limb during the development of motor function. Despite the similar behavioural mechanisms of reinforcement of the unaffected hand and suppression of the affected hand, as identified in adults. Eliasson, (2005) suggested that the learned non-use may be a different phenomenon in children who sustain an early brain lesion. Unlike an adult who has had a neurological insult later in life, a child with hemiplegia has not had the experience of normal motor function of the limb. There is not the potential to unmask

motor function that is inhibited. Therapy must, therefore, create the opportunity, experience and environment in which a child can learn how to use their affected limb. This experience must reverse the behavioural aspect of suppression of use of the affected limb and reward use of that limb in even the simplest tasks, such as stabilisation of an object. CIMT is proposed as a method of achieving this (Deluca, 2002).

Gordon, et al. (2005) stated that the Constraint-induced therapy was introduced for children with cerebral palsy (CP) following evidence that it could improve upper limb function for adults with hemiparetic stroke. Conventionally, constraint-induced therapy involves constraining the unaffected upper limb with a splint or cast for most or all of the day, for a period of 2 to 3 weeks. Constraint is combined with structured adjunct therapy for 6 or more hours per day. The premise underpinning this intervention is that constraint of the unaffected arm increases use of the affected arm, and this, combined with adjunct therapy, improves motor ability of the affected arm. Modified forms of constraint-induced therapy have subsequently been developed with the aim of being more clinically feasible and child and family friendly. Modifications include alteration to type of constraint, length of time the constraint is worn each day, duration of intervention, and nature of adjunct therapy. Two rigorous systematic reviews concluded that there is some evidence that constraint-induced therapy improves (Sakzewski, et al., 2009).

Eliasson, et al., (2005) mentioned that the form of modified constraint-induced therapy (mCIT) that is the focus of this study was based on work by A mitt was worn for 2 hours each day, during which time therapy was carried out, predominantly by parents, at times and locations that suited family responsibilities and routines. Therapy was continued for 8 weeks, which is longer than conventional programmes,

to compensate for shorter daily periods of constraint. No published randomized trials have compared this type of mCIT with intensive upper limb therapy for children with hemiplegic CP. The objective of this randomized trial was to compare mCIT for children with spastic hemiplegic CP with a block of intensive occupational therapy. The primary outcome was ability to complete activities of daily living, and secondary outcomes included goal attainment, upper limb function, and hypertonicity, spasticity, and parent perceptions.

Cerebral Palsy (CP) is a neurodevelopmental disordercaused by no progressive lesion(s) in the immature brain. The early central nervous system (CNS) damage results in chronic physical disabilities and often includes sensory impairments. The prevalence of congenital CP is approximately 2 per 1000 births; with hemiplegia accounting for approximately 25% of all new cases worldwide (Winstein, et al., 2001). The cost of health care associated with CP in the United States is approximately $800,000 (2000 dollars) per person over their lifespan.For people with hemiplegia, characterized by unilateral upper andlower-extremity involvement, impaired manual dexterity is often among the most disabling motor symptoms. Treatment options include physical therapy (PT), occupational therapy (OT), conductive education, neurodevelopmental therapy, peripheralsplinting and casting, pharmacotherapy (e.g., botulinumtoxin type A), and surgery. There is no strong evidence of successful treatment with of any of these approaches (Boyd, et al., 2001). Recent evidence suggests that children with CP may improve motor performance if provided with sufficient opportunities to practice. One treatment approach that provides those opportunities and that is becoming increasingly popularis forced use or constraint-induced movement therapy (Shumway, et al., 2003).

Charles, et al. (2006) mentioned that clinical evidence supporting CIMT is limited to controlled trials that found beneficial effects on the speed and dexterity of upper limb movement, on functional use measures and on the effectiveness of the assisting hand. A further recommendation was that these studies should be appropriately powered and should use uniform, objective, and valid outcome measures. Considering the variety in the currently proposed therapeutic mCIMT approaches and the limited evidence for their clinical efficacy, it remains a challenge to construct an age-appropriate and appealing program for young children with unilateral spastic CP to encourage them to use their affected arm and hand and to teach them new skills.

Boake, et al. (2007) performed a study on constraint induced therapy in stroke patients within the first two weeks after stroke. Prior to this study there was evidence that constraint induced therapy was beneficial for chronic stroke patients more than one year after stroke, but very little research had been done on constraint induced therapy with early stroke. The researchers hoped to determine whether this type of treatment was feasible in a sub-acute setting, to determine if learned non-use could be prevented, and to determine if functional improvements were long term. They also measured and compared the neurophysiologic change with therapeutic gains by using trans cranial magnetic stimulation (TMS). Law & Ramey (2006) to again compare Constraint Induced Therapy with controlled conservative therapy for children with Cerebral Palsy. However this study was randomized and done in two phases. In the first phase the participants were assigned randomly to either the control group or to the Constraint Induced Therapy group. The participants included 18 children with cerebral palsy between the ages of 7 months to 8 years. The Constraint Induced Therapy group again used casting and intense therapy while the control group continued with their previous physical or occupational therapy program. In the second

phase, the control group was crossed over to receive Constraint Induced Therapy using the same protocol as the initial Constraint Induced Therapy group. The initial Constraint Induced Therapy group continued follow-up testing during this phase.

Thakkar, (2004) showed that the study was planned to see the effectiveness of Modified CIMT that is on hand function of hemiplegic CP children. In the QUEST there was significant improvement seen in overall 4 domains but less improvement in weight bearing and protective Extension. Results from this study are consistent with other studies in showing a significant improvement in upper limb function after mCIMT in children. In this study most families did not find it easy to complete even modified CIMT. Some children disliked wearing the glove and some have complaint of uneasiness due to close glove. Studies in adults following stroke have provided evidence of adaptation in the brain following CIMT. Since the potential for central nervous system plasticity in young children is increased relative to adults, it is postulated that this approach might prove to be especially effective in children (Sutcliffe, et al., 2007).

In one study found that bilateral cortical activation was increased following mCIMT including higher levels of activity in the contralateral sensorimotor cortex. This suggests that with mCIMT, cortical reorganization occurs as new pathways between the damaged and healthy cortical hemisphere are made and control of the affected UE moves towards coming from the contralateral (lesion) hemisphere rather than solely from the ipsilateral hemisphere (Sutcliffe, et al., 2007). Secondly, the motor learning literature suggests that CIMT employs massed practice to increase the tendency of patients to use their more impaired limb, and thereby induces a use-dependent functional reorganization of brain structures. Thakkar, (2004) showed that in conclusion, the planning and implementation of this multisite study on the efficacy of

modified CIMT in hemiplegic CP children shows that interventions are safe, effective and worthwhile. Modified constraint induced movement therapy yields clinically as well as statistically significant improvements in both motor function and functional use of the affected upper extremity in children between the ages of 2 and 8 years with hemiplegic cerebral palsy. Thakkar, (2004) showed that in this study we found that modified CIMT is a feasible and tolerable intervention for children with hemiplegic CP children. The results obtained seem particularly important for the current rehabilitation practice for hemiplegic CP with modified CIMT.

Reid, et al. (2005) suggested that Hemiplegic cerebral palsy, characterized by a clinical pattern of unilateral motor impairment, accounts for 35.1% of all cerebral palsy types in Victoria, Australia , 15.3% in Ontario, Canada, 40% in Sweden and 31.2% in North England, United Kingdom. Along with muscle spasticity and hypertonia, children with hemiplegic cerebral palsy experience a loss of upper motor neuron excitation that is typically associated with poor selective motor control and weakness, and in some instances, sensory deficits. These additional impairments significantly impact on a child's ability to perform daily tasks (Hoare & Russo, 2009). The spastic motor type of cerebral palsy is the most common, comprising about 80% of all reported cases. Although the mechanism is unknown, spastic muscle often shortens to create muscle contractures, which often leads to fixed deformity and further functional complications. (Hoare & Imms, 2004) stated that therefore, management of the upper limb in children with cerebral palsy usually involves a variety of interventions targeting the musculoskeletal system. These may include splinting and casting, passive stretching, the facilitation of posture and movement (e.g. occupational therapy and physiotherapy) or systemic spasticity-reducing medication and surgery. Botulinum toxin-A (BoNT-A) is now commonly used as an

adjunct to these interventions. BoNT-A in the treatment of the upper limb in childrenwith cerebral palsy is to produce selective reduction in muscle spasticity using the smallest possible dose. The reduction in spasticity is intended to provide an opportunity to optimize the effects of motor training by reducing the negative interference of spasticity. It can also serve to improve tolerance and compliment the effects of splinting and casting potentially delaying the need for soft tissue surgery (Hoare & Russo, 2009).

Hoare, et al. (2007) showed that CIMT is a multi-faceted intervention and studies describing its use in children with cerebral palsy present wide variation in its application in relation to: method of restraint; length of restraint (per day, number of weeks); type and duration of therapy; intervention environment (that is home, school, or clinic) and intervention provider (therapist, parent, or teacher). Children included in studies have also varied in age, diagnosis, severity of motor and sensory impairment, cognitive abilities and behavior. Despite the emerging popularity of CIMT in children with hemiplegic cerebral palsy, a Cochrane review identified a significant treatment effect in only a single trial which adopted a less intensive modified form of CIMT (Hoare & Russo, 2009). The modified CIMT (mCIMT) involved the application of a restraint on the unaffected upper limb and less than three hours per day of therapy provided to the affected limb, while a positive trend was found favoring CIMT and forced use, no significanttreatment effect was demonstrated for these interventions when compared with traditional services (Hoare, et al., 2007).

Sankar, (2015) investigation that the purpose of this study was to identify effectiveness of modified constraint induced movement therapy for children with hemiplegic cerebral palsy. Statistically significant difference in upper extremity function between pre-test and post-test total score of QUEST ($t = - 4.680$, $P<0.01$) in

mCIMT group. The children were used playful activities with three trials that increase upper extremity function of affected arm. Each activity creates motivational interest to the children. Cortical activation in the ipsilateral motor field after mCIMT therapy is increased; cortical reorganization was maintained at the 6 months follow up (Sankar, 2015). The results of this study is agrees with earlier studies. Cope, et al. (2008) reported that the mCIMT showed greater improvement in motor changes than regular therapy. Researcher found that after mCIMT completion, the patient exhibited substantial improvement in affected upper limb function. Literature reported that patients receiving mCIMT produced more preplanned reaching movement than patients receiving traditional (TR) during the unilateral task. mCIMT produced a greater improvement in functional performance and motor control. Improvement of motor control after mCIMT was based on improved spatial and tallemporal efficiency, during bimanual rather than unilateral task performance. Hence the null hypothesis which states that there is no statistically significant difference between pre-test and post-test total score of QUEST scale in mCIMT group is rejected (Charles, et al., 2003). The current study concluded that mCIMT for a small child with hemiplegic cerebral palsy seems to be an important intervention method for improving upper extremity function. Furthermore research is strongly recommended by using mCIT intervention for hemiplegic cerebral palsy children to conform the evidence (Sankar, 2015).

Edward, et al. (2004) mentioned that the two of the pediatric CI therapy subjects were 7 and 10 months of age, respectively. There can be some question concerning the accuracy of the diagnosis of CP at those ages. However, both children had experienced severe prenatal strokes, as revealed by marked clinical symptoms and confirmed by magnetic resonance imaging findings. Three randomized, controlled

trials testing the efficacy of widely used, professionally endorsed forms of physical rehabilitation failed to report significant benefits. Two other randomized trials showed possible and/or small-magnitude benefits, but methodological limitations render interpretation oftheir results problematic. In our study, treated children showed large and significant gains in both quality and amount of use of the more-impaired extremity. Our results also differ markedly from those of 4 studies in which restraint of the less-affected upper extremity alone was used for varying periods in children with hemiparesis without the intensive training component of pediatric CI therapy. This is similar to the situation with adult patients with stroke in which restraint alone produces just 20% of the treatment effect obtained with the full protocol. The main therapeutic factor underlying the clinical efficacy of CI therapy is the concentrated extended nature of the training conducted for many hours daily over a period of consecutive weeks.

Review of literature:

A) Modified constraint-induced therapy for children with hemiplegic cerebral palsy: a randomized trial

Wallen, et al. (2011) examined that modified forms of constraint-based therapies that are family-centred may be more acceptable and feasible for families of children with cerebral palsy (CP)-but require rigorous evaluation using randomized trials. The aim of this study was to determine the effects of modified constraint-induced therapy compared with intensive occupational therapy on activities of daily living and upper limb outcomes in children with hemiplegic CP. In this assessor-blinded pragmatic randomized trial, 50 children (27males, 23 females; age range 19month–7y 10month) with hemiplegic CP were randomized using a concealed allocation procedure to one of two 8-week interventions: intensive occupational therapy (n=25), or modified

constraint-induced therapy (n=25). All participants were included in the analysis. Between-group differences for all outcomes were neither clinically important nor statistically significant. The mean difference in COPM was 0.3 (95% confidence interval [CI]) 0.8 to 1.4; p=0.61) and mean difference in COPM satisfaction was 0.1 (95% CI) 1.1 to 1.2; p=0.90). Minor adverse events were reported by five of the 25 participants in the modified constraint-induced therapy group and by one of the 25 in the intensive occupational therapy group. Useful information on the feasibility of implementingmCIT was obtained. For instance, most parents (75%) did notfind it easy to carry out this intervention (Table II). Themajority, however, reported that they felt mCIT was worth while (96%) and would consider implementing it again (76%). Participants represented a broad span of ages and ability levels, and intervention was carried out by occupational therapistswith a range of paediatric experience in a variety of settings. For these reasons, findings are expected to be broadly generalizableto the population of children with hemiplegic CP whosatisfy the inclusion criteria for this study.

