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# Effect of Modified Constraint Induce Therapy on affected upper extremity of Mild - Moderate Spastic Hemiplegic Cerebral Palsy children

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***Abstract:***
***Objectives:*** *The study was conducted to determine the effects of MCIT on the affected upper extremity among Mild - Moderate Spastic Hemiplegic children.*
***Study Design:*** *Randomized Control Trial (RCT)*
***Study Settings & Participants:*** *An experimental study was conducted on 30 participants at a renowned CP Centre in Karachi.*
***Procedure:*** *The participants were randomly divided into Group A that received MCITwhereas group Bwas given conventional therapy.Group Aparticipants restraint non-affected arm and involve in different activities by using the affected arm while the other group performed different selected activities using both the arms.Data was recorded in a treatment sheet where PAFTwas used as a measurement tool.Data was analyzedusing SPSS version 20*
***Results:*** *Results revealed significant improvements on affected hand in both the groups but MCIT isfound to be more effective than conventional therapy. Results were independent of children age and genderbut were dependent on degree of spasticity.*
***Conclusion:*** *MCIT has proved more effective than conventional therapy. Therefore Continuation of this program will give better result and ultimately improve the quality of life of hemiplegic children.*
***Key Words:*** *Spastic Cerebral Palsy, Hemiplegic, ModifiedConstraint Induced Therapy, Effected side Arm, functional arm test.*

## I. Introduction

Cerebral Palsy (CP), is termed as a lesion or damage to the brain causing non progressive movement impairment syndrome[1] affecting approximately 2 in 1000 births in US and million children in below 21 in other developing and under developed countries. Generally there are number of syndromes under the umbrella of CP, but they may differ with each other in symptoms and etiologies. The prevalence of Asymmetric CP is found to be one third among all the cases of CP,mostly the lesion occur in prenatal, perinatal or in very early antenatal age[2,3]. There are number of treatment approaches for CP but the efficacy of the treatment options still has a considerable question mark[4-10]. The motor deficit affecting the upper extremities generates many complications in daily living activities and in need of a specialized rehab program to solve this serious concern. There are different Physical therapy and Occupational therapy approaches to CP, but their affects are still obscure because of the lack of Randomized control trials[6-8]. Constraint induced movement therapy (CIMT) is an auspicious and new approach for rehab for the hemi-paretic CP children. It has two principles on which it works, first is constraint of the least affected arm and hand and second is thorough and repeated training of different type of activates with the affected arm and hand[11]. A family of neuro-rehabilitation techniques termed constraint-induced movement therapy has been developed in over the past 25 years. This technique examined and intervened on adult and infant Monkeys[12-13]. Translation of the technique to human began with application to the upper extremity of chronic stroke patients. Constraint-induced therapy was potentially successful for children with cerebral palsy given the great plasticity of their central nervous systems. The aim of Constraint Induced Movement Therapy (CIMT) enhances the function of affected upper limb by performing activities repetitively. In true constraint procedure, apply POP cast on patient's non affected hand for 06 months, but constraint can also be applied by tying the hand with sling, by use of splint. A planned program of activities was selected, including games or sports activities which is fundamental for the growth of all children and is central point to their survival.

Different researches provided evidence that the adult stroke patients have adapted cortical zone controlling movement of more involved limb after applying constraint induced movement therapy [14-15]. Children

retain better brain reorganization capabilities after lesion then adults. The neuron plasticity is assumed to be more active in early decade of life. Because the brain cells (called neuron cells) are alive in the early years of post-natal growth. The neuron substrates for hand control, however, it maintains to expand over the initial 2 decades of life, which recommends the incidence of neuroplasticity in elder children as well. Constraint induce therapy is based on the theory that hemiplegic child does not use affected limb, and thus non-use deformity develops, for the reason that it is more comfortable for the child to utilize their normal arm and ignore their affected side continuously.In every therapy or intervention home based exercise programs are very important. Parents or caregiver and therapist interaction plays very crucial role for progress of any intervention or treatment. In this study we also involve parents or caregivers to follow same protocol at their home. Because children spend most of the time with their family, if parents motivate them to use their affected limb during play and other daily work then the outcome of study will be better. Various scales are available to measure rehabilitation like Jabsen Taylor test Paralytic Arm Function Test, for the analysis of affected extremity. In our study we were using paralytic arm function test (PHFT)[16].

## II. Material And Methods

**Study Design**

Randomized clinical experimental trail study, used to evaluate the effectiveness of Modified Constraint Induced Therapy on effected upper extremity among Mild to Moderate Spastic Hemiplegic children.

**Study Settings**

This study was conducted in renowned and densely populated region, including cerebral palsy children center, in Karachi, Pakistan.

