



## A Comparative Study On Effectiveness Of Conventional Physiotherapy Versus Bimanual Therapy To Improve The Upper Limb Functions Among The Children With Hemiparetic Cerebral Palsy

### KEYWORDS

Cerebral palsy, Conventional Physiotherapy, Bimanual Therapy, Paediatric Motor Activity Log.

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**ABSTRACT** *Background: Hemiplegia is a form of cerebral palsy. These children have limitations in capacity to use the impaired upper limb and bimanual coordination deficits which has impact on daily activities and participation in home, school and community life. This study aims to compare the efficacy of Conventional versus Bimanual therapy to improve the upper limb functions among the children with hemiparetic cerebral palsy.*

*Methods: 12 children with hemiparetic cerebral palsy were randomized to the Conventional or and bimanual group. Interventions lasted for 4weeks, 2hrs/day, Paediatric Motor Activity Log (PMAL) was used to assess the children's upper limb functions before and after intervention.*

*Results: Both groups showed significant improvement on functional measures of PMAL. However when the outcome measure were compared between the two groups, significant difference was observed in bimanual therapy than conventional Physiotherapy.*

*Conclusion: Bimanual training was more effective than conventional therapy in upper limb functional activities among the children with hemiparetic cerebral palsy.*

### Introduction

Cerebral palsy (CP) is a disorder of movement and posture due to non progressive lesion in the foetal or infant brain. It may occur before, during or after birth<sup>1</sup>. It is the most common cause of disability in childhood and has an incidence of 2 – 2.5 per 1,000 live births. Spastic hemiparetic is a type of cerebral palsy due to lesion of brain in one hemisphere and as a result, the contra lateral side of body is affected and have the impairments of muscle paralysis or weakness<sup>2</sup>.

Most of the children with hemiplegic CP rarely use their impaired hand for unimanual tasks. The affected hand is typically used when there is need for bimanual task performances. Bimanual actions are more complicated than unimanual actions as the movements of both arms and hands must be coordinated temporally and spatially to complete a task or achieve a desired goal, but many everyday tasks require coordinated use of both arms and hands<sup>3</sup>.

Limitations in activity or Poor bimanual performance are often the greatest functional impairment for children with hemiplegia in areas such as self-care, school and household related activities. So participation can be restricted in home, school and broader community life and may in turn impact on quality of life. Interventions are aimed to minimise the disability, and optimise functional independence, career activities and social participation<sup>4</sup>.

Conventional Physiotherapy includes passive movements, passive stretching, active movements, active assisted exercises, Resisted exercises. All these exercises are used to improve the functions of limbs<sup>5</sup>. If it is applied only in affected side, it is considered as a unimanual intervention.

Bimanual therapy is a new interventions aimed at increasing the efficiency of movement in the context of using

both hands together in daily functions. It involves intensive bimanual training and performed in group settings with an emphasis of having fun<sup>6</sup>. It is based on the principles of Motor learning which would suggest that improvement in use of two hands together will be maximised by repetitive practice and bimanual goal directed tasks<sup>7</sup>.

### Methods

• **Study Design:** An experimental study was conducted to find out the effects of conventional therapy versus bimanual therapy on children with hemiparetic Cerebral Palsy.

• **Sample :** 12subjects were selected after giving due consideration to inclusion and exclusion criteria. They were divided into 2 groups; group A of 6 and group B of 6 hemiparetic children with Cerebral Palsy.

• **Sampling method :** Random sampling technique was used to select the samples.

### • Inclusion Criteria:

1. Diagnosis of hemiplegic cerebral palsy by a medical specialist
2. Both gender with children aged 8 to 12 years
3. Modified Ashworth scale (MAS) grade>1but<3
4. Sufficient co-operation and cognitive understanding to participate
5. Ability to extend the wrist greater than 20° and the fingers at the metacarpo phalangeal joints greater than 10° from full flexion
6. The ability to lift the involved arm from the table surface to six inches above

### • Exclusion Criteria:

1. Prior upper limb surgery

2. uncontrollable seizures
3. Botulinum toxin A injection in the upper limb within 6 month prior to study
4. Visual problems

**Outcome measures**

Paediatric Motor Activity Log

a )How often scale

b )How well scale

Paediatric Motor Activity Log (PMAL) is the Motor Activity Log scale which developed for children with unilateral CP and includes a mixture of unimanual and bimanual activities. The child's caregiver was interviewed to evaluate how well and how often the child used their affected upper extremity based on 22 functional activities of young children. The PMAL was scored on a scale from 0-5.