B) Methods of Constraint-Induced Movement Therapy for Children with Hemiplegic Cerebral Palsy: Development of a Child-Friendly Intervention for Improving Upper Extremity Function

Andrew et al. (2005) mentioned that the study was randomised control trail Initial effort to adapt CIMT for children began in 1997, and the method described below is based on piloting and testing with 38 children between the ages of 4 and 14 years. The criteria for participation were: congenital hemiplegia with a difference of at least 50% between the 2 limbs on timed motor tasks of the Jebsen-Taylor Test of Hand Function, and the ability to extend the wrist at least 20° and fingers 10° from full flexion.Of the 38 children, 37 successfully completed the treatment protocol, while 1

child with high levels of frustration discontinued the program at the staff's request. The essential considerations in modifying CIMT for use with children were that the intervention: maintain, in addition to the restraint, the 2 major elements of the adult CIMT (repetitive practice, shaping), be aligned as closely as possible with the duration of intervention is also important. The adult CIMT studies typically involve wearing the sling for 10 weekdays, 90% of waking hours, with 6 hours of active therapy. We believe this duration is too demanding for young children. There are risks associated with keeping children in a restraint when unsupervised, which may happen in the home environment. However, reducing the intervention duration drastically may have repercussions for overall treatment intensity. So we chose to restrain the arm for 6 hours a day for 10 days (60h) of active therapy but to remove the restraint during all other waking hours. However, we ask parents to engage their children in an hour of unimanual practice (without the restraint), and to keep a log of activities so that we could relate compliance with outcome. The 2-week period was chosen to minimize disruption of parents' and caregivers' schedules and to permit participation during the summer or school breaks. The outlined methodology is the first effort to describe the application of CIMT with children in more detail than is possible in data-based articles. It attempts to carefully define CIMT, to clarify that it is not simply forced use or traditional PT and OT with a restraint. Overall, we have demonstrated that CIMT can be successfully modified for 4- to 14-year-old children with hemiplegic CP. Despite the successful modification and application to children, considerable work is needed to determine the efficacy of CIMT in children with CP. Although CIMT was modified specifically for this population, the methodology should be applicable to other children with hemiplegia (i.e., due to stroke, traumatic brain injury, hemispherectomy), though the efficacy for these populations may need

to be determined separately. Further modification of CIMT will likely be required to hone in on the specific components of the intervention that are found to be most effective and to apply it with children who are most likely to benefit.

C) Effect of Modified Constraint Induced Movement Therapy on hand function of hemiplegic Cerebral palsy:

Thakkar, et al. (2004) stated that the last few years constraint induced movement therapy (CIMT), as an intervention, has received a greatdeal of attention for children with Hemiplegic cerebral palsy (CP). 10 children (age: 2 to 8 years) from pediatric physiotherapy clinics from Vadodara and Ahmedabad with hemiplegicCP were included in the study. Modified constraint was applied to unaffected hand. The intervention was given for 3 hrs/day including 30 minutes of therapy time and home program which could split into different sessions of no less than 30 minutes duration for consecutive 4 weeks. Pre and Post outcome measure by using QUEST (Quality of upper extremity skill test) and PMAL (pediatric motor activity log) were taken Significant difference between Pre and Post values of all components of PMAL and QUEST ($P<0.05$) showing the effectivenessof mCIMT in improving hand function and in ADL activities. MCIMT yields statistically as well as clinically significant improvements in both motor function and functional useof the affected upper extremity in children between the ages of 2 and 8 years with hemiplegic CP. Modified constraint inducedmovement therapy yields clinically as well as statisticallysignificant improvements in both motor function andfunctional use of the affected upper extremity in childrenbetween the ages of 2 and 8 years with hemiplegiccerebral palsy. In this study it was found that modified CIMTis a feasible and tolerable intervention for children withhemiplegic CP children. The results obtained seem

particularlyimportant for the current rehabilitation practice for hemiplegic CP with modified CIMT.

D) Modified Constraint Induced Movement Therapy (mCIMT) for Children with Hemiplegic Cerebral Palsy to Improve Upper Extremity Function: Pilot Study

Sankar, (2013) mentioned that the purpose of this study was to identify effectiveness of modified Constraint Induced Movement Therapy (mCIMT) to improve upper extremity function in children with hemiplegic Cerebral Palsy. Ten children with hemiplegic cerebral palsy were included through convenience sampling procedure. The results found that there is statistically significant difference ($t = -4.68$, $p < 0.01$) between pre-test & post-test total score of QUEST scale. Further it found that there is statistically significant difference between pre-test & post test scores of all QUEST components ($t=-3.07$, $p<0.05$ for dissociate movement, $t=-2.93$; $p<0.05$ for grasps; $t=-5.20$, $p<0.01$ for weight bearing; $t=-22.90$, $p<0.05$ for protective extension). Finally, this study concluded mCIMT for small children with hemiplegic cerebral palsy seems to be an important intervention method for improving upper extremity function. The current study concluded that mCIMT for a small child with hemiplegic cerebral palsy seems to be an important intervention method for improving upper extremity function. Furthermore research is strongly recommended by using mCIMT intervention for hemiplegic cerebral palsy children to conform the evidence.The study results agrees with the earlier study of Naylor C.E, found that there was a statistically significant change in dissociate movement, grasp, weight bearing and protective extension components in mCIMT group.

E) Efficacy of Constraint-Induced Movement Therapy for Children With Cerebral Palsy with Asymmetric Motor Impairment:

Taub et al. (2015) described randomized, controlled clinical trial ofpediatric CI therapy in which 18 children with diagnosedhemiparesis associated with cerebral palsy (7–96 months old) were randomly assigned to receive either pediatricCI therapy or conventional treatment. Pediatric CI therapyinvolved promoting increased use of the more-affectedarm and hand by intensive training (using shaping) of the more-impaired upper extremity for 6 hours/day for 21 consecutive days coupled with bivalvecasting of the child's less-affected upper extremity forthat period. Children's functional upper-extremity skillswere assessed in the laboratory (blinded scoring) and athome (parent ratings) just prior, after, and 3 weeks post treatment.Treated children were followed for 6 months. Children receiving pediatric CI therapy comparedwith controls acquired significantly more newclasses of motoric skills (9.3 vs. 2.2); demonstrated significant. Gains in the mean amount (2.1 vs. 0.1) and quality (1.7 vs. 0.3) of more-affected arm use at home; and in a laboratory motor function test displayed substantial improvement including increases in unprompted use of the more-affected upper extremity (52.1% vs. 2.1% of items). Benefits were maintained over 6 months, with supplemental evidence of quality-of-life changes for many children. Pediatric CI therapy produced major and sustained improvement in motoric function in the youngchildren with hemiparesis in the study.

F) Change in basic motor abilities, quality of movement and everyday activities following intensive, goal-directed, activity-focused physiotherapy in a group setting for children with cerebral palsy:

Sorsdhal, et al. (2010) mentioned that the randomised control trial effects of intensive training for children with cerebral palsy (CP) remain uncertain. The aim of the study

was to investigate the impact on motor function, quality of movements and everyday activities of three hours of goal-directed activity-focused physiotherapy in a group setting, five days a week for a period of three weeks. A repeated measures design was applied with three baseline and two follow up assessments; immediately and three weeks after intervention. Twenty-two children with hemiplegia (n = 7), diplegia (n = 11), quadriplegia (n = 2) and ataxia (n = 2) participated, age ranging 3-9 years. All levels of Gross Motor Function Classification System (GMFCS) andManual Ability Classification System (MACS) were represented. Parents and professionals participated in goal setting and training. ANOVA was used. A main effect of time was shown in the primary outcome measure; Gross Motor Function Measure-66 (GMFM-66), mean change being 4.5 ($p < 0.01$) from last baseline to last follow up assessment. An interaction between time and GMFCS-levels was found, implying that children classified to GMFCS-levels I-II improved more than children classified to levels III-V. There were no main or interaction effects of age or anti-spastic medication. Change scores in the Pediatric Evaluation of Disability Inventory (PEDI) ranged 2.0-6.7, $p < 0.01$ in the Self-care domain of the Functional Skills dimension, and the Self-care and Mobility domains of the Caregiver Assistance dimension. The children's individual goals were on average attained. Mean Goal Attainment Scaling (GAS) T-score being 51.3. Non-significant improved scores on the Gross Motor Performance Measure (GMPM) and the Quality of Upper Extremities Skills Test (QUEST) were demonstrated. Significant improvement in GMPM scores were found in improved items of the GMFM, not in items that maintained the same scoresed to analyse change over repeated measures Basic motor abilities and self-care improved in young children with CP after goal-directed activity focused physiotherapy with involvement of their local environment, and their need for caregiver assistance in self-care and

mobility decreased. The individualized training within a group context during a limited period of time was feasibleand well-tolerated. The coherence between acquisition of basic motor abilities and quality of movement should be further examined.

CHAPTER-III METHODOLOGY

This research was an experimental design to evaluate the efficacy of Constraint induce movement therapy on improving upper extremity function for children with hemiplegic type of Cerebral palsy. To identify the effectiveness of this treatment regime QUEST scale, PMAL Scale and modified ashworth scale were used as measurement tools for measuring the upper extremity function activity.

3.1. Study design

Pre experimental design of quantitative research was selected for this study. The researcher was conducting the study with a single group and provided an intervention during the experiment. This design had no control group to compare with the experimental group.

Pre experimental design is those in which two of three criteria for the true experimental are absent. The three criteria of the true experimental design is – randomization, control group, intervention. In this research, there were absent of randomization & control group.

The basic premise behind the pretest–posttest design involves obtaining a pretest measure of the outcome to administering some treatment, followed by a posttest on the same measure after treatment occurs. Pretest–posttest designs were employed in quasi-experimental research and used without control groups. For example, quasi-experimental pretest–posttest designs may or may not include control groups. In the simplest pretest–posttest design, researchers gather data about some outcome through a single pretest, administer a treatment, and then gather posttest data on the same measure (Depoy, et al., 1998).

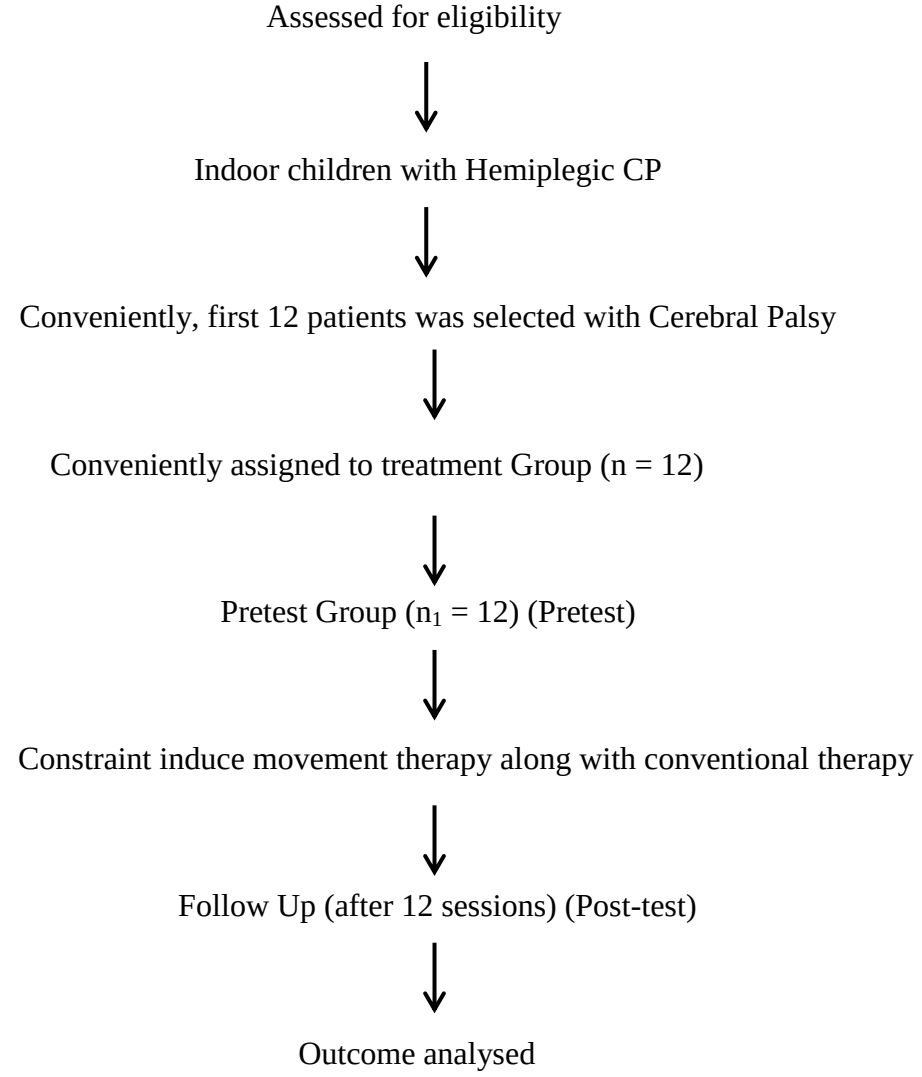
Pre experimental design could be shown by:

One group pretest- posttest design:

O X O

The pretest- posttest design is valuable in describing what occurs after the introduction of the independent variable.

