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A comparative study on conventional therapy and hand arm bimanual intensive therapy on manual ability of upper limb functions among hemiparetic cerebral palsy children

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Abstract

Background: Cerebral palsy is the most common pediatric physical disability, with an incidence of 2.0–2.5 cases per 1000 births. Spastic hemiplegia accounts for more than one third of all new cases and the impairments of upper extremities affect the functional independence and quality of life.

Methods: Ten children with hemiparetic cerebral palsy were treated by conventional therapy and Hand arm bimanual intensive therapy (HABIT). Interventions lasted for 12 weeks, 3hrs/day, ABILAND KID Questionnaire was used to assess the children's manual ability of upper limb functions before and after intervention.

Results: Conventional therapy and HABIT showed significant improvement in manual ability of upper limb functions among hemiparetic cerebral palsy children. But there was more significant difference in HABIT group.

Conclusion: HABIT was more effective in improving manual ability of upper limb functions among the children with hemiparetic cerebral palsy.

Keywords: Cerebral palsy, conventional therapy, hand arm bimanual intensive therapy and ABILAND KID questionnaire

Introduction

Cerebral palsy (CP) is: “an umbrella term covering 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.”^[1] hemiplegic CP is the result of early brain damage, including brain malformations, peri ventricular brain lesions and non-progressive post-natal brain injuries. Movement impairments are more in one side. The upper extremity usually being affected more than the lower extremity.^[2]

Impaired hand function is a major disability in children with hemiplegic CP as a result, children often fails to use the involved upper extremity and learn to perform most tasks exclusively with their noninvolved upper extremity leading to additional impairments secondary to neural damage.^[3]

Treatment for cerebral palsy mainly focuses in maximizing child's potential, facilitate motor development, and enhance independence in motor skills, self-care, and play and leisure activities.^[4]

HABIT focuses on structured practice increasing in complexity, functional activities that necessitate bimanual hand use and a child-friendly intervention protocol that takes into account children's goals and parental involvement. Participation in HABIT involves active learning and problem solving for children to discover their bimanual capabilities. Targeted movements and spatial and temporal coordination are practiced within the context of completing a task.^[5] HABIT'S emphasis on functional activity performance also directly addresses the recent modification of the definition of CP, whereby it is considered a disorder of movement and posture causing activity limitation.^[6]

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Methods

- **Study design:** An experimental study was conducted to find out the effect of Conventional therapy and HABIT on manual ability of upper limb functions among hemi paretic cerebral palsy
- **Sample:** 10 subjects were selected after giving due consideration to inclusion and exclusion criteria.
- **Sampling method:** Random sampling technique was used to select the samples.
- **Inclusion criteria:**
 1. Diagnosed hemiplegic cerebral palsy
 2. Both gender with children aged 8 to 12 years
 3. Sufficient co-operation and cognitive understanding to participate
- **Exclusion criteria:**
 1. Prior upper limb surgery
 2. Uncontrollable seizures
 3. Botulinum toxin injection in the upper limb within 6 month prior to study
 4. Visual and cognitive problems

• Outcome measures

ABILAND Kids Questionnaire

Manual ability was measured with the ABILHAND-Kids questionnaire. This questionnaire measures the child's capacity to manage daily activities requiring the use of hands and upper limbs. Twenty-one, mostly bimanual activities were rated by the children's parents on a three level-scale (0: Impossible, 1: Difficult and 2: Easy) by providing their child's perceived difficulty in performing each activity. The parents were instructed to give their responses when the activities were done without any technical or human help, irrespective of the hand actually used to do the activity and whatever the child's compensatory strategies [7].

Procedure

10 hemi paretic cerebral palsy children were selected for the study and were divided into 2 groups 5 children in each group. Consents were obtained from the parents prior to enrolment. Pre evaluation was done for manual ability of upper limb functions by ABILAND Kids questionnaire. The children were treated by conventional therapy and HABIT. Interventions were delivered daily 3 hours and the same was continued for a period of 12 weeks. Post intervention readings were taken after 12 weeks on the outcome parameter.

In conventional group, children were treated with passive movements, stretching exercises, active assisted, active exercise and resisted exercises. [8, 9]

In HABIT group, 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. 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. The principle of bimanual therapy is to promote intensive practice and repetition in part- and whole-task movements, increasing complex bimanual skills, in timing, accuracy and fine manipulation. The training includes Bottle and marbles activities, Dough activities, Throwing or catching different sized balls, Transferring cube from non-

affected to the affected hand and towered cubes, Stacking rings, Stringing beads, Alternate banging and clapping movements, Fastening clothing, button and unbutton buttons, open and close zip, Twist the lid of the jar, Twist and press a lock and its key and Cutting of paper by scissors [10, 11].

The data were collected from the samples and analyzed with the application of paired t- test for pre and post intervention; unpaired t- test was used to compare the outcome measurement between groups.

