COMPARISON OF CONSTRAINED INDUCED MOVEMENT THERAPY AND BIMANUAL TRAINING ON FUNCTIONAL OUTCOME OF HEMIPLEGIC CEREBRAL PALSY

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ABSTRACT

OBJECTIVES

The aim of this study was to compare the effects of constrained induced movement therapy (CIMT) and Bimanual Intensive Training (BIT) on functional outcomes of hemiplegic cerebral palsy children.

METHODOLOGY

Cerebral palsy children with age groups of 5 to 12 years were included with a total sample size of 38. Simple random sampling was done, and data was collected from Islamabad. Two groups were formed and named group A: constrained induced movement therapy with 19% and group B: bimanual training with 19% respectively. The functional outcome for the CIMPT and for the BIT group was assessed on the pretest and post-test score evaluation of QUEST and JTHF tests.

RESULTS

Statistically significant ($p < 0.05$) improvement was found in The Quality of Upper Extremity Skills Test (QUEST) and Jebsen-Taylor Test of Hand Function (JTHF) in the between-group analysis. For within the group analysis the p-value < 0.05 suggests that there was a significant difference in within-group analysis too. The values for grasp and dissociated movements suggest that QUEST post-test values are impactful in the CMIT group whereas in the BIT group simultaneous and spontaneous movement was increased but JTHF post-test values were more significant in CMIT.

CONCLUSION

BIT is more beneficial for both hand's simultaneous and spontaneous movement, whereas CMIT is more beneficial for grip and overcoming the "learned-nonuse" phenomena in cerebral palsy children.

KEYWORDS: *Constrained Induced Movement Therapy, Bimanual Training, Functional Outcome, Cerebral Palsy*

How to cite this article:
Iqbal H, Hussain A, Khan E, Zahid A, Shafiq M, Khalid M, et al. Comparison of Constrained Induced Movement Therapy and Bimanual Training on Functional Outcome of Hemiplegic Cerebral Palsy. J Gandhara Med Dent Sci. 2022;9(4):9-13
https://doi.org/10.37762/jgmds.9-4.304

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INTRODUCTION

Cerebral palsy comprises a combination of permanent disorders of movement and posture that is caused by non-progressive disturbances that occur in the developing brain. The incidence of which is 2-2.5 per 1000 live births in developing countries. One-third of this estimate is occupied by hemiplegics.[1] Since the reliability of the motor cortex and the cortical-spinal cord for precise grip and fine control fingers are damaged and skilled movements of the fingers and hands do not adapt often they are reluctant to use the affected limb which is called developmental disused.[2] One-sided defects in children include increased muscle tone, decreased power, stamina and range of motion, and impaired proprioception and touch sense. These defects lead to problems in holding,

attaining, and handling objects.[3] Also, two-sided coordination is affected in these children. In other words, actions that necessitate both hands are difficult for them.[4] Despite having adequate aptitude in the affected limb, these children are usually performing tasks with their unaffected limb by using alternative approaches.[5] These perspectives are strengthened over time making rehabilitation of the paretic limb of these children more complicated. Cerebral Palsy is a broad term referring to complications of motor control or movement of the body caused by an injury to a child's brain. The brain injury can occur before birth, during birth, or in the first few months following birth and physical symptoms, like hemiplegic or hemi paresis, appears in first few months of life. A child with weakness or paralysis on one side of the body may be termed or labeled as hemiplegic cerebral palsy**.** People sometimes discuss right or left sided hemi paresis depending on where on the body the child is suffering from the weakness. An injury to the right side of the brain will cause left hemiplegic (left side of body is weak) and an injury to the left side of the brain will result in right hemiplegic (right side of body is weak). Common abbreviations for these conditions are often RH (right hemiplegic) and LH (left hemiplegic). Motor insufficiency of upper limb function will lead to problems in all actions such as self-care, school and leisure and/or play activities.[6,7] Constraints Induced Movement Therapy (CIMT) and Bimanual Intensive Training (BIT) are well known approaches provided solutions for children with hemiplegic to practice and so may improve their movement and posture.[8] CIMT is an inventive approach in the treatment of hemiplegic. It is based on two principles: constraints of unaffected limb and at the same time, intensive practice with affected limb. It has been well-known that this technique is effective therapy for children and adult with hemiplegic.[9] BIT is also used for upper limb management. It aims to improve bilateral synchronization with the usage of planned training with in the functional actions and bimanual games.[10] CIMT and BIT training have recently drawn an immense deal of consideration. the effects of CIMT based on the significance of the children with hemiplegic six hours daily for ten consecutive days.[11,12] The rationale of the study was to check the results of applied both tests simultaneously on functional outcomes, to check the outcomes in spastic cerebral palsy and to check the results in the given due time. These all factors were not studied in previous studies.

METHODOLOGY

A randomized control trial was conducted on the sample of thirty-eight hemiplegic children and the data was collected from AL-FARABI school of special education, after the approval taken from directorate general of special education G-8 Islamabad. The study was completed in the duration of six months from January 2019 to June 2019. Each group consisted of 19 patients calculated by open epitool. Sampling technique was randomization through lottery method. The inclusion criteria consisted of patients with age group of 5-12 years of both genders who have active PIP extension, active wrist extension and thumb abduction. Patients who fall on level II on MAC system with mild spasticity of spasticity scale of QUEST test. Patients who fall on level II on MAC System were included and had cognitive dysfunction (screening by WISC Wechsler Intelligence test for children) secured score above 80. QUEST, JTHF AND WISC-V were used to assess the cognitive and reasoning skills of patients. After taking permission from ethical view committee, data was collected by using above mention tools and settings an inform consent was taken from each patient. Before collecting data each detail of the study was provided to the patient with total assuredly of their confidentiality. Participants were randomly allocated group A and group B with CIMT and bimanual training respectively. Data analysis is done by using SPSS version 21 and graphs are made on Microsoft excel 2010. The p value of Shapiro-Wilk test suggests that nonparametric test will be applied as p value < 0.05. Based on this p-value inter and intra group analysis is done by Man Whitney test and Wilcox on test respectively.