Flow-chart of the phases of pretest-posttest design



3.2. Study Site

The researcher was a student of Master of Science in physiotherapy of Bangladesh health professions institute (BHPI) & the research was conducted as part of the courses module. For this reason the researcher had to collect data within short time to maintain the contrast of the course module time. So, paediatric unit of Centre for the rehabilitation of the Paralyzed (CRP) was chosen as the venue to collect data

3.3. Sampling Procedure

Population

Children with hemiplegic Cerebral Palsy

Sample

Subjects who were matched the researcher inclusion criteria and the sampling procedure is convenience. Convenience sampling allows us to establish criteria or condition then purposefully select a case or cases that match the criteria.

Sample Size

Twelve children with hemiplegic cerebral palsy were selected. The small sample size was selected due to limited time. The study had its own limitation constructed by limited time scale and as a result by the sample size. Small sample size was corrected by increased in the stringency to measure the outcome. A large sample was more likely to be representative of the population than a smaller one and secondly small sample size were corrected by an increase in the stringency with which the analysis was conducted. The sample were selected through some inclusion and exclusion criteria which were given below –

3.4 .Inclusion criteria

1. Participants with diagnosis of spastic hemiplegic cerebral palsy as diagnosed and reported in the medical history by paediatric Physician.

2. Age between 2 to 8 years (Gordon, et al.,2011; Sankar, 2015).

3. Active movement of the shoulder, elbow, wrist, digits and thumb of the affected upper limb, such that the: child is able to reach forward to an elevated position in front with mid-range of shoulder flexion (Deluca, 2002).

4. Active movement of the shoulder, elbow, wrist, digits and thumb of the affected upper limb, such that the: child is able to reach forward to an elevated position in front with mid-range of shoulder flexion,at least 20 degree wrist extension,10 degree thumb flexion (Deluca, 2012).

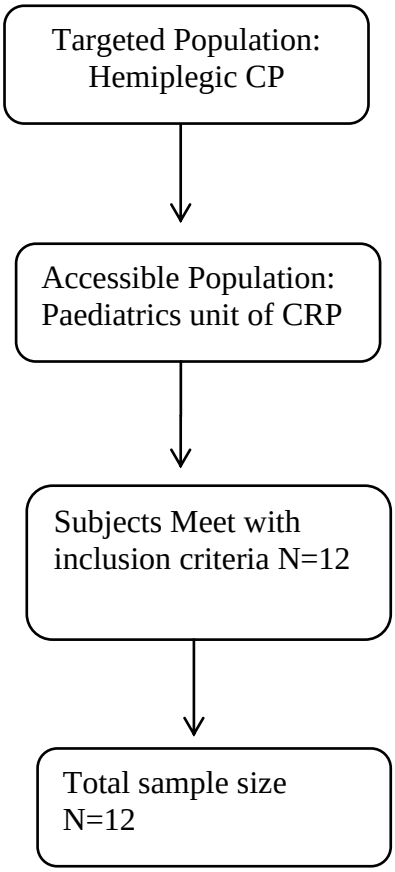
5. Able to attend the tasks and follow simple commands. Muscle tone (i.e. 1,2 modified Ashworth scale)

6. Parents who are willing to commit for an intensive therapy program and agree to cease all other upperlimb therapeutic interventions for the 2 weeks period of the trial.

3.5 . Exclusion Criteria

1. Known case of seizure and on anti–epileptic drugs
2. Visual problems interfering with treatment
3. Any surgery on the paretic hand within past 1year
4. Botulinum toxin therapy in the upper extremity within the past 6 month

3.6. Sample Recruitment



Procedure of Constraint induce therapy (CIMT):

Parents and Children (who were understandable) were explained about the study.

Informed consent was obtained from parents prior to study.

Modified Constraint Induced Movement Therapy (MCI):

Subjects participate in the study had provided to wear a fairly comfortable sling by Principal Investigator, as a modified restraint up to wrist was used which covers fingers, thumb and hand to avoid hand function of unaffected side. The subjects can however use the hand for support or for breaking a fall.

The intervention was given for 3 hours/day including therapy time and home program which they can split into different sessions of no less than 30 minutes duration for consecutive 2 weeks (week days). 3 hours had decided according to children play time

when maximum use of hand was needed. According to assessment, treatment plan based on unimanual activities were given.

Treatment protocol:

• Reach out activities (forward, Lateral and backward reach)

• Grasping and releasing activities (using different size of cubes and different shape things e.g. Pencil, eraser, toys, glass etc.)

• Fine motor movements

• Coordination exercises

• Protective function exercise

• Hand weight bearing exercise (forward, lateral, backward)

• Functional ADL and play activities

• Goal oriented activities

Activities which were facilitated by using simple verbal commands, encouragement, toys, demonstration and assistance which was given when needed. Family members and care givers were explained to undertake an intensive home program for 3 hours per day. Families were provided with specific goals after each session. Logbook (Work diary) –will be given to primary care giver for collecting details of child activity during that 3 hour time period.

Outcome measure:

The motor outcome was measured by using,

- PMAL (Pediatric motor activity scale) (How often and how well) (Taub, et al.,2011) and
- QUEST (Quality of Upper Extremity Skill Test) (dissociated movement, grasp, protective extension, and weight bearing) (Dematteo, et al.,1993)

Upper limbs muscle tone (Biceps brachi, wrist flexor) measured through Ashworth scale Prior to treatment and after 2 week of treatment

Materials in the study:

- Restraint (an elbow bag)
- Different Toys
- Work Diary
- QUEST, PMAL, ashworth Score sheet
- Chair and Table
- Mat

Statistical Analysis: Data analysis was done by using SPSS 20 for windows, for both outcome measures PMAL and QUEST were used. Mean difference scores and Standard deviation for each variable were done. Paired- t test (as quantitative data) was used for data analysis. A significance level of 0.05 was set for all data analysis.

3.7. Data Collection Procedure:

Children diagnosed as hemiplegic type of CP who were attend at Paediatric unit of Centre for Rehabilitation of the Paralysed (CRP), Savar during the period of January 2016 to April 2016 were included in this study. Data collection tools had been written questionnaire, elbow bag, QUEST scale, PMAL scale, ashworth scale. Children diagnosed as Hemiplegic CP who were attend at Paediatric unit of Centre for Rehabilitation of the Paralysed (CRP), Savar during the period of November 2015 to January 2016 were included in this study. Convenience sampling technique was used for data collection. Participants were given a semi-structured questionnaire and their responses will be recorded. Data were compiled and analyses were done by using SPSS version 20. Data collection tools were elbow bag, QUEST Scale and PMAL scale, ashworth scale.

In order to evaluate the effects of the upper extremity functioning, the following assessments were used: QUEST scale and PMAL test. These assessments were completed in two sessions: 1) upper extremity before MCIT therapy 2) upper extremity after MCIT therapy. Between these two sessions the hemiplegic children went through a hand functioning training program for 2 week. For 12 participants the researcher used 6 different weeks.

3.8. Data Analysis

The entire participant's names are coded to maintain confidentiality. Participants were evaluated by QUEST scale, PMAL scale, ashworth scale. Initial assessment was carried out in each participant that provides the pre-test score. After receiving 2 week hand function training program in the same way as the pre-test data were collected which give the post-test score. The pretest-posttest comparison group design was one of the most extensively used methods to evaluate clinical research. By calculating of the difference between pretest and posttest score the level of improvement deprived. Bailey (1997) stated that at quantitative research data analysis occurs at the conclusion of data collection.

All the participants were perform about different variables before starting hand function training program and after completing 2 week hand function training program and were scored according to the researcher.

To find out the 'p' value for the significance of the result, the examiner used a related 't' test. Dependent variables of the treatment group will be statistically tested by related 't' test and eventually give a 'p' value.

In this study, using a same subject group, where conveniently allocated to the treatment program group. The same subjects will be used for each level of the independent variable. As the subjects are the same for all levels of the independent

variables, they are their own controls. Outcomes are measured by collecting the scores of different variables and the scores are considered of interval data. The common methods of analyzing data from pretest-posttest research design are related‘t’ test on the difference score between pretest and posttest. If the variables are quantitative, the mean of each group are calculated. The application of statistical inference test may or may not be required. A t test is a common device used to find out the differences between means. For this reason, the study used parametric related t test to calculate the significance level of the study. The ‘t’ test is used to find out whether the t value represented a significance differences between the results from before received treatment & after received treatment of the same group of subjects.

The t formula

Formula of related t test:

$$t = \frac{\sum d}{\sqrt{\frac{N\sum d^2 - (\sum d)^2}{N-1}}}$$

Where,

$\sum d$= The total of the difference

$(\sum d)^2$= The total of the differences squared

$\sum d^2$= The total of the squared difference

N= Number of subjects

3.9. Treatment Protocol

Four physiotherapists who were expert in treatment of paediatric children were involved in treatment of patients. All the physiotherapists have the experience have more than five years, in the aspect of paediatric physiotherapy. Among them two will be male, and rest of two will be female physiotherapist. An in service training to share the information to practical demonstration regarding modified constraint induce therapy including types of exercise, dose, repetition and patient position. In addition

the types, dose, repetition, duration of conventional care including manual therapy, Coordination exercise, and exercise therapy will be taken permission from head of Physiotherapy department, centre for the rehabilitation of the paralyzed (CRP).

The patients only taking below treatment options-

Table-1: Experimental Group Treatment Protocol

Treatment option	**Duration/Repetition**
Reach out activities	10 repetition in each session
Grasping and releasing activities	5 minutes in each session
Fine motor movements	10 minutes in each session
Protective function exercise	15 repetition in each session
Coordination exercise	5 minute in each session
Hand weight bearing exercise	5 minute in each session
Functional ADL and play activities	5 minute in each session
Goal oriented activities	5 minute in each session
Constraint Induce movement therapy	3 hour per day for 2 weeks

4.0. Ethical Consideration

The whole process of this research project was done by following the Bangladesh Medical Research Council (BMRC) guidelines and World Health Organization (WHO) Research guidelines. The proposal of the dissertation including methodology was presented to the Institutional Review Board (IRB) of Bangladesh Health Professions Institute (BHPI). Again before the beginning of the data collection, researcher has obtained the permission from the concerned authorities ensuring the safety of the participants. The researcher strictly maintained the confidentiality regarding participant's condition and treatments. The researcher obtained consent to

participate from every subject. A signed informed consent form was received from each participant. The participants had informed that they have the right to meet with outdoor doctor if they think that the treatments were not enough to control condition or if the condition became worsen. The rigorous manner was maintained to conduct study. The study was conducted in a clean and systematic way. During data collection it was ensured that participants were not influenced by data collector.

4.1. Informed Consent

The researcher was obtaining consent to participate from every subject. A signed informed consent form had received from each participant. The participants informed that they had the right to meet with outdoor doctor if they think that the treatment was not enough to control the condition or if the conditions became worsen. The participants 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 will not affect their treatment in the physiotherapy department and they still will 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.

Children in the study were aged between 2 to 8 years (the mean age was 6 years). There were of 42% (n=5) boys and 58% (n= 7) girls, and not equal numbers of the right or left arm affected (Figure 1 & 2).

