

Effects of Task Oriented Approach to Improve Hand Dexterity Skills among Cerebral Palsy Children

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KEYWORDS

Task oriented approach, Hand dexterity skills, Box and blocks, Spastic Cerebral palsy children

ABSTRACT:

Introduction: Cerebral palsy describes a clinical presentation rather than a special etiology or pathology. As such, CP encompasses a heterogeneous group of individuals, varying by functional motor severity, motor type and distribution, and co morbidities (vision, hearing, speech, intellectual function, hand function and epilepsy). The direct cause of CP often remains unidentified, but of known events there are marked difference in the type and timing of neurological lesion. Depending location and extent of the neurological lesions .children motor type may be described as spasticity, dyskinesia {athetosis and hypertonic}. Ataxia or hypotonic.

Cerebral Palsy (CP) refers to the non-progressive neuromotor disorder at cerebral origin (Paul et al., 2013 p 581). The term CP was first described by English physician William Little in 1843 (Solomon et al., 2000 p 115). The prevalence of CP worldwide is about 1-5 per 1000 live births, which represents major reason for motor disorder (Dias et al., 2016).It is mainly characterized by paralysis, spasticity, abnormal postural control, balance issues and atypical motor patterns that serve as a barrier to the ongoing motor skill development. The child has difficulty in integrating all the information needed to plan and implement skilled and efficient movements in the trunk and extremities of the body (Solomon et al., 2011 p 303). CP includes motor dysfunction arises from a brain lesion occurring in areas controlling the quality and quantity of skilled movements. Thus, the uncoordinated and inefficient way of shortening and lengthening of muscles fail to produce smooth and effective motion. It is often accompanied by sensory, cognitive, perceptual, social, emotional, behavioural, play, education and ADL difficulties

Objectives: To find out spastic cerebral palsy children with poor hand dexterity skills

To find out the effect of conventional occupational therapy in control group

To find out the effect of task oriented approach in improving hand dexterity skills in experimental group ;

To find out pre test and post test by using Box and blocks test.

To compare the effect of task oriented approach with conventional occupational therapy program.

Methods: The study was done among the children with spastic cerebral palsy (CP) in the age group 6 to 13 years of age. Total of 30 children with spastic cerebral palsy were selected according to inclusion and exclusion criteria. 15 children in control and 15 children in experimental group.

Results: The statistical analysis showed a significant difference between the pre-test and post-test. Thus, the null hypothesis is rejected.

Conclusions: From this study, it is concluded that there improvement in hand dexterity skills among spastic cerebral palsy children



1. Introduction

Spastic cerebral palsy – Stiff muscles (spasticity), associated with damaged or developmental difference in cerebral cortex. Spastic cerebral palsy is most common type of cerebral palsy. The muscles of children with spastic appear stiff and their movements may look stiff and jerky. Spasticity is a form of hypertonia, or increased muscle tone. Spasticity arises as a result of damage to bundles of neurons in the brain and spinal cord called the corticospinal tracts and corticobulbar tracts.

Hand impairment in cerebral palsy is due to a nonprogressive disturbance of the developing fetal or infant central nervous system that affects movement and posture causing activity limitation (Wendy A. Tomhave et.al., 2015)

Hand function in Cerebral palsy

Hand functioning in cerebral palsy, the ability of the hands to perform properly in various contexts, requires the integrity of the central nervous system and, therefore, maybe disturbed by different brain disorders. Cerebral palsy is the most prevalent form of physical disability in children (Peter Rosenbaum 2003). The impact of CP on a child's hand functioning may be formalized through the theoretical framework of the International Classification of Functioning, Disability, and Health (ICF) (WHO 2001).

Major functions of hand are reach, grasp, pinch, hold, release, grip, in-hand manipulation.