**Duration Of Study**

The data were collected in 6 months duration.

**Sample Size**

Children with diagnosed cerebral palsy .Participant had divided in two groups:
Group A: MCIT Group
Group B: Conventional Group
Sample size:
30 Children were randomly selected with 15 Children in each group.

**Group A**

Intervention session was applied three days in a week in the CP Centre, and rest of four days the parents and caregiver were explained to follow these exercises program at home. Non affected hand was exhausted after five hours a day. Therapy session time was 45 minutes.Before starting (MCIT) all children were seated on comfortable position in group in front of activity table and therapist performed Range of Motion exercises (ROM) of both upper extremity. Then elbow immobilizer was applied on non-affected side. After that MCIT session started. Sometime children show aggressive and irritating behavior when the non- affected limb is constrained with sling. The therapist will have to develop interest with modifying activities while giving some rest and motivation to get better result and outcome. After removing elbow immobilizer or sling, therapist should give visual check to the skin for any adverse reaction to the therapy like skin rashes.

**Group B**

Before starting activities all children were seated on comfortable position in group in front of activity table and therapist performed Range of Motion exercises (ROM) of both upper extremities.
In control group, children both hands were free to move. Therapist only give verbal instruction to perform activities. Therapist observed that children either use their affected hand or not on verbal instruction.

**Sampling Technique**

Sample is selected through convenience probability sampling technique.

**Inclusion Criteria**

- Hemiplegic Cerebral Palsy children with (mild to moderate spasticity).
- Age ranges between 4 – 20 years.
- Both male and female genders were included.

**Exclusion Criteria**

- Children with health problems not associated with cerebral palsy.
- Severe Epileptic.
- Severe spastic (fixed contracture formed in elbow, wrist joint).
- Children with severe vision problem.
- Any post-orthopedic surgery on their involved upper extremity

## III. Data Collection Procedure

We have used treatment sheath for Data collection. Ten different simple activities were performed. Which were, 1-Reaching 2-Grasp the gross object, 3-Press soft rubber toy, 4-Take out peg from peg board, 5-Put in peg piece into peg board, 6-Play with single key of musical key board, 7Hit the ball with stick 8-Bring the hand to the mouth 9- Remove handkerchief or napkin, 10- Put glass of water on the table.

## IV. Data Analysis Procedure

Data was analyzed through SPSS 20 version. Frequency and Percentage were determined for demographic information. Mean was calculated for the age. Multiple response analysis was carried out to see the treatment response on 6 months. To analyze the significance between the both group independent T Statistical test was applied.

**Tools for data collection**

Recorded the scores of each activity by using Paralytic Arm Function Test (PAFT) as tool on monthly basis.

**Ethical considerations**

Approval was taken from concerned authorities of the Rehabilitation Centre fromwhere the information was obtained.

## V. Result

The effectiveness of Modified Constraint Induced Therapy was assessed on 30 participants with CP were selected comprises of 63.3% male and 36.7% of female. Table 1 is showing the Demographic information of entire participants. Ages ranged from 4 years to 20 years, with a mean age of 10.41. From 30 participant 53.3% right hand affected 46.7 % are left hand affected. Moderate spastic are 46.7 % and 53.3 % are mildly affectedchildren.To analyze the significance between the both group independent T tests was applied. Table 2 lists mean post-treatment scores and their standard deviation, effect size. Indicates and significance values.Statical analysis of 6 month result of 10 different activities showed in table 2 in which SD value and P showed that MCIT group more effective than conventional therapy group.Children immediately after constraint-induced therapy used their more-impaired arm in daily life more frequently and with better dexterity than children immediately after usual and customary care. The Immediate Constraint-Induced Therapy Group had a very large increase on the Pediatric Motor Activity Log relative to the Control Group(P value is <0.005)

Table 1: Demographic Information

| **Age** | Valid Percent |
|---|---|
| Group A | 10.7±4.5 |
| Group B | 10.1±4.8 |
| **Gender** | |
| Male | 63.3% |
| Female | 36.7% |
| **Affected hand** | |
| Right | 53.3% |
| Left | 46.7% |
| **Diagnosis** | |
| Mild | 53.3% |
| Moderate | 46.7% |

| Table 2 | | | |
|---|---|---|---|
| Variable | Treatment | Mean±SDPost | P-value |
| Grip gross object | MCIT | 2.27±.884 | .024 |
| | Conventional | 1.60±.828 | |
| Press soft rubber toy | MCIT | 2.20±1.014 | .002 |
| | Conventional | 1.07±.799 | |
| Take out peg from peg board | MCIT | 3.60±.632 | .000 |
| | Conventional | 1.93±1.100 | |
| Put in peg piece into peg board | MCIT | 3.27±.961 | .000 |
| | Conventional | 1.87±.640 | |
| Bring hand to mouth | MCIT | 2.93±.884 | .000 |
| | Conventional | 1.60±.910 | |
| Play single key of musical key board | MCIT | 3.67±.617 | .012 |
| | Conventional | 2.60±1.352 | |
| Hit ball with stick | MCIT | 3.53±.743 | .000 |
| | Conventional | 1.73±.961 | |
| Remove handkerchief | MCIT | 2.67±.900 | .000 |
| | Conventional | .93±.704 | |
| Put glass of water | MCIT | 2.53±1.125 | .000 |
| | Conventional | .87±.743 | |