Figure 1: Gender of the participants

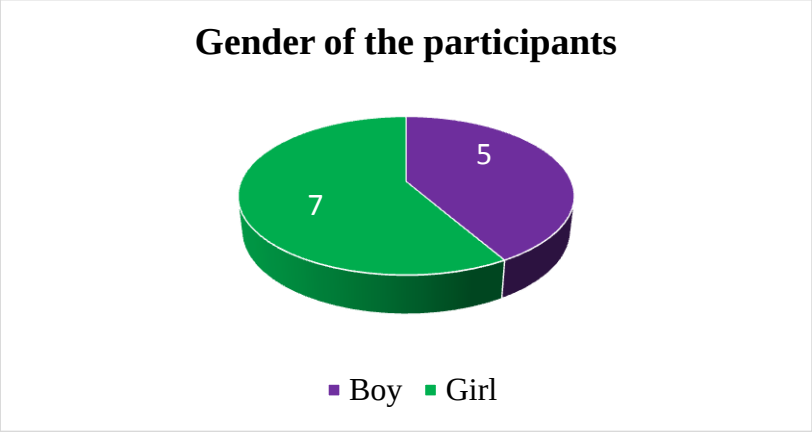
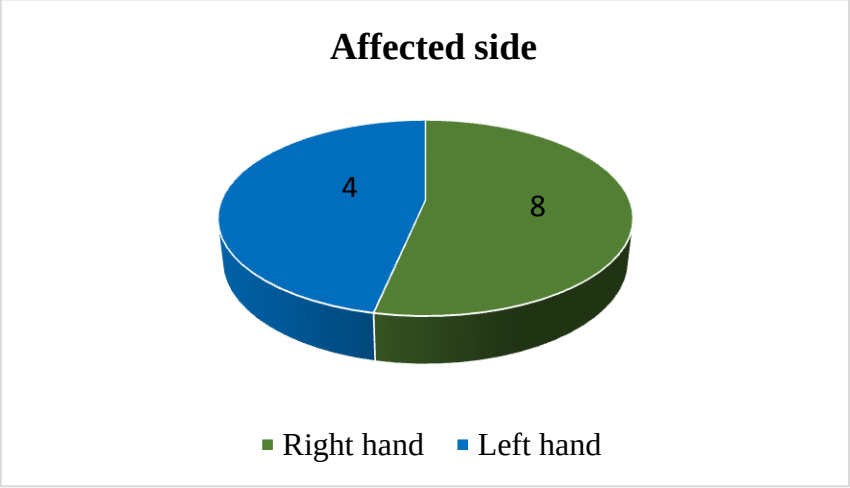


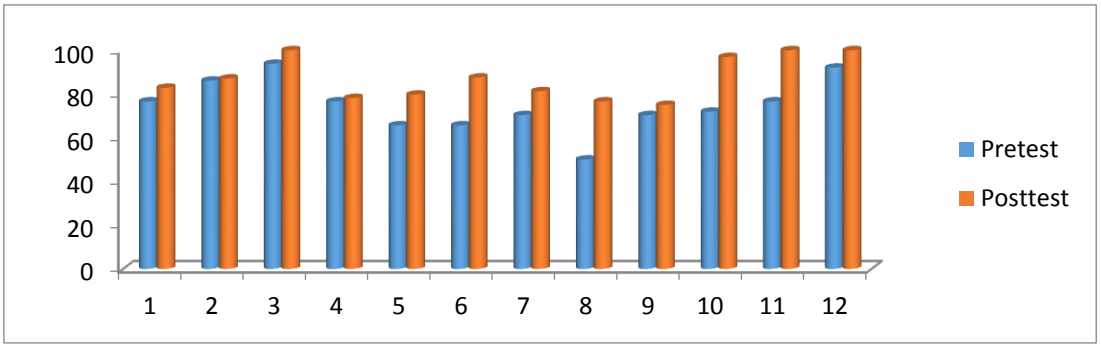
Figure 2: Affected hand of the participants



Result of QUEST movement for twelve children pre-test and post-test scores were shown at figure-3. It indicates that there have differences between pre-test and post-

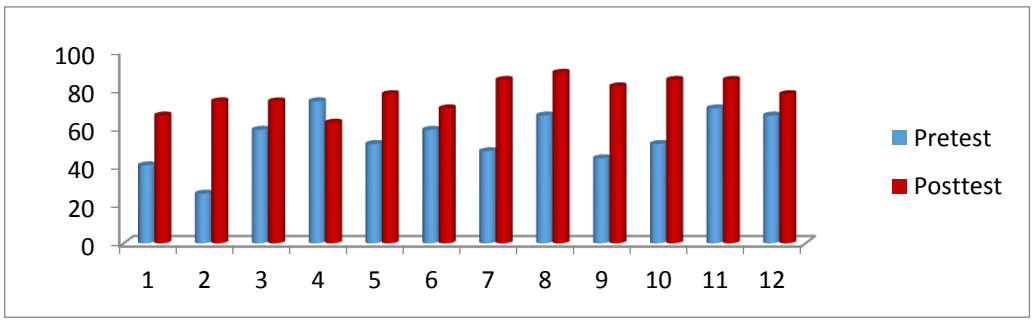
test scores. Post-test scores were higher than pretest score. So MCIT therapy have great role on dissociated movement performances.

Figure 3: Compare pretest and posttest score of dissociate movement



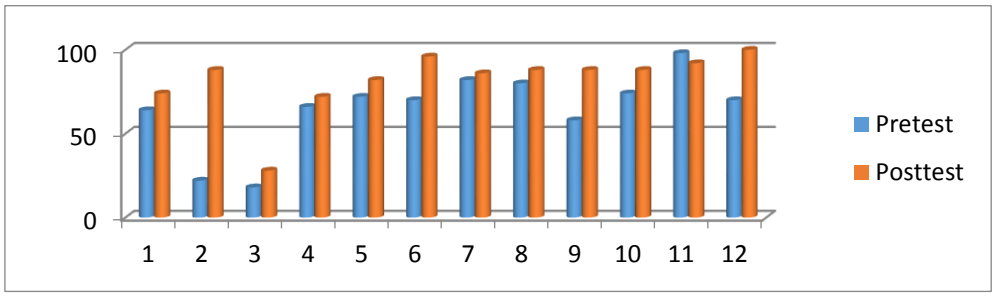
Result of GRASP movement for twelve children's pre-test and post-test scores were shown at figure-4. It indicates that there have differences between pre-test and post-test scores. Post-test scores were higher than pretest score. So MCIT therapy have great role on grasp movement performances.

Figure 4: Compare pretest and posttest score of grasp movement



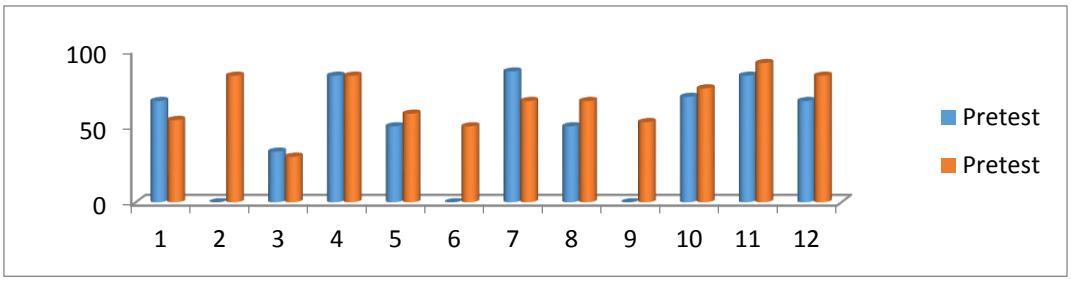
Result of weight bearing movement for twelve children's pre-test and post-test scores were shown at figure-5. It indicates that there have differences between pre-test and post-test scores. Post-test scores were higher than pretest score. So MCIT therapy have great role on weight bearing movement performances.

Figure 5: Compare pretest and posttest score of weight bearing movement



Result of protective extension movement for twelve children's pre-test and post-test scores were shown at figure-6. It indicates that there have differences between pre-test and post-test scores. Post-test scores were higher than pretest score. But t-value was -1.98 and p >0.05, for protective extension indicates that MCIT therapy was not effective for protective extension.

Figure 6: Compare pretest and posttest score of protective extension movement



Result of QUEST in which p value ($p<0.05$) showing significance difference between pre and post values for dissociated movements, grasp, weight bearing and protective extension showing in (Table:2; Figure:7). But p value of protective extension was 0.073($p>0.05$) indicates that association between pre and post test was not significant.

Table 2: The Comparison of pre & post test score of QUEST components

Components	Test	Mean	SD	't' value	LOS 2sided
Dissociated movement	Pre	74.61	12.51	-4.58	0.001**
	Post	87.07	9.72		
Grasp	Pre	54.94	13.93	-4.95	0.000**
	Post	77.49	8.14		
Weight bearing	Pre	64.50	23.13	-3.20	0.008**
	Post	81.83	18.73		
Protective extension	**Pre**	**49.07**	**33.34**	**-1.98**	**0.073**
	Post	66.27	18.00		

SD- Standard Deviation; LOS – Level of Significance, 2 sided

*P < 0.05; ** P < 0.01

Figure 7: Mean differences between pre and post values for dissociated movement, Grasp, Weight bearing, Protective extension and total score.

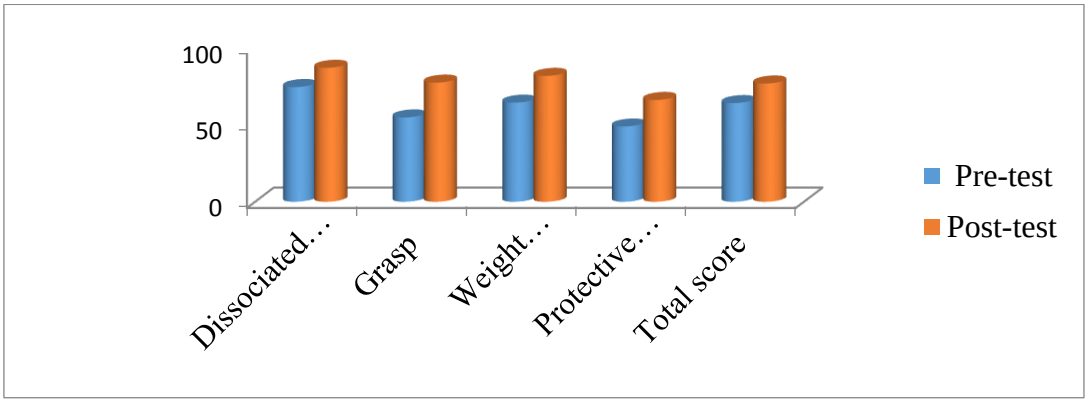


Table-3 demonstrated that paired ''t'' test was used to compute the effectiveness of MCIMT in components of QUEST scale. The result shows that there was statistically

significant difference between pre-test & post-test scores of all QUEST components except protective extension (t=-4.58, P < 0.05 for dissociated movement; t=-4.95, P < 0.05 for grasp; t=-3.20, P < 0.05 for weight bearing; t=-1.98, P > 0.05 for protective extension it indicates protective extension was not significant among the children).

Table 3: Comparison of pre-test & post-test of total score of QUEST

Test	Mean	SD	't' value	LOS
Pre	64.24	10.53	-3.87	0.003
Post	76.91	10.14		

LOS- level of Significance

Table-3 indicates that paired't- test was used to find out effectiveness of MCIMT in hemiplegic CP. The results shows that there was statistically significant difference (t=-3.87, p < 0.05) between pre-test and post-test of total score of QUEST scale. So, it is statistically proved that MCIT therapy was effective for all QUEST components except protective extension

Result of PMAL in which *p* value (p<0.05) showing significance difference between pre and post values of amount of use, quality of use and average score showing in (Table-4; Figure:8). Result of PMAL in which *p* value (p<0.05) showing significance difference between pre and post values for how often, how well, average showing in (Figure:8).

Figure 8: Pre-test and post-test differences of how often and how well scores

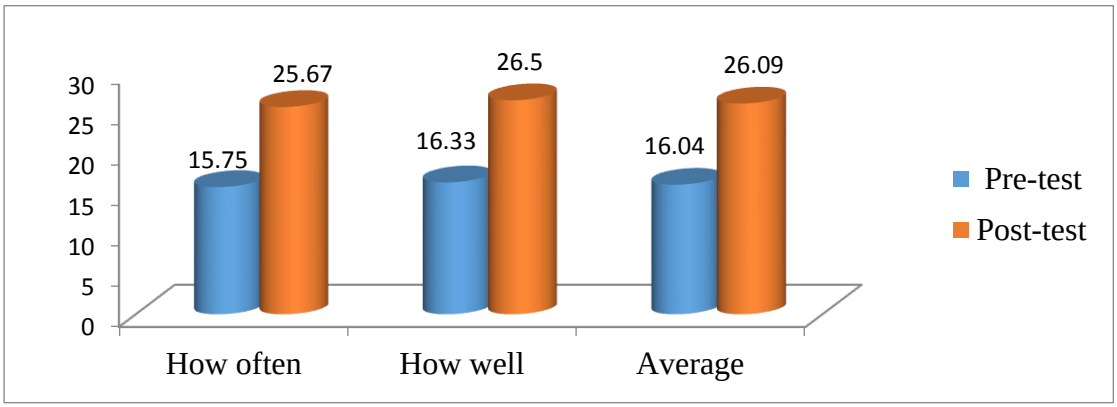


Table 4: Variable, SD and *p*-value for PMAL score

Variable	Pre		Post		"t" value	*p* value
	Mean	SD	Mean	SD		
How Often	15.75	7.09	25.67	11.26	-4.890	0.000
How Well	16.33	6.27	26.50	10.77	-4.843	0.001
Average	16.04	6.68	26.09	11.01	-4.86	0.001

CHAPTER-V DISCUSSION

This study was planned to see the effectiveness of Modified CIMT that is on upper extremity function of hemiplegic CP children. In the QUEST there was significant improvement seen in overall 4 domains but less improvement in protective Extension. Results from this study are consistent with other studies in showing a significant improvement in upper limb function after CIMT in children (Naylor & Bower, 2005). In this study most families did not find it easy to complete even modified CIMT. Some children disliked wearing the elbow bag and some have complaint of uneasiness due to close elbow bag. Studies in adults following stroke have provided evidence of adaptation in the brain following CIMT (Liepert, 2006). Since the potential for central nervous system plasticity in young children is increased relative to adults, it is postulated that this approach might prove to be especially effective in children (Sutclife, et al., 2007). In one study found that bilateral cortical activation was increased following CIMT including higher levels of activity in the contralateral sensorimotor cortex. This suggests that with CIMT, cortical reorganization occurs as new pathways between the damaged and healthy cortical hemisphere are made and control of the affected UE moves towards coming from the contralateral (lesion) hemisphere rather than solely from the ipsilateral hemisphere (Sutclife, et al.,2007). Secondly, The motor learning literature suggests that CIMT employs massed practice to increase the tendency of patients to use their more impaired limb, and thereby induces a use-dependent functional reorganization of brain structures. Taub's study involved restraining children in casts for 24 hours per day for 1 month, with and without structured practice. Our study, as well as Eliasson's, succeeded in being 'child friendly' by reducing the number of hours that children were restrained while

still improving motor performance in the involved hand and embedding practice in play activities with intensive rehabilitation programme. Although in one study they have concluded that Improvement in hand function is not captured by any one measure. The effectiveness of this intervention is promising but may be dependent on the age, severity of the impairment, cognitive abilities and behaviour (Charles, et al., 2001). Clinically Overall, this intervention improve in hand function of involved upper extremity in a selected group of children with hemiplegic CP. In this study no side effects of restraint was found. No comparison with control group so can't comment on that modified CIMT is better than the conventional therapy.