Occupational therapy management in cerebral palsy

One of the primary goals of occupational therapy is to maximize an individual's functional independence by practicing activities of daily living. Individuals consistently practice using their hands to develop their fine motor skills and perform everyday tasks. Occupational therapists also frequently use play activities to promote hand functions related to children's daily tasks. For example, they the effect may use sculpting with play dough to help with hand strengthening, building a tower of blocks help with precision, or playing game of connect 4 to improve grasp and release skills. (Elizabeth Denslow 2021).

Task oriented approach

Task oriented approach involves practicing real life tasks, with the intention of acquiring or requiring a skill defined by consistency, flexibility and efficiency. The task should be challenging and progressively adapted and should involve active participation (Wolf &Winstein, 2009).

Task oriented training is a restorative, therapeutic approach based on the system theory of motor control. This was given by Bernstein in 1967 to retain the patients with movement disorders. This approach utilizes a training program that focuses on specific functional tasks to promote and restore optimal functional capacity (Ivey FM et.al, 2008)

To attain active movements after a phase of active assisted activity. The task analysis includes the nature of task, the essential elements within the task, the context or environment in which the task occurs. It is a client centred task. The task-oriented interventions use specific activities that are meaningful to children and provide them with an opportunity to practice these activities to improve corresponding motor skills (Motohide Miyahara et.al, 2017).

2. Objectives

- To find out spastic cerebral palsy children with poor hand dexterity skills.
- To find out the effect of conventional occupational therapy in control group.
- To find out the effect of task-oriented approach in improving hand dexterity skills in experimental group.
- To find out pre-test and post-test by using Box and blocks test.
- To compare the effect of task-oriented approach with conventional occupational therapy program.

3. Methods

Research Hypothesis

There is a statistic difference between the pre and post test score of Box and Blocks Test in control and experimental group.

Research Design

Quasi experimental study design

Sample Technique

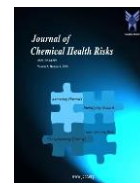
Convenient sampling technique was adopted

Sample Size

30 Subjects
15 subjects in control group
15 subjects in experimental

Sample Setting

Premavasam, Gerugambakam
Mirth CDC, CIT Nagar



Variables

Independent Variable

Task Oriented Approach

Dependent variable

Hand dexterity skills

Selection Criteria

Inclusion criteria

Children with Spastic Cerebral Palsy.

Age between 5 to 13 years.

Both male and female patients are included.

Exclusion criteria

Age above 13 year.

Children with other neurological condition.

Instrument Used

- Box & Blocks test

PURPOSE OF THE TEST

The Box and Blocks test (BBT) measures unilateral gross manual dexterity. It is a quick, simple and inexpensive test. It can be used with a wide range of populations.

Scoring Method

The score is the number of blocks carried from one compartment to the other in one minute.

Score each hand separately.

Reliability

Test – retest: reliability of the BBT, as calculated using ICC and Spearman rho correlation, was excellent (icc = 0.96 and r = 0.97)

Validity

Cromwell (1976) examined the convergent validity of the BBT by comparing it to the Minnesota Rate of Manipulation Test (American Guidance Service, 1969) in an unspecified population. The correlation between BBT and the Minnesota Rate of Manipulation Test was excellent (r = 0.91)

DURATION

The duration of the study was 3 months, the duration of intervention was given for 3 months (36 session) and each session was about 45 minutes.

PROCEDURE

Totally 30 samples were selected according to inclusion and exclusion criteria. The samples are divided as 15 in experimental group and 15 in control group. The selected

children were asked to undergo the BOX & BLOCKS TEST to measure hand dexterity. All the 30 subjects were measured using BOX & BLOCKS TEST to get pre test value then divided equally in 15 samples as control group and 15 samples of experimental group. The experimental group underwent Task oriented training. The therapy consists totally sessions 36 for 12 weeks. Each session was held in the morning and lasted approximately 45 minutes. After the sessions the BOX & BLOCKS Test was again administered to get the post test values.

INTERVENTION

SESSION-1:

The self introduction by therapist and orientation was given. The pre test was also taken.

SESSION-2

- Touching the ball behind the back.
- Touching the ball above head.
- Shifting the bottle side to side.