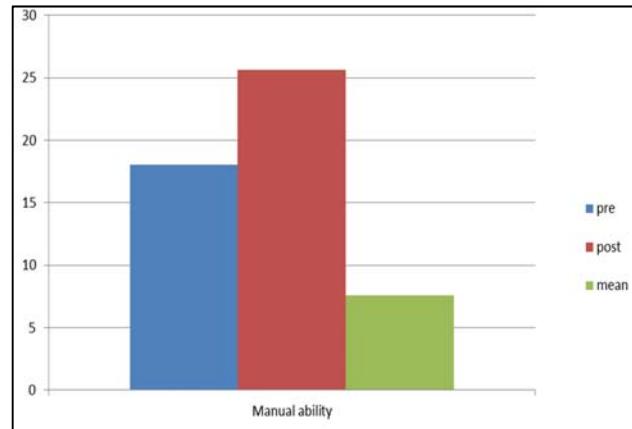
Data Analysis and Results

The aim of the study was to find out the effectiveness of conventional physiotherapy and bimanual therapy on manual ability of upper limb functions among children with hemi paretic cerebral palsy.

Table 1: Comparison between pre and post test of manual ability in group A

Variable	Mean	Mean difference	SD	Paired 't' value
Pre test	18			
Post test	25.6	7.6	1.14	14.90

Table 1 displays the manual ability values of pre and post treatment of group A. In group A, the calculated paired' value is 14.90 which is greater than table value (4.6). So the significant improvements in manual ability score in conventional therapy group A.

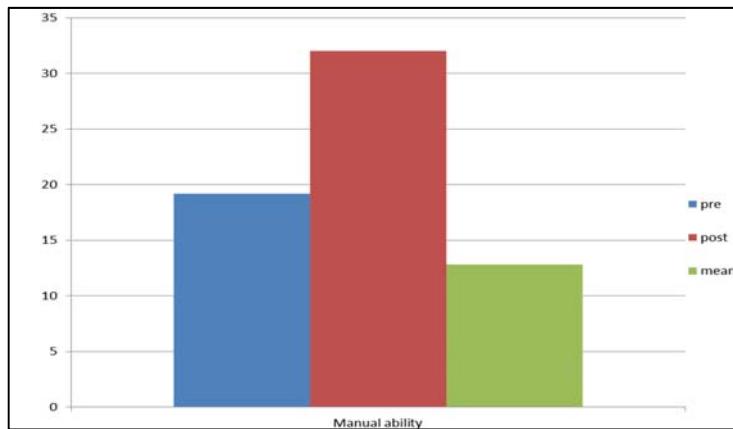


Graph 1: Comparison between pre and post Mean of manual ability in group A

Table 2: Comparison between pre and post test of manual ability in group B

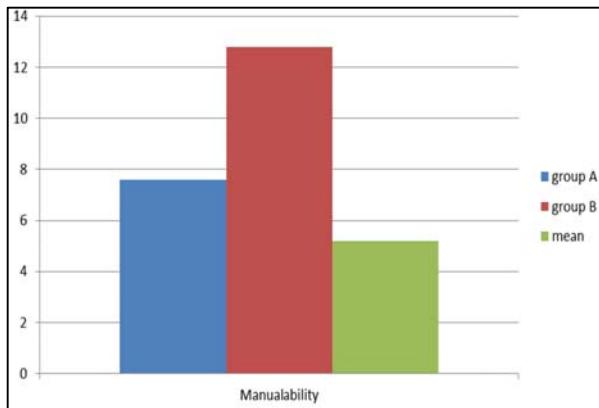
Variable	Mean	Mean difference	SD	Paired 't' value
Pre test	19.2			
Post test	32.0	12.8	0.86	33.28

Table 2 displays the manual ability values of pre and post treatment of group B. In group B, the calculated paired' value is 33.28 which is greater than table value (4.6). So the significant improvements in manual ability score in bimanual therapy group B.

**Graph 2:** Comparison between pre and post Mean of manual ability in group B**Table 3:** Comparison of between manual ability in group A and group B

ABILAND Kids Questionnaire	Group A			Group B			Table value
	mean	SD±	Calculated t value	Mean	SD±	Calculated t value	
	7.6	1.14	14.9	12.8	0.86	33.28	4.6

Table 3 displays the values of manual ability in group A and group B. In both group A and B results showed significant differences in improvement in scores which is greater than table value (4.6). But group B is highly significant than group A.

**Graph 3:** Comparison of manual ability between group A and group B

On comparison, bimanual training in group B was found to produce more statistically significant in manual ability than Conventional Physiotherapy in group A.

Discussion

Present study was done to find out the effectiveness of conventional therapy and bimanual therapy to improve manual ability of upper limb functions among hemiparetic cerebral palsy children.

The conventional physiotherapy had been proved to be effective in improving the upper limb function. The result of the study is supported by Buddhadev *et al* [8] and Chen y n *et al* [9].

The bimanual therapy had been proved to be effective in improving the upper limb function. The result of the study is supported by wahb *et al* [10] and SkoldA *et al* [11].

The bimanual approach is based on an active rather than a passive view of motor learning; people learn by actively attempting to solve the problems inherent to a functional

task, rather than repetitively practicing normal patterns of movement [12]. It is becoming increasingly clear that the key to eliciting improvement in function is to provide sufficient practice. however, rather than just focusing on repetition, the practice must be structured, based on how the central nervous system responds during learning; i.e. optimal responses with increasing movement complexity and provision of motivation and reward [13].

Conclusion

Bimanual therapy is an effective treatment method than conventional physiotherapy to improve the manual ability of upper limb functions among the children with hemiparetic cerebral palsy.

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