The purpose of this study was to identify effectiveness of modified constraint induced movement therapy for children with hemiplegic cerebral palsy. Table :3 shows that there is statistically significant difference in upper extremity function between pre-test and post-test total score of QUEST ($t= -3.87$, $P < 0.01$) in CIMT group. The children were used playful activities with three trials that increase upper extremity function of affected arm. The results of this study is agrees with earlier studies. Stevan et al., (2008) reported that the CIMT showed greater improvement in motor changes than regular therapy. Researcher found that after CIMT completion, the patient exhibited substantial improvement in affected upper limb function (Charles et al., 2003). Table 2 shows that there is statistically significant difference in dissociate movement ($t= -4.58$, $p < 0.05$), grasps ($t=-4.95$, $p < 0.05$), Weight bearing ($t=--3.20$, $p < 0.01$) and protective extension ($t=-1.95$, $P>0.01$) of QUEST components between pre-test and post test score in CIMT group. Some children were finding difficulties of using CIMT therapy in protective extension component because lack of balance. The children were practiced for playful activities with three trials with minimal restrained, children showed more interest towards each activity, motivational factors was increased by

giving reinforcements that increases the upper extremity function .The results agrees with the earlier study of Naylor C.E, et al., (2005) found that there was a statistically significant change in dissociate movement, grasp, weight bearing and protective extension components in CIMT group.

CHAPTER-VI LIMITATION

6.1. Limitation

- The hospital based studies and small sample size are not reflecting wider population of children with hemiplegic cerebral palsy.
- Time and resources were limited which have a great deal of impact on the study and affect the result of the study to generalize for wider population.
- There was no long term follow up and also no control group so can't comment on that modified CIMT is better than the conventional therapy.

CHAPTER-VII CONCLUSION AND RECOMMENDATION

7.1. Conclusion

In conclusion, the planning and implementation of this multisite study on the efficacy of modified CIMT in hemiplegic CP children shows that interventions are safe, effective and worthwhile. Modified constraint induced movement therapy yields clinically as well as statistically significant improvements in both motor function and functional use of the affected upper extremity in children between the ages of 2 and 8 years with hemiplegic cerebral palsy. In this study we found that modified CIMT is a feasible and tolerable intervention for children with hemiplegic CP children. The results obtained seem particularly important for the current rehabilitation practice for hemiplegic CP with modified CIMT. This current study concluded that mCIMT for small child with hemiplegic CP seems to be an important intervention method for improving upper extremity function.

7.2. Recommendation

The following recommendations could increase the validity and improve the results of this study:

- Long-term follow-up for amount of time required for stable performance following this type of training.
- Multiple intervention episodes of Pediatric mCIMT with a larger sample of children with Hemiplegic CP and to see whether functional changes relate to cortical reorganization and, if so whether changes vary as a function of age.
- Further research strongly recommended by using mCIMT intervention for hemiplegic cerebral palsy children to confirm the evidence.

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APPENDIX

1. Informed Consent (Bangla)
2. Informed Consent (English)
3. Questionnaire (Bangla)
4. Questionnaire (English)
5. Permission Letter

সম্মতিপত্র

আসসালামুয়ালাইকুম, আমি এহসানুর রাহমান, ঢাকা বিশ্ববিদ্যালয়ের চিকিৎসা অনুষদের অধিভুক্ত বাংলাদেশ হেলথ প্রফেশনস্ ইন্সিটিটিউট এর এম.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 **"হেমিপ্লেজিক সেরিব্রাল পালসি সম্বলিত বাচ্চাদের কনস্ট্রেইন্ট ইনডিউস থেরাপি এর কার্যকারিতা "**এই পরীক্ষামূলক গবেষণার মাধ্যমে আমি একটি অনুমান পরীক্ষা করব যে, হেমিপ্লেজিক সিবাচ্চাদের ,পি , ক্ষেত্রে শুধুমাত্র প্রচলিত ফিজিওথেরাপি অপেক্ষা প্রচলিত ফিজিওথেরাপির সাথে কনস্ট্রেইন্ট ইনডিউস থেরাপি বেশি কার্যকরী । আমার গবেষণার উদ্দেশ্য হলো থেরাপি দেবার পূর্বে ও পরে বাচ্চাদের হাতের কাজ করার ক্ষমতা পরিমাপ করা। আমি যদি আমার গবেষণাটি সার্থক ভাবে সম্পূর্ণ করতে পারি তবে যেসব বাচ্চারা হেমিপ্লেজিক 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 এবং আমি আপনাকে আমার গবেষণায় অংশগ্রহন করতে অনুরোধ জানাচ্ছি।

আমি প্রতিজ্ঞা করছি যে, এই গবেষণা আপনার জন্য ঝুঁকিপূর্ণ হবে না অথবা আপনার কোন ক্ষতি করবে না। গবেষণা চলাকলীন সময়ে কোন রকম দ্বিধা বা ঝুঁকি ছাড়াই যে কোন সময়ে আপনি এটাকে বাদ দিতে পারবেন। এই গবেষণার প্রাপ্ত তথ্য সম্পূর্ণভাবে গোপনীয় থাকবে এবং অংশগ্রহণকারীর ব্যক্তিগত তথ্য অন্য কোথাও প্রকাশ করা হবে না। যদি কোনও প্রশ্ন আপনার পছন্দ না হয় তাহলে ওই প্রশ্নের উত্তর না দেয়ার অধিকার আছে।

যদি আপনার গবেষণা সম্পর্কে কোনো জিজ্ঞসা থাকে তবে আপনি অনুগ্রহপূবক যোগাযোগ করতে পারেন গবেষক এহসানুর রাহমান, ফিজিওথেরাপি বিভাগ, বিএইচপিআই অথবা ডা. কামাল আহাম্মেদ, সহযোগী অধ্যাপক, হেলথ সার্ভিস ম্যানেজমেন্ট বিভাগ, সিআরপি, সাভার, ঢাকা-১৩৪৩ এর সাথে।

শুরু করার আগে আপনার কি কোন প্রশ্ন আছে ?

আমি কি শুরু করতে পারি ?

☐ ☐

হ্যাঁ না

বাচ্চার অভিভাবকের স্বাক্ষর ও তারিখ .....

গবেষকের স্বাক্ষরও তারিখ .....

সাক্ষীর স্বাক্ষরও তারিখ .....

তথ্য সংগ্রহকারীরস্বাক্ষর ও তারিখ.....

প্রশ্নাবলী (বাংলা)

পর্ব-ক:ব্যক্তিগত তথ্যাবলী

এই প্রশ্নপত্রটি গড়ে তলা হয়েছে হেমিপ্লেজিক সেরিব্রাল পালসি সম্বলিত বাচ্চাদের জন্য। ব্যক্তিগত তথ্যাবলী অংশটি রুগী কিন্তু বিশেষ বিবেচনায় ফিজিওথেরাপিস্ট কালো নীল কলমের দ্বারা/পূরণ করবেন। সঠিক জবাবটির বাম পার্শে টিক (√) চিহ্নদিন।

রোগীর কোড নং: তারিখ :

১। বাচ্চার নাম ঃ রোগের নামঃ

২। বাচ্চার বয়স ঃ

৩। লিঙ্গ ঃ i. ছেলে ii. মেয়ে

৪। ঠিকানা ঃ

গ্রাম: : পোস্ট অফিস :

থানা: : জেলা :

মোবাইল নম্বর:

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

i. হ্যাঁ

ii. না

চিকিৎসা পূর্ববর্তী উপাত্ত সমূহ

পর্ব-খ: হাতের দক্ষতার মাপ কাঠি

ক. গতিবিধি পৃথকীকরন

আইটেম	প্রশ্ন/ তথ্য	নির্ণায়ক	কোডিং বিভাগ			
			ডান		বাম	
			<৯০	≥৯০	<৯০	≥৯০

কাঁধ	ভাঁজ করা	কনুই: পূর্ণসম্প্রসারিত কব্জি:নিরপেক্ষ থেকে সম্প্রসারণ				
	আঙুল সম্প্রসারন করে ভাঁজ করা	কনুই: পূর্ণসম্প্রসারিত কব্জি: নিরপেক্ষ থেকে সম্প্রসারণ				
	বাইরের দিকে সম্প্রসারন করা	কনুই: পূর্ণসম্প্রসারিত কব্জি: নিরপেক্ষথেকেসম্প্রসারণ				
	আঙুল সম্প্রসারন করে বাইরের দিকে সম্প্রসারন করা	কনুই: পূর্ণসম্প্রসারিত কব্জি: নিরপেক্ষথেকেসম্প্রসারণ				
কনুই	সোজাবস্থায় রেখে ভাঁজ করা	সম্মুখবাহু সম্পুর্ণ সোজা				
	সোজাবস্থায় সম্প্রসারণ করা	সম্মুখবাহু সম্পুর্ণ সোজা				
	উপুড় ভাবে ভাঁজ করা	সম্মুখবাহু সম্পূর্ণ উপুড়				
	উপুড় ভাবে সম্প্রসারণ করা	সম্মুখবাহু সম্পূর্ণ উপুড়				
কব্জি	কনুই সম্প্রসারিত রেখে সম্প্রসারণ করা	কনুই সম্পূর্ণ সম্প্রসারণ				
	কনুই ভাঁজ রেখে সম্প্রসারণ করা	কনুই নিম্নে ১০ ভাঁজ				
	সম্প্রসারন করা (উপুর করে)	সম্মুখবাহুঃসম্পূর্ণউপুড়				
	সোজা ভাবে সম্প্রসারণ	সম্মুখবাহুঃসম্পূর্ণসোজা				
স্বাধীণভাবে আঙ্গুল নড়াচরা / নাড়নো	সোজা ভাবে ভাঁজ আংগুলের স্বাধীণ ভাবে নড়ানো	সম্মুখবাহুঃসম্পূর্ণসোজা সব আঙ্গুল পৃথক হয় কোন সংযুক্ত প্রতিক্রিয়া নেই				
	বৃদ্ধাঙ্গুলের স্বাধীণ ভাবে নড়ানো	কোন সংযুক্ত প্রতিক্রিয়া নেই				

১" ঘনক বস্তু মুষ্টি করে ধরা

আইটেম	**নির্ণায়ক**	**কোডিং বিভাগ**	
		ডান	বাম
বৃদ্ধাঙগুলি দিয়ে মুঠি করা	কাঁধ স্বাভাবিক কনুই সম্প্রসারিত কব্জি নিরপেক্ষ থেকে সম্প্রসারণ		
তালু দিয়ে মুঠি করা	কাঁধ স্বাভাবিক কনুই সম্প্রসারিত কব্জি নিরপেক্ষ থেকে সম্প্রসারণ		
বৃদ্ধাংগুলি ও আংগুল থেকে মুঠিখোলা	কাঁধ স্বাভাবিক কনুই সম্প্রসারিত কব্জি নিরপেক্ষ থেকে সম্প্রসারণ		
তালুথেকেমুঠিখোলা	কাঁধ স্বাভাবিক কনুই সম্প্রসারিত কব্জি নিরপেক্ষ থেকে সম্প্রসারণ		