(This session was conducted to improve the gross movement over the shoulder. Each activity was done actively by the clients following the instruction with 10 repetitions)

SESSION-3

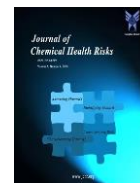
- Touching the ball behind the back.
- Touching the ball above head.
- Shifting the cup side to side.
- Holding the ball

SESSION-4

- Rapid alternative movement of hand.
- Place affected hand on affected leg with the palm.
- Up and gently move side to side.
- Bend the elbow as far as possible to touch the nose.
- Place wrist on table with holding a spherical object and perform up and down movements.
- Make a full fist.
- Spread your finger.
- (This session was conducted to improve the motor function of wrist and fingers. Each activity was done for 20 times of count)

SESSION-5

- Squeeze the ball.
- Opposite of the thumb.
- Flexion of thumb and touch the little fingers.
- Make a full fist. . Spread your fingers.



- Press the ball with four fingers without thumb.
- (This session was conducted to improve the motor function of wrist and fingers. Each activity was done for 20 times of count)

SESSION-6

- Making finger prints on theraputty with each finger.
- Finger spread- Spread the putty like a pancake over your fingers and thumb. Try to spread them apart.
- Make a full fist.
- Spread your finger.

SESSION-7

- Hold a cup and place side to side
- Pegboard in different level of height
- Coin towers

SESSION-8

- Touching the ball behind the back.
- Touching the ball above head.
- Shifting the cup side to side.

SESSION-9

- Transfer a coin from one bowl to another
- Coin flipping
- Coin towers
- Coin tracing on paper with pencil
- Coin sorting- identifying 5rs, 2rs and 1re and placing it in different bowls.
- (This session was conducted to improve the fine motor difficulties and control the finger movements. Each activity was done for 25 times of count)

SESSION-10

- Transfer a coin from one bowl to another
- Coin flipping
- Coin towers

SESSION- 11

- Rapid alternative movement of hand.
- Place affected hand on affected leg with the palm.
- Up and gently move side to side. .
- Place wrist on table with holding a spherical object and perform up and down movements.
- Make a full fist.
- Spread your finger.

SESSION-13

- Ball squeezing
- Opening a jar lid
- Touching the ball above the head

SESSION-14

- Games using balls
- Using fork/spoon
- Age appropriate play with construction material
- Screwing and unscrewing – jar lids on and off
- Play dough and clay activity

SESSION-15

- ball activity with tweezers.
- Opening a jar lid
- Place wrist on table with holding a spherical object and perform up and down movements.

SESSION-16

- Flexion of thumb and touch the little fingers.
- Make a full fist. . Spread your fingers.
- Press the ball with four fingers without thumb. (This is for 25 repetitions)

SESSION-17

- Transfer of water from one cup to another with spoon.
- Drinking water with spoon.

SESSION-18

- Place wrist on table with holding a spherical object and perform up and down movements.
- Make a full fist.
- Spread your finger
- Ball squeezing

SESSION-19

- Water orbis cascading
- Transferring from bowl to bowl

SESSION-20

- Pimpom ball activity with tweezers.
- Opening a jar lid
- Age appropriate play with construction material
- Screwing and unscrewing – jar lids on and off

SESSION- 21

- Rapid alternative movement of hand.
- Place affected hand on affected leg with the palm.



- Up and gently move side to side.

SESSION-23

- Place wrist on table with holding a spherical object and perform up and down movements.
- Make a full fist.
- Spread your finger

SESSION-24

- Games using balls
- Using fork/spoon
- Age appropriate play with construction material
- Screwing and unscrewing – jar lids on and off

SESSION- 25

- Transferring water from one glass to another glass
- Using fork/spoon
- Mixing with play dough

SESSION-26

- Opening a jar lid
- Screwing and unscrewing – jar lids on and off
- Place wrist on table with holding a spherical object and perform up and down movements.
- Make a full fist.