**Procedure**

12 hemi paretic cerebral palsy children were selected and divided randomly in to 2 groups A and B, 6 numbers in each group. Consent was obtained for the participation of the child and the child's parent prior to enrolment .Pre evaluation was done by Paediatric Motor Activity Log (PMAL) .Group A was treated by Conventional Physiotherapy. Group B was treated by bimanual therapy. Intervention were delivered to children for 2 hours per day 4 weeks. Post intervention readings were taken after 4 weeks on the outcome parameter.

Conventional physiotherapy group were received passive movements, stretching, active movements, Active assisted exercises, and resisted exercises.

Bimanual activities were selected and directions were given to the child before the start of each task in order to specify how each hand would be used during the activity and to avoid use of non-involved extremity only. If a child attempted to use the non-involved hand, the task was paused and the child was reminded of the task rules, at the same time avoid urging the child to use his/her involved hand. Task difficulty was graded by speed and accuracy.

The data were collected from the samples and they were processed with the application of paired t- test for pre and post intervention; unpaired t- test was used to compare the outcome measure of both groups at 0.05 level significant.

**Data analysis and Results**

The aim of the study was to compare and find out the effectiveness of Conventional Physiotherapy and Bimanual therapy to improve the upper limb functions on children with hemiparetic cerebral palsy.

**Table 1 : Comparison between pre and post PMAL in group A**

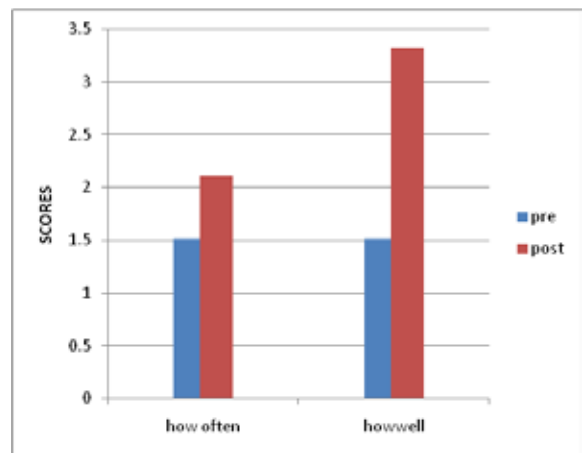
Variables	Group A	Calculated t value	Table value
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PMAL		Mean	SD±		
How well	PRE	1.51	0.22	4.35	2.571
	POST	2.11	0.30		
How often	PRE	1.51	0.22	11.32	
	POST	3.33	0.55		

PMAL- Paediatric Motor Activity Log

Table 1 displays the PMAL values for both how well and how often scale of pre and post treatment of group A. In group A, results showed significant differences in improvement on PMAL in both how well( 4.35)& how often scale (11.32) which is greater than table value (2.571),so the significant improvement in PMAL score in Conventional Physiotherapy group A.

**Graph 1:** Comparison between pre and post Mean of PMAL in group A

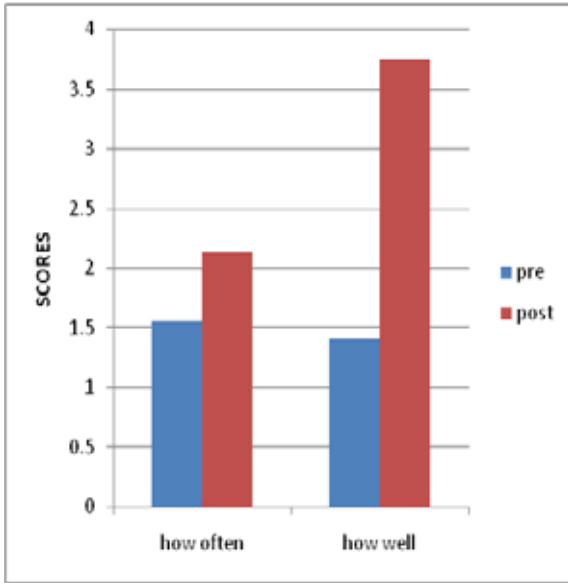


**Table 2: Comparison between pre and post PMAL in group B**

variables		Group B	Calculated t value	Table value
PMAL		Mean	SD±	
	How well	PRE	1.56	0.15
	POST	2.13	0.21	
PMAL				16.45
	How often	PRE	1.41	
	POST	3.76	0.26	