স্কোরঃ গতিবিধি পৃথকীকরন

✓ **মোটঃ** **=a**

× **মোটঃ** **=b**

মোট(পরিক্ষা করা যায় নি) **=c**

খ. মুষ্টিবদ্ধতা

বসা অবস্থায় মুষ্টিবদ্ধতাঃ

<table>
<tr><td>আইটেম</td><td colspan="5">স্কোর</td></tr>
<tr><td></td><td>স্বাভাবিক</td><td colspan="4">অস্বাভাবিক</td></tr>
<tr><td rowspan="2">মাথা</td><td rowspan="2"></td><td>বাম</td><td>ডান</td><td>ভাঁজ</td><td>সম্প্রসারণ</td></tr>
<tr><td colspan="4">বৃত্তীয় করুন অস্বাভাবিক ভঙ্গি</td></tr>
<tr><td>দেহ</td><td></td><td colspan="4"></td></tr>
<tr><td rowspan="2"></td><td rowspan="2"></td><td colspan="2">সামনে</td><td colspan="2">পার্শ্বীয়</td></tr>
<tr><td colspan="4">অবস্থান যাচাই করুন</td></tr>
<tr><td rowspan="3">কাঁধ</td><td rowspan="3"></td><td colspan="4"></td></tr>
<tr><td colspan="2">পিছনে</td><td colspan="2">উপরে</td></tr>
<tr><td colspan="4">অবস্থান যাচাই করুন</td></tr>
</table>

স্কোরঃ মুষ্টিবদ্ধতা

মোট স্বাভাবিক (সর্বোচ্চ ৩) **= d**

মোট অস্বাভাবিক (সর্বোচ্চ ৫) **= e**

১" ঘনক মুষ্টিতে নিয়ে (টেবিলে বসে)

আইটেম	স্কোর		নির্ণায়ক
	বাম	**ডান**	
রেডিয়াল ডিজিটাল			কব্জিঃ নিরপেক্ষ থেকে সম্প্রসারণ
রেডিয়াল পামার			কব্জিঃ নিরপেক্ষ থেকে সম্প্রসারণ

পামার			কব্জিঃ নিরপেক্ষ থেকে সম্প্রসারণ

শস্যদানা মুষ্টিতে নিয়ে (টেবিলে বসে)

আইটেম	**স্কোর**		**নির্ণায়ক**
	বাম	**ডান**	
সূক্ষ চিমটি			কব্জিঃ নিরপেক্ষ থেকে সম্প্রসারণ
চিমটি			কব্জিঃ নিরপেক্ষ থেকে সম্প্রসারণ
নিম্নমুখী চিমটি			কব্জিঃ নিরপেক্ষ থেকে সম্প্রসারণ
কাঁচি ব্যবহার			কব্জিঃ নিরপেক্ষ থেকে সম্প্রসারণ
নিচের দিকে কাঁচি ব্যবহার			কব্জিঃ নিরপেক্ষ থেকে সম্প্রসারণ

মুষ্টিতে পেন্সিল বা রঙ্গিন চক নিয়ে

আইটেম	**স্কোর**	
	বাম	**ডান**
ডায়নামিকট্রাইপড (পেন্সিল, দূরেমুষ্টিগত – সুনির্দিষ্টভাবে বৃদ্ধাংগুলি, তর্জনী ও মধ্যাংগুলির বিপরীতে)		
স্ট্যাটিক ট্রাইপড (পেন্সিল কাছাকাছি মুষ্টিগত– অসূক্ষ্ম স্নিকটে আগমন বৃদ্ধাংগুলি, তর্জনী ও মধ্যাংগুলি)		
ডিজিটাল প্রোনেট		
পামার প্রোনেট		

<u>স্কোরঃ মুষ্টিবদ্ধতা</u>

✓ **মোটঃ** **=f**

× **মোটঃ** **=g**

মোট(পরিক্ষা করা যায় নি) **=h**

গ. ভারবহন

প্রারম্ভিকঅবস্থান: উপুড় বা ৪পয়েন্ট

বৃত্ত পরীক্ষার অবস্থান	**উপুড়**	**৪পয়েন্ট**

আইটেম		**স্কোর**		**নির্নায়ক**
		বাম	**ডান**	
১।ভার বহন	ক)কনুই প্রসারিত, হাত খোলা			সব ভার বহন আইটেমের জন্য বৃদ্ধাংগুলি তালুর বাইরে থাকবে অথবা সেক্ষেত্রে স্কোর 'না'।
	খ) কনুই প্রসারিত, আংগুল ভাঁজ			
	গ)কনুই প্রসারিত, হাত মুস্টিবদ্ধ			
	ঘ) কনুই ভাঁজ, হাত খোলা			
	ঙ) কনুই ও আংগুল ভাঁজ			
	চ) কনুই ভাঁজ, হাত মুস্টিবদ্ধ			

আইটেম		**স্কোর**
২। ভারবহন করে নাগালে পৌঁছান	ক) বাম কনুই সম্পূর্ণ প্রসারিত অবস্থায় বাম হাত দিয়ে ভারবহন এবং অন্য বাহুতে পৌঁছানো।	
	খ)ডানকনুইসম্পূর্ণপ্রসারিতঅবস্থায়ডানহাতদিয়েভারবহনএবংঅন্যবাহুতেপৌঁছানো।	

মেঝেতে বসে, বিশেষত আড়াআড়িভাবে পা রেখে

আইটেম		স্কোর		নির্ণায়ক
		বাম	ডান	
১।হাতসামনে	ক)কনুইপ্রসারিত,হাতখোলা			সবআইটেমএরজন্যবৃদ্ধাংগুলিতালুরবাইরেথাকবে।
	খ) কনুইপ্রসারিত, আংগুলভাঁজ			
	গ) কনুইপ্রসারিত,হাতমুস্টিবদ্ধ			
	ঘ) কনুইভাঁজ, হাতখোলা			
	ঙ) কনুইওআংগুলভাঁজ			
	চ) কনুইভাঁজ, হাতমুস্টিবদ্ধ			

আইটেম		স্কোর		নির্ণায়ক
		বাম	ডান	
২।হাতপাশেরেখে	ক)কনুইপ্রসারিত,হাতখোলা			সবআইটেমএরজন্যবৃদ্ধাংগুলিতালুরবাইরেথাকবে।
	খ)কনুইপ্রসারিত, আংগুলভাঁজ			
	গ)কনুইপ্রসারিত,হাতমুস্টিবদ্ধ			
	ঘ) কনুইভাঁজ, হাতখোলা			
	ঙ) কনুইওআংগুলভাঁজ			
	চ)কনুইভাঁজ, হাতমুস্টিবদ্ধ			
৩. হাতপিছনে	ক)কনুইপ্রসারিত,হাতখোলা			সবআইটেমএরজন্যবৃদ্ধাংগুলিতালুরবাইরেথাকবে।
	খ)কনুইপ্রসারিত, আংগুলভাঁজ			
	গ)			

	কনুইপ্রসারিত,হাতমুস্টিবদ্ধ			
	ঘ) কনুইভাঁজ, হাতখোলা			
	ঙ) কনুইওআংগুলভাঁজ			
	চ) কনুইভাঁজ, হাতমুস্টিবদ্ধ			

স্কোরঃ ভারবহন

- ✓ **মোটঃ** **=i**
- × **মোটঃ** **=j**

মোট(পরিক্ষা করা যায় নি) **=k**

ঘ. প্রতিরক্ষামূলক সম্প্রসারণ

বিশেষত পা ছড়িয়ে বা হাঁটু গেড়ে বসে

আইটেম		**স্কোর**		**অন্যান্য**
		বাম	**ডান**	
১।সামনেরদিকেপ্রসারণ	ক) কনুই প্রসারিত, হাত খোলা			
	খ) কনুই প্রসারিত, আংগুল ভাঁজ			
	গ) কনুই প্রসারিত,হাত মুস্টিবদ্ধ			
	ঘ) কনুই ভাঁজ, হাত খোলা			
	ঙ) কনুই ও আঙগুল ভাঁজ			
	চ) কনুইভাঁজ, হাতমুস্টিবদ্ধ			
২।পাশেপ্রসারণ	ক) কনুই প্রসারিত,হাত খোলা			
	খ) কনুই প্রসারিত, আঙগুল ভাঁজ			
	গ) কনুই প্রসারিত,হাতমুস্টিবদ্ধ			
	ঘ) কনুই ভাঁজ, হাত খোলা			
	ঙ) কনুই ও আঙগুল ভাঁজ			

	চ) কনুই ভাঁজ, হাতমুস্টিবদ্ধ			
৩।পিছনেপ্রসারণ	ক) কনুই প্রসারিত,হাত খোলা			
	খ) কনুই প্রসারিত, আংগুল ভাঁজ			
	গ) কনুই প্রসারিত,হাত মুস্টিবদ্ধ			
	ঘ) কনুই ভাঁজ, হাত খোলা			
	ঙ) কনুই ও আঙগুল ভাঁজ			
	চ) কনুই ভাঁজ, হাত মুস্টিবদ্ধ			

স্কোরঃ প্রতিরক্ষামূলক সম্প্রসারণ

✓ **মোটঃ** **=l**

× **মোটঃ** **=m**

মোট(পরিক্ষা করা যায় নি) **=n**

ঙ. হাতের ফাংশন নির্ধারণ

	খারাপ									**ভালো**
বামহাত	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
ডানহাত	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
দ্বিপার্শিক	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০

চ. মাংসপেশির সংকোচণ নির্ধারণ

	নাই	**সামান্য**	**সহনীয়**	**মারাত্মক**
বামহাত				
ডানহাত				

ছ. সহযোগিতা নির্ধারণ

সহযোগী নয়	কিছুটা সহযোগী	অনেকটা সহযোগী

পর্ব-গ: হাতের দক্ষতার পি, এম, এ, এল মাপ কাঠি

কোন প্রতিক্রিয়া না পাওয়াতে PMAL **সংকেতসমূহ**:

১. "শিশু সম্পূর্ণরূপে শক্তিশালী বাহু ব্যবহার করেছে।"

(নির্দিষ্ট করুন "০")

২. "শিশুর জন্য অন্য কেউ এটা করেছে।"

(নির্দিষ্ট করুন "০")

৩. "ঐ কাজ করার মত সুযোগ শিশুটির ছিল না।"

(নির্দিষ্ট করুন "০" এবং দেখাশুনা কারীকে বলুন সুযোগ করে দিতে।)

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

(আগের স্কোরের সাথে যুক্ত করুন।)

৫. শিশুটি শুধুমাত্র 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 হয় নি -আপনার শিশু কাজটির জন্য দুর্বল বাহু ব্যবহার করে নি।

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

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

'ভাল' এর স্কেল কেমন?

০ – ব্যবহার হয় নি – আপনার শিশু কাজের জন্য দুর্বল বাহুটি মোটেও ব্যবহার করে নি।

১ – খুব কম –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 জটিলতার সাথে সম্পন্ন হত।

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

৫ – স্বাভাবিক –দুর্বল বাহুটি স্বাভাবিকভাবেই 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 কাপ ধরতে দিন।		
২।	চেয়ারে বসিয়ে একটি ছোট জিনিস ধরতে ও তুলতে দিন।		
৩।	চেয়ারে বসিয়ে একটি বর কিছু ধরতে অ তুলতে দিন।		
৪।	আঙুল দিয়ে খেতে দিন।		

৫।	হাতের নাগালের বাইরে কিছু ধরতে দিন।		
৬।	বোতামে টিপ দিতে বলুন।		
৭।	দরজা বা জানালা খুলতে দিন।		
৮।	মেঝেতে নড়তে বাহু ব্যবহার করতে 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, বা ড্রামস্টিক)		
১৩।	বল বা বলের মত কিছু ছুঁড়ে মারতে দিন।		
১৪।	একটি অশ্বচালনা, পোলিং, বা ধাক্কা খেলনা একটি হ্যান্ডেল ধরতে দিন।		
১৫।	দুর্বল হাত যখন পেটের সঙ্গে তখন শরীরের সামনে ধাক্কা দিতে 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।	পিতামাতা দ্বারা কোলে তোলার জন্য তাদের কাছে পৌছাতে বলুন।		