SESSION-27

- Games using balls
- Using fork/spoon
- Age appropriate play with construction material

SESSION- 28

- Transfer of water from one cup to another with spoon.
- Drinking water with spoon

SESSION-29

- Rapid alternative movement of hand.
- Place affected hand on affected leg with the palm.
- Up and gently move side to side. .

SESSION-30

- Place wrist on table with holding a spherical object and perform up and down movements
- Transferring water from one glass to another glass
- Drinking water with spoon

SESSION-31

- Mixing grains of different textures and sizes
- Transferring orbis balls in spoon
- Holding glass and release

SESSION-32

- Rapid alternative movement of hand.
- Place affected hand on affected leg with the palm

SESSION-33

- Taking a drinking cup from the table and bring close to the mouth
 - Transfer a coin from one bowl to another
 - Drinking water with spoon
- (This session was conducted for holding of spoon and taking to mouth without spilling)

SESSION-34

- Place wrist on table with holding a spherical object and perform up and down movements.
- Make a full fist.
- Spread your finger
- Holding glass and drinking water

SESSION-35

- Hold the spoon and drink water
- Mixing rice in a bowl
- Using spoon/fork

SESSION-36

- Feedback
- Post test

4. Results

TABLE 4.1 - Statistical analysis of pre- test and post-test in control group

Test	Mean	SD	N	Z value	p value
Cntr pre	14.0667	3.67359	15	-3.142	0.001*
Cntr Post	15.3333	4.04734	15		

*Significant at 5% alpha level

Since the p value of 0.001 is lesser than 0.05, alternate hypothesis is accepted. Hence, there is statistically significant difference between pre- test and post test scores in the Control Group of the BBT. This suggests that the intervention received by the control group had significant improvement.



FIGURE NO 4.1 - Comparison of pre – test and post – test values of the control group.

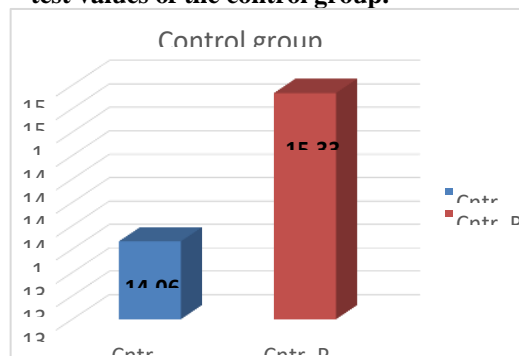


TABLE 4.2 - Statistical analysis of pre- test and post-test in experimental group

Test	Mean	SD	N	Z value	p value
Expt pre	15.2	5.14365	15	-3.408	0.001*
Expt Post	20.533	6.39047	15		

* Significant at 5% alpha level

In the Experimental group, since the p value of 0.001 is less than 0.05, alternate hypothesis is accepted. Hence, there is statistically significant difference in Experimental Group between pretest and post test scores of BBT. This suggests that the intervention received by the experimental group had significant improvement.

FIGURE NO 4.2 – Comparison of pre – test and post – test values of the experimental group.

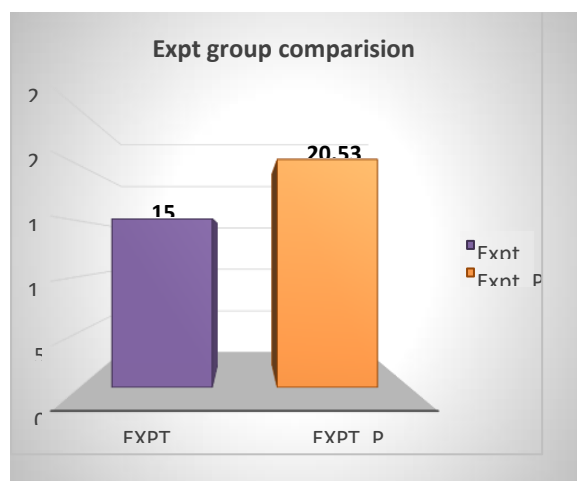