Table 2 displays the PMAL values for both how well and how often scale of pre and post treatment of group B. In group B, results showed significant differences in improvement on PMAL in both how well (7.85) & how often (16.45) which is greater than table value (2.751s). So the significant improvement in PMAL scores in bimanual therapy.

**Graph 2:** Comparison between pre and post Mean of PMAL in group B

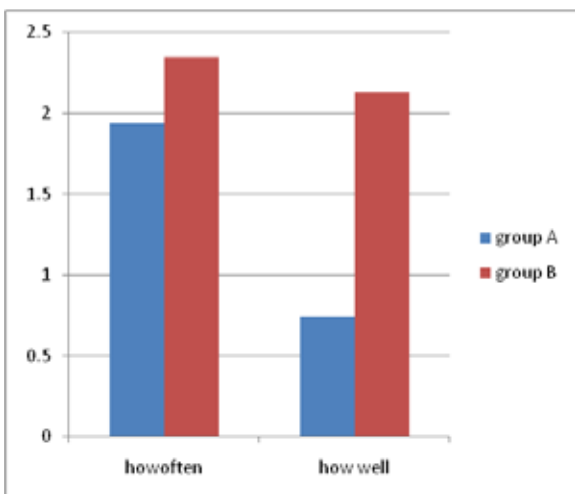


**Table 3: Comparison of PMAL between group A and group B**

PMAL	Group A		Group B		Calculated t value	Table value
	Mean	SD	Mean	SD+		
How well	0.74	0.32	2.13	0.21	3.85	2.228
How often	1.94	0.10	2.35	0.64	12.75	

Table 3 displays the PMAL values for both how well and how often scale in group A and group B. In both group A and B results showed significant differences in improvement on PMAL in both how well & how often scores which is greater than table value (2.228). But PMAL-how often score is highly significant than in PMAL-how well score in both Conventional and Bimanual therapy group.

**Graph 3:** Comparison of mean of PMAL between group A and group B



On comparison, Bimanual training in group B was found to produce more statistically significant in PMAL-how often and how well scales than Conventional Physiotherapy in

group A.

**Discussion**

Present study was done to find out the effectiveness of conventional therapy versus bimanual therapy to improve upper limb functions in children with hemiparetic cerebral palsy.

The Conventional Physiotherapy had been proven to be effective in improving functional activities of upper limb. The result came in agreement with Zhang et al<sup>5</sup>, Tin et al<sup>8</sup> and Anderson et al<sup>9</sup>. Improvement of functions may be, due to the use of affected hand more in bilateral activities.

The result of the study showed that Bimanual therapy were more effective in improving upper limb functions. It came in agreement with Charles et al<sup>6</sup>, Gordon et al<sup>7</sup> and Boyd et al<sup>4</sup>.

Improving functional activities may be, using the principles of motor learning, and neuro plasticity<sup>7</sup>. The brain and spinal cord underlying human dexterity are capable of considerable reorganization after damage, likely responsible for recovery of function. Pathways on the same (ipsilateral) side of the impaired upper extremity have been implicated in the control of the affected hand in CP. Thus, task recruitment of these ipsilateral pathways, such as symmetrical bilateral movements, may be beneficial. Bilateral practice may result in changes in cortical representations and excitability in the brain<sup>8,9,10</sup>.

The most appropriate goal for the hemiparetic CP is to improve the functional activities of upper limb by increased quality and quantity of bimanual use of arms and hands<sup>11</sup>.

The result of this study showed that Experimental group B who received Bimanul therapy had better improvement in upper limb function than group A who received Conventional Physiotherapy.

**Conclusion**

Bimanual therapy is an effective treatment method than Conventional Physiotherapy to improve upper limb functions among the children with hemiparetic cerebral palsy.

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