২২।	জামার হাতা দিয়ে হাত দিতে বলুন।		

চিকিৎসা পরবর্তী উপাত্ত সমূহ

পর্ব-খ: হাতের দক্ষতার মাপ কাঠি

ক. গতিবিধি পৃথকীকরন

আইটেম	প্রশ্ন/ তথ্য	নির্ণায়ক	কোডিং বিভাগ			
			ডান		বাম	
			<৯০	≥৯০	<৯০	≥৯০
কাঁধ	ভাঁজ করা	কনুই: পূর্ণসম্প্রসারিত কব্জি:নিরপেক্ষ থেকে সম্প্রসারণ				
	আঙুল সম্প্রসারন করে ভাঁজ করা	কনুই: পূর্ণসম্প্রসারিত কব্জি: নিরপেক্ষ থেকে সম্প্রসারণ				
	বাইরের দিকে সম্প্রসারন করা	কনুই: পূর্ণসম্প্রসারিত কব্জি: নিরপেক্ষথেকেসম্প্রসারণ				
	আঙুল সম্প্রসারন করে বাইরের দিকে সম্প্রসারন করা	কনুই: পূর্ণসম্প্রসারিত কব্জি: নিরপেক্ষথেকেসম্প্রসারণ				
কনুই	সোজাবস্থায় রেখে ভাঁজ করা	সম্মুখবাহু সম্পুর্ণ সোজা				
	সোজাবস্থায় সম্প্রসারণ করা	সম্মুখবাহু সম্পুর্ণ সোজা				
	উপুড় ভাবে ভাঁজ করা	সম্মুখবাহু সম্পূর্ণ উপুড়				
	উপুড় ভাবে সম্প্রসারণ করা	সম্মুখবাহু সম্পূর্ণ উপুড়				
কব্জি	কনুই সম্প্রসারিত রেখে সম্প্রসারণ করা	কনুই সম্পূর্ণ সম্প্রসারণ				
	কনুই ভাঁজ রেখে সম্প্রসারণ করা	কনুই নিম্নে ১০ ভাঁজ				
	সম্প্রসারন করা (উপুর করে)	সম্মুখবাহুঃসম্পূর্ণউপুড়				
	সোজা ভাবে সম্প্রসারণ	সম্মুখবাহুঃসম্পূর্ণসোজা				
	সোজা ভাবে ভাঁজ	সম্মুখবাহুঃসম্পূর্ণসোজা				

স্বাধীণভাবে আঙ্গুল নড়াচরা / নাড়নো	আংগুলের স্বাধীণ ভাবে নড়ানো	সব আঙ্গুল পৃথক হয় কোন সংযুক্ত প্রতিক্রিয়া নেই		
	বৃদ্ধাঙ্গুলের স্বাধীণ ভাবে নড়া	কোন সংযুক্ত প্রতিক্রিয়া নেই		

১" ঘনক বস্তু মুষ্টি করে ধরা

আইটেম	**নির্ণায়ক**	**কোডিং বিভাগ**	
		ডান	বাম

বৃদ্ধাঙগুলি দিয়ে মুঠি করা	কাঁধ স্বাভাবিক কনুই সম্প্রসারিত কব্জি নিরপেক্ষ থেকে সম্প্রসারণ		
তালু দিয়ে মুঠি করা	কাঁধ স্বাভাবিক কনুই সম্প্রসারিত কব্জি নিরপেক্ষ থেকে সম্প্রসারণ		
বৃদ্ধাংগুলি ও আংগুল থেকে মুঠিখোলা	কাঁধ স্বাভাবিক কনুই সম্প্রসারিত কব্জি নিরপেক্ষ থেকে সম্প্রসারণ		
তালুথেকেমুঠিখোলা	কাঁধ স্বাভাবিক কনুই সম্প্রসারিত কব্জি নিরপেক্ষ থেকে সম্প্রসারণ		

স্কোরঃ গতিবিধি পৃথকীকরন

✓ **মোটঃ** **=a**

× **মোটঃ** **=b**

মোট(পরিক্ষা করা যায় নি) **=c**

খ. মুষ্টিবদ্ধতা

বসা অবস্থায় মুষ্টিবদ্ধতাঃ

আইটেম	**স্কোর**				
	স্বাভাবিক	**অস্বাভাবিক**			
মাথা		বাম	ডান	ভাঁজ	সম্প্রসারণ
		বৃত্তীয় করুন অস্বাভাবিক ভঙ্গি			
দেহ					
		সামনে			পার্শ্বীয়
		অবস্থান যাচাই করুন			
কাঁধ					
		পিছনে			উপরে
		অবস্থান যাচাই করুন			

স্কোরঃ মুষ্টিবদ্ধতা

মোট স্বাভাবিক (সর্বোচ্চ ৩) = d

মোট অস্বাভাবিক (সর্বোচ্চ ৫) = e

১" ঘনক মুষ্টিতে নিয়ে (টেবিলে বসে)

আইটেম	স্কোর		নির্ণায়ক
	বাম	ডান	
রেডিয়াল ডিজিটাল			কব্জিঃ নিরপেক্ষ থেকে সম্প্রসারণ
রেডিয়াল পামার			কব্জিঃ নিরপেক্ষ থেকে সম্প্রসারণ
পামার			কব্জিঃ নিরপেক্ষ থেকে সম্প্রসারণ

শস্যদানা মুষ্টিতে নিয়ে (টেবিলে বসে)

আইটেম	স্কোর		নির্ণায়ক
	বাম	ডান	
সূক্ষ চিমটি			কব্জিঃ নিরপেক্ষ থেকে সম্প্রসারণ
চিমটি			কব্জিঃ নিরপেক্ষ থেকে সম্প্রসারণ
নিম্নমুখী চিমটি			কব্জিঃ নিরপেক্ষ থেকে সম্প্রসারণ
কাঁচি ব্যবহার			কব্জিঃ নিরপেক্ষ থেকে সম্প্রসারণ
নিচের দিকে কাঁচি ব্যবহার			কব্জিঃ নিরপেক্ষ থেকে সম্প্রসারণ

মুষ্টিতে পেন্সিল বা রঙ্গিন চক নিয়ে

আইটেম	স্কোর	
	বাম	ডান
ডায়নামিকট্রাইপড (পেন্সিল, দূরেমুষ্টিগত – সুনির্দিষ্টভাবে বৃদ্ধাংগুলি, তর্জনী ও মধ্যাংগুলির বিপরীতে)		
স্ট্যাটিক ট্রাইপড (পেন্সিল কাছাকাছি মুষ্টিগত– অসূক্ষ্ম স্নিকটে আগমন বৃদ্ধাংগুলি, তর্জনী ও মধ্যাংগুলি)		

ডিজিটাল প্রোনেট		
পামার প্রোনেট		

স্কোরঃ মুষ্টিবদ্ধতা

✓ **মোটঃ** **=f**

× **মোটঃ** **=g**

মোট(পরিক্ষা করা যায় নি) **=h**

গ. ভারবহন

প্রারম্ভিকঅবস্থান: উপুড় বা ৪পয়েন্ট

বৃত্ত পরীক্ষার অবস্থান	**উপুড়**	**৪পয়েন্ট**

আইটেম		**স্কোর**		**নির্নায়ক**
		বাম	**ডান**	
১।ভার বহন	ক)কনুই প্রসারিত, হাত খোলা			সব ভার বহন আইটেমের জন্য বৃদ্ধাংগুলি তালুর বাইরে থাকবে অথবা সেক্ষেত্রে স্কোর ‘না’।
	খ) কনুই প্রসারিত, আংগুল ভাঁজ			
	গ)কনুই প্রসারিত, হাত মুস্টিবদ্ধ			
	ঘ) কনুই ভাঁজ, হাত খোলা			
	ঙ) কনুই ও আংগুল ভাঁজ			
	চ) কনুই ভাঁজ, হাত মুস্টিবদ্ধ			

আইটেম		স্কোর
২। ভারবহন করে নাগালে পৌঁছান	ক) বাম কনুই সম্পূর্ণ প্রসারিত অবস্থায় বাম হাত দিয়ে ভারবহন এবং অন্য বাহুতে পৌঁছানো।	
	খ)ডানকনুইসম্পূর্ণপ্রসারিতঅবস্থায়ডানহাতদিয়েভারবহনএবংঅন্যবাহুতেপৌঁছানো।	

<u>মেঝেতে বসে, বিশেষত আড়াআড়িভাবে পা রেখে</u>

আইটেম		স্কোর		নির্ণায়ক
		বাম	**ডান**	
১।হাতসামনে	ক)কনুইপ্রসারিত,হাতখোলা			সবআইটেমএরজন্যবৃদ্ধাংগুলিতালুরবাইরেথাকবে।
	খ) কনুইপ্রসারিত, আংগুলভাঁজ			
	গ) কনুইপ্রসারিত,হাতমুস্টিবদ্ধ			
	ঘ) কনুইভাঁজ, হাতখোলা			
	ঙ) কনুইওআংগুলভাঁজ			
	চ) কনুইভাঁজ, হাতমুস্টিবদ্ধ			

আইটেম		স্কোর		নির্ণায়ক
		বাম	**ডান**	
২।হাতপাশেরেখে	ক)কনুইপ্রসারিত,হাতখোলা			সবআইটেমএরজন্যবৃদ্ধাংগুলিতালুরবাইরেথাকবে।
	খ)কনুইপ্রসারিত, আংগুলভাঁজ			
	গ)কনুইপ্রসারিত,হাতমুস্টিবদ্ধ			
	ঘ) কনুইভাঁজ, হাতখোলা			
	ঙ) কনুইওআংগুলভাঁজ			

	চ)কনুইভাঁজ, হাতমুস্টিবদ্ধ			
৩. হাতপিছনে	ক)কনুইপ্রসারিত,হাতখোলা			সবআইটেমএরজন্যবৃদ্ধাংগুলিতালুরবাইরেথাকবে।
	খ)কনুইপ্রসারিত, আংগুলভাঁজ			
	গ) কনুইপ্রসারিত,হাতমুস্টিবদ্ধ			
	ঘ) কনুইভাঁজ, হাতখোলা			
	ঙ) কনুইওআংগুলভাঁজ			
	চ) কনুইভাঁজ, হাতমুস্টিবদ্ধ			

স্কোরঃ ভারবহন

✓ **মোটঃ** **=i**

× **মোটঃ** **=j**

মোট(পরিক্ষা করা যায় নি) **=k**

ঘ. প্রতিরক্ষামূলক সম্প্রসারণ

বিশেষত পা ছড়িয়ে বা হাঁটু গেড়ে বসে

আইটেম		**স্কোর**		**অন্যান্য**
		বাম	**ডান**	
১।সামনেরদিকেপ্রসারণ	ক) কনুইপ্রসারিত,হাতখোলা			
	খ) কনুইপ্রসারিত, আংগুলভাঁজ			
	গ) কনুইপ্রসারিত,হাতমুস্টিবদ্ধ			
	ঘ) কনুইভাঁজ, হাতখোলা			
	ঙ) কনুইওআঙগুলভাঁজ			
	চ) কনুইভাঁজ, হাতমুস্টিবদ্ধ			
২।পাশেপ্রসারণ	ক) কনুইপ্রসারিত,হাতখোলা			

	খ) কনুই প্রসারিত, আঙগুল ভাঁজ			
	গ) কনুই প্রসারিত,হাত মুস্টিবদ্ধ			
	ঘ) কনুই ভাঁজ, হাতখোলা			
	ঙ) কনুই ও আঙগুলভাঁজ			
	চ) কনুই ভাঁজ, হাত মুস্টিবদ্ধ			
৩।পিছনেপ্রসারণ	ক) কনুই প্রসারিত,হাত খোলা			
	খ) কনুই প্রসারিত, আংগুল ভাঁজ			
	গ) কনুই প্রসারিত,হাতমুস্টিবদ্ধ			
	ঘ) কনুই ভাঁজ, হাত খোলা			
	ঙ) কনুই ও আঙগুল ভাঁজ			
	চ) কনুই ভাঁজ, হাত মুস্টিবদ্ধ			

<u>স্কোরঃ প্রতিরক্ষামূলক সম্প্রসারণ</u>

✓ **মোটঃ** **=l**

× **মোটঃ** **=m**

মোট(পরিক্ষা করা যায় নি) **=n**

ঙ. হাতের ফাংশন নির্ধারণ

	খারাপ										**ভালো**
বামহাত	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
ডানহাত	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০
দ্বিপার্শিক	০	১	২	৩	৪	৫	৬	৭	৮	৯	১০

চ. মাংসপেশির সংকোচণ নির্ধারণ

	নাই	সামান্য	সহনীয়	মারাত্মক
বামহাত				
ডানহাত				

ছ. সহযোগিতা নির্ধারণ

সহযোগী নয়	কিছুটা সহযোগী	অনেকটা সহযোগী

পর্ব-গ: হাতের দক্ষতার পি, এম, এ, এল মাপ কাঠি

কোন প্রতিক্রিয়া না পাওয়াতে PMAL **সংকেতসমূহ**:

১. "শিশু সম্পূর্ণরূপে শক্তিশালী বাহু ব্যবহার করেছে।"

(নির্দিষ্ট করুন "০")

২. "শিশুর জন্য অন্য কেউ এটা করেছে।"

(নির্দিষ্ট করুন "০")

৩. "ঐ কাজ করার মত সুযোগ শিশুটির ছিল না।"

(নির্দিষ্ট করুন "০" এবং দেখাশুনা কারীকে বলুন সুযোগ করে দিতে।)

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

(আগের স্কোরের সাথে যুক্ত করুন।)

৫. শিশুটি শুধুমাত্র 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 হয় নি -আপনার শিশু কাজটির জন্য দুর্বল বাহু ব্যবহার করে নি।

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

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

'ভাল' এর স্কেল কেমন?