## VI. Discussion

The present study shows that MCIT program induced a significant improvement of effected upper extremity use, function and ultimately improvement in bimanual function in Cerebral Palsy Children. These results were obtained at the six months follow up study. On the other side the conventional therapy program did not bring any significant improvement. Because in conventional therapy children's both hands are free to perform any activities. Due to impairment in brain areas children are reluctant to use effected side to perform activities. They feel relaxed to use sound hand for activities.

One main finding is that nonuse deformity, which is relevant problem in the rehabilitation of unilateral arm paresis, can be to some extent reversed by treatment. This is very important in Cerebral Palsy, because these children grown up without previous experience of normal arm motor function. This condition hinders the development of normal movement, strongly favoring the use of the least affected arm. Previous study support that outcome of study has not depend upon child age. [16] Similar in this study, data showed child age has no effect on hand improvement.In Taub's study apply plaster of Paris for constraint child's arm for 24-hours for the period of 1 month[18].Other studies constraint child arm by apply cast for short period of time that children restrained, while still improving motor performances in the involve hand[15-18]

In this study, constraint child's arm with elbow immobilizer or sling for five days in weeks duration of 5 hours for the period of six months. Children showed their interest and actively participated in simple play activities without irritation and enhanced their motor performance. Some study showed initially those children use their affected hand less effectively during bia-manual task; performed more efficiently while given any task[16] al. But our finding belongs to uni-manual hand performance. Three randomized controlled trials that have been used widely efficient. Professionally endorsed forms to physical rehabilitation, failed to report significant result. [17-18]the others randomized trials showed possible and/or small-amount of benefits. [19-20]

These results markedly differ from those of four studies where restraint of the non-affected upper extremities alone. It was used for varying periods, children suffered with hemi paresis, without prior intensive training of the component of pediatric CI therapy. [21-22]Restraint alone, for the limited period was found to be a weak result in a modest therapy regime. Study proved that when both restraint plus the training components of pediatric CI therapy were used, that are the only portion to obtain fruitful result in this program. Although restraint alone popularity increase now a day. It would seem to be a limited value when active training has limited coupled, as by a shaping technique.

C.P. infants and toddler involves delay or permanent neuro-motor and sensory dysfunction. They also have deep effects on other functional, auditory, visual, sensory and cognitive domains. Their physical and sensory deficit cause inadequate response in the level of social environment. The consequences of major motor disabilities are profound for all aspects of a child's quality of life. [23-24] It would be a worth to ascertain more systematically than we did the extent to which pediatric CI therapy itself contributes to changes in other developmental domains. While presume introducing new motor capabilities into the child's behavioral and allowed the child to experience in rapid gains. Children received pediatric CI therapy which increased their self-confidence, interacted more with their environment, and demonstrated new sensory awareness of the effected extremity.It should be observed that pediatric constraint-induced therapy is not a "cure" for motor deficit in children with cerebral palsy. It does not make movement normal, nor is that its objective.

It is important to make this clear to parents of participating children to avoid disappointment with a good result. Result of MCIT also depend on the cognitive status of children those children having mild to border line and normal IQ level giving better response as compare to moderate and profound IQ level children.

## VII. Conclusion

Modified Constraint induced therapy MCIT involves constraint of the unaffected extremity and intensive treatment of the affected arm. A quantitative study has been performed to investigate the effectiveness of MCIT in 30 children among the mild to moderate Spastic Hemiplegic Cerebral Palsy. Three modifications that differentiate the study from earlier CIM therapy studies were introduced with the aim of improving endurance of the treatment;First, the use of gentle restraint (use of elbow immobilizers, gloves or sling) and verbal instruction instead of prolonged physical restraint (apply Plaster of Paris).Secondly, the use of structured activities and take part in therapy. Results suggest that a significant improvement occurred in upper limb function after the intervention in these children with hemiplegic CP. The use of gentle restraint and verbal instruction was found to be effective, and the activities were well tolerated. Both were easy to administer and were suitable to the participant.Thirdly,the treatment intensity and repetition for many hours was also important.

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