RESULTS

Table 1: Normality Check and P-Value <0.05 Suggests Nonparametric Tests

Variables	Shapiro-Wilk test
QUEST total score pre-test	0.005
QUEST total score post-test	0.000
JTHF total score pre-test time in seconds	0.001
JTHF total score post-test time in seconds	0.033

Table 2: Shows the Type of Hemiplegic Side in Both Groups with Percentages

Hemiplegic Side	Group A f(%)	Group B f(%)
Right hemiplegic	10(52.6%)	15(78.9%)
Left hemiplegic	09(47.4%)	04(21.1%)

Table 3: Inter Group Analysis Man-Whitney Test

Variables		Median	IQR	Z-Value	Mean Rank Value	P-Value
QUEST total score pretest	CIMT	32	08.00	-1.477	10.00	0.146
	BIT	38	05.00		0.00	
QUEST total score post test	CIMT	55	10.00	-2.325	10.00	0.020
	BIT	56	04.00		0.00	
JTHF total score pretest time in seconds	CIMT	500	120.00	-1.360	10.00	0.181
	BIT	530	114.00		0.00	
JTHF total score post-test time in seconds	CIMT	690	150.00	-2.472	10.00	0.013
	BIT	770	140.00		0.00	

Table 4: Wilcox Shows the Median and IQR of CIMT Group

Variables	Median	IQR	Mean Rank	P-Value
QUEST total score pretest	32	08.00	10.00	0.001
QUEST total score post test	55	10.00	0.00	0.001
JTHF total score pretest time in seconds	500	120	10.00	0.001
JTHF total score posttest time in seconds	690	150	0.00	0.001

Table 5: Wilcox Test Shows the Median and IQR of BIT Group

Variables	Median	IQR	Mean Rank	P-Value
QUEST total score pretest	34	4.00	10.00	0.001
QUEST total score post test	58	9.00	0.00	0.001
JTHF total score pretest time in seconds	530	100	10.00	0.001
JTHF total score posttest time in seconds	820	90	0.00	0.001

DISCUSSION

The functional outcome of affected hemiplegic side and upper limb is very necessary and important aspect regarding the rehabilitation of cerebral palsy patients. Children with hemiplegic cerebral palsy suffer from various limitation and hindrance in the functional daily active livings. This impairment limits their social and individual interaction, confidence, self-respect and most importantly dependence on adults or care giver's for their daily routine tasks like eating, dressing and self-grooming. The rehabilitation protocol of CIMT and BIT has become very potent tool against the limitations of paretic side in children with cerebral palsy and stroke patients. The studies on neuroplasticity show that there are structural and functional changes in brain with time in paretic upper limb children and stroke patients.[13,14] During neuronal activities many premotor areas and supplementary motor areas along with motor cortex shows increased electrical and metabolically activity with the CIMT and modified treatment. Therefore, there is strong evidence that CIMT promotes the motor activity.[15] In the prospective study we measured the functional outcome of hemiplegic children with the quality of life (QOL) test and JTHF test regarding its better scores in CIMT group and BIT. The better scores of QOL shows that there is much improvement in dissociated movements, grasp and resistance training in BIM bimanual training group and increased functional outcome whereas the JTHF results improvement in grasp and various other activities in CIMT group because hemiplegic cerebral palsy child started taking less time in accomplishing tasks with the affected side and become more useful and affective. The pretest value of mean and standard deviation of both tests in inter groups analysis is high and shows that p value is greater than 0.05 and there is significant difference whereas the posttest values are less than 0.05 which depicts that there is significant difference in between group analysis and values. The previous studies also show that the combination of CIMT and BIT is used for the functional outcome and compared with simple CIMT training the combination would give far better results than just one simple treatment or intervention.[16,17] The study conducted over hemiplegic on upper limb after stroke by Sana Batool and others researchers studied the comparison of CIMT, and motor relearning programmed on forty-two participants at civil hospital Karachi concluded that there was improvement in CIMT group and evaluated on functional independence measure scale but on acute and chronic conditions further investigations can be done.[18] The recommendation of the study is that more complex task training can also be assessed in future studies. The functional outcome of CP can also be after 3 weeks period instead of 6 weeks and other tests AHA and HABIT etc can also be applied.

LIMITATION

The limitation of this study was the age group

taken as five years least age and twelve years most age. As for rehabilitation point of view the younger age group we take the better and quicker results we can extract from protocol. The study was only conducted on hemiplegic cp. This protocol or intervention can also be applied on bi-plegic or tetra - plegic. This intervention focusses on basic hand function it is not applied on fine tasks and skilled movements.

CONCLUSION

The result of our study provides the sound experimental ground for hemiplegic Cerebral Palsy that CIMT and BIT is quite beneficial for 6 weeks session, however BIT is proved to be good for spontaneous and simultaneous hand function and for functional improvement of daily active living whereas CIMT is quite beneficial for eradicating the learned no use phenomena in cerebral palsy children.

CONFLICT OF INTEREST: None

FUNDING SOURCES: None

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