০ – ব্যবহার হয় নি – আপনার শিশু কাজের জন্য দুর্বল বাহুটি মোটেও ব্যবহার করে নি।

১ – খুব কম –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 জটিলতার সাথে সম্পন্ন হত।

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

৫ – স্বাভাবিক –দুর্বল বাহুটি স্বাভাবিকভাবেই 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 কাপ ধরতে দিন।		
২।	চেয়ারে বসিয়ে একটি ছোট জিনিস ধরতে ও		

	তুলতে দিন।		
৩।	চেয়ারে বসিয়ে একটি বর কিছু ধরতে অ তুলতে দিন।		
৪।	আঙুল দিয়ে খেতে দিন।		
৫।	হাতের নাগালের বাইরে কিছু ধরতে দিন।		
৬।	বোতামে টিপ দিতে বলুন।		
৭।	দরজা বা জানালা খুলতে দিন।		
৮।	মেঝেতে নড়তে বাহু ব্যবহার করতে 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, বা ড্রামস্টিক)		
১৩।	বল বা বলের মত কিছু ছুঁড়ে মারতে দিন।		
১৪।	একটি অশ্বচালনা, পোলিং, বা ধাক্কা খেলনা একটি হ্যান্ডেল ধরতে দিন।		
১৫।	দুর্বল হাত যখন পেটের সঙ্গে তখন শরীরের সামনে ধাক্কা দিতে 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।	পিতামাতা দ্বারা কোলে তোলার জন্য তাদের কাছে পৌছাতে বলুন।		
২২।	জামার হাতা দিয়ে হাত দিতে বলুন।		

Consent Form

Assalamualaikum,

I am Ehsanur Rhaman, Final part of M.Sc. in Physiotherapy student of Bangladesh Health Professions Institute (BHPI) under the Faculty of Medicine, University of Dhaka. To obtain my Mastars 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 Modified Constraint-Induced Movement Therapy on upper extremity function for Children with hemiplegic type of Cerebral Palsy**". Through this study I will find the effectiveness of Modified Constraint-Induced Movement Therapy in upper extremity function along with other physiotherapy for the treatment of Children with hemiplegic type of Cerebral Palsy. If I can complete this study successfully, patients may get benefits who are suffering from hemiplegic type of Cerebral Palsy.

To fulfill 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 reject any particular question that you don't like.

If you have any query about the study or right as a participant, you may contact with researcher Ehsanur Rhaman, Dept. of Physiotherapy or Dr. Kamal Ahmed, Associate professor, Department of health service management, BHPI, CPR, Savar, Dhaka-1343.

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……..

Questionnaire (English)

SECTION-1: Subjective Information

This questionnaire is developed to measure **the effectiveness of Modified Constraint-Induced Movement Therapy along with conventional physiotherapy on upper extremity function for Children with hemiplegic type of Cerebral Palsy** 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. Sex:

i. Male

ii. Female

4. Address:

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

5. Did your child take three hour session physiotherapy for every day?

i. Yes

ii. No

QUESTIONNAIRE

A. Dissociated Movements

Item	Questions/ Information on	Criteria	Coding Category			
			Right		Left	
			<90	≥90	<90	≥90
Shoulder	Flexion	Elbow: complete extension Wrist: neutral to extension				
	Flexion with fingers extend	Elbow: complete extension Wrist: neutral to extension				
	Abduction	Elbow: complete extension Wrist: neutral to extension				
	Abduction with fingers extend	Elbow: complete extension Wrist: neutral to extension				
Elbow	Flexion with supination	Forearm: complete supination				
	Extension with supination	Forearm: complete supination				
	Flexion with pronation	Forearm: complete pronation				
	Extension with pronation	Forearm: complete pronation				
Wrist	Extension with elbow extension	Elbow: complete extension				
	Extension with elbow flexion	Elbow: at least 10 flexion				
	Extension with pronation	Forearm: complete pronation				
	Extension with supination	Forearm: complete supination				
	Flexion with supination	Forearm: complete supination				
Independent movements	Independent Fingers Wiggling	Dissociation of all fingers No associated reaction				
	Independent Thumb Movement	No associated reaction				

Grasp of 1” cube

Item	criteraia	Score	
		Left	Right

Grasp Using Thumb	Shoulder: Normal Elbow: Extension Wrist: neutral to extension		
Grasp Using Palm	Shoulder: Normal Elbow: Extension Wrist: neutral to extension		
Release from thumb and fingers	Shoulder: Normal Elbow: Extension Wrist: neutral to extension		
Release from palm	Shoulder: Normal Elbow: Extension Wrist: neutral to extension		

B. Grasps

Sitting **posture during Grasps**

Item	**Score**				
	Normal	**Atypical**			
Head		Left	Right	Flexion	Extension
		Circle atypical posture			
Trunk					
		Forward			Lateral
		Check off position			
Shoulders					
		Retracted			Elevated
		Check off position			

Grasps of 1" Cube (sitting at table)

Item	**Score**		**Criteria**
	Left	**Right**	
Radial Digital			Wrist: neutral to extension
Radial Palmar			Wrist: neutral to extension
Palmar			Wrist: neutral to extension

Grasp of Cereal (sitting at table)

Item	Score		Criteria
	Left	Right	
Fine Pincer			Wrist: neutral to extension
Pincer			Wrist: neutral to extension
Inferior Pincer			Wrist: neutral to extension
Scissor			Wrist: neutral to extension
Inferior Scissor			Wrist: neutral to extension

Grasp of Pencil or Crayon

Item	Score	
	Left	Right
Dynamic Tripod (pencil, grasped distally – precise opposition of thumb, index & middle finger)		
Static Tripod (pencil grasped proximally – crude approximation of thumb, index & middle finger)		
Digital Pronate		
Palmar Supinate		

C. Weight Bearing

Start Position: Prone or 4 point

Circle test position	Prone	4 point

Item		Score		Criteria
		Left	Right	
1.Weight Bearing	a)elbow extended, hand open			Thumb must be out of palm for all weight bearing items or they are scored "NO".
	b)elbow extended, fingers flexed			
	c)elbow extended, hand fisted			
	d)elbow flexed, hand open			
	e)elbow flexed, fingers flexed			
	f)elbow flexed, hand fisted			

Item		Score
2.Weight Bearing with Reach	a) Bears weight on **LEFT** hand with **LEFT** elbow completely extended and reaches with other arm.	
	b) Bears weight on **RIGHT** hand with **RIGHT** elbow completely extended and reaches with other arm.	

Sitting on floor, preferably cross-legged

Item		Score		Criteria
		Left	**Right**	
1.Hands forward	a)elbow extended, hand open			Thumb must be out of palm for all items.
	b)elbow extended, fingers flexed			
	c)elbow extended, hand fisted			
	d)elbow flexed, hand open			
	e)elbow flexed, fingers flexed			
	f)elbow flexed, hand fisted			

Item		Score		Criteria
		Left	**Right**	
2.Hands by side	a)elbow extended, hand open			Thumb must be out of palm for all items.
	b)elbow extended, fingers flexed			
	c)elbow extended, hand fisted			
	d)elbow flexed, hand open			
	e)elbow flexed, fingers flexed			
	f)elbow flexed, hand			

	fisted			
3.Hands behind	a)elbow extended, hand open			Thumb must be out of palm for all items.
	b)elbow extended, fingers flexed			
	c)elbow extended, hand fisted			
	d)elbow flexed, hand open			
	e)elbow flexed, fingers flexed			
	f)elbow flexed, hand fisted			

D. Protective Extension

Preferably ring sitting or kneeling

Item		Score		Other
		Left	**Right**	
1. Protective Extension - Forward	a)elbow extended, hand open			
	b)elbow extended, fingers flexed			
	c)elbow extended, hand fisted			
	d)elbow flexed, hand open			
	e)elbow flexed, fingers flexed			
	f)elbow flexed, hand fisted			
2. Protective Extension - Side	a)elbow extended, hand open			
	b)elbow extended, fingers flexed			
	c)elbow extended, hand fisted			
	d)elbow flexed, hand open			
	e)elbow flexed, fingers flexed			
	f)elbow flexed, hand fisted			
3. Protective Extension - Backward	a)elbow extended, hand open			
	b)elbow extended, fingers flexed			
	c)elbow extended, hand fisted			
	d)elbow flexed, hand open			
	e)elbow flexed, fingers flexed			
	f)elbow flexed, hand fisted			

E. Hand Function Rating

	Poor									Good
Left Hand	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	10
Right Hand	**0**	1	2	3	4	5	6	7	8	9	10
Bilateral	**0**	1	2	3	4	5	6	7	8	9	10

F. Spasticity Rating

	None	Mild	Moderate	Severe
Left Hand				
Right Hand				

G. Cooperativeness Rating

Not cooperative	Some what cooperative	Very cooperative

Section 3: 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	Open a door or cabinet		
08	Use arm to move across floor		
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	Push up front of body with weaker arm while on stomach		
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 to be picked up by parent		
22	Push arm through sleeve of clothing		

SECTION-4: **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 areonly moderately reliable and repeatable for assessment ofmuscle 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 constant induce movement 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 noticeblecatch 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 positionexcept 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 to avoid the affects of the ATNR and the STNR.
5. Make sure that the limb you are about to move is relaxed as much aspossible.
6. The passive movement should be performed within one second given the facthat spasticity is characterized by a velocity dependent increase in muscletone.
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				

BANGLADESH HEALTH PROFESSIONS INSTITUTE

বাংলাদেশ হেল্‌থ প্রফেশন্স ইনস্টিটিউট (বিএইচপিআই)
Bangladesh Health Professions Institute (BHPI)
(The Academic Institute of CRP)

Ref. CRP/BHPI/IRB/02/16/023 Date: 27.02.2016

To

Ehsanur Rahman
Part – II, Student of M.Sc. in Physiotherapy
Session: 2013-2014, DU Reg. No.: 1475
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

Subject: Approval of the thesis proposal – "Effectiveness of Modified Constraint Induced Movement Therapy along with Conventional Physiotherapy on Upper Extremity Function for Children with Hemiplegic Type of Cerebral Palsy" **by ethics committee.**

Dear Ehsanur Rahman

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

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

Since the study involves answering a questionnaire that takes 45 minutes, have no likelihood of any harm to the participants and have possibility of benefit in upper extremity function of children with hemiplegic type of cerebral palsy. However, the members of the Ethics committee have approved the study to be conducted in the presented form at the meeting held at 8.30 am on February 25, 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,

S. M. Ferdous Alam
Assistant Professor, Dept. of M. Sc. in Rehabilitation Science
Member Secretary, Institutional Review Board (IRB)
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

সিআরপি-চাপাইন, সাভার, ঢাকা-১৩৪৩, বাংলাদেশ, ফোন ঃ ৭৭৪৫৪৬৪-৫, ৭৭৪১৪০৪ ফ্যাক্স ঃ ৭৭৪৫০৬৯
CRP-Chapain, Savar, Dhaka-1343, Tel : 7745464-5, 7741404, Fax : 7745069, E-mail : contact@crp-bangladesh.org, www.crp-bangladesh.org

Permission Letter

February 17, 2016
Head of Physiotherapy Department
Center for the Rehabilitation of the Paralyzed (CRP),
Savar, Dhaka-1343.
Subject: Regarding permission to collect data from paediatric unit to conduct a research project.

Through: Course Coordinator, MSc in Physiotherapy Program.
Sir,

Greetings from Bangladesh Health Professions Institute (BHPI).

It is your kind attention that Bangladesh Health Professions Institute (BHPI)- an academic institute of CRP, has been conducting M.Sc. in Physiotherapy under Faculty of Medicine of University of Dhaka(DU) since 2014. My thesis entitled "Effectiveness of Modified Constraint-Induced Movement Therapy along with conventional physiotherapy on hand function for Children with hemiplegic type of Cerebral Palsy" under honorable supervisor, Dr. Kamal Ahmed, Associate professor, Department of health service management, Bangladesh Health Professions Institute(BHPI).The purpose of study is to investigate the effectiveness of modified Constraint-Induced Movement Therapy on hand function for Children with hemiplegic type of Cerebral Palsy.

It is a quantitative experimental research. Data collection will require the patients and a small space of your reputed paediatric unit and will occur for six weeks from 20th February,2016. Data collectors will receive informed consents from all participants. Any data collected will be kept confidential. Ethical approval is received from the Institutional Review Board(IRB) of Bangladesh Health Professions Institute. I have chosen Pediatric Unit to collect required data. Now I am looking for your kind approval to start my data collection. I would like to assure that anything of my research project will not harmful for the participant.
Therefore I look forward to your cooperation by giving me permission for data collection at paediatric unit, CRP, Savar.

Forwarded to the Head of Dept. of Physiotherapy
Kamal
17-02-2016

Yours faithfully

E. Rahman
(Ehsanur Rahman)

Part-2, M. Sc. in physiotherapy Program

Session:2013-14

BHPI,CRP,Savar, Dhaka-1343

Approved
18/02/16
Mohammad Anwar Hossain
Associate Professor &
Head of Physiotherapy Dept.
CRP, Chapain, Savar, Dhaka-1343

Forwarded to the HOD, PT
17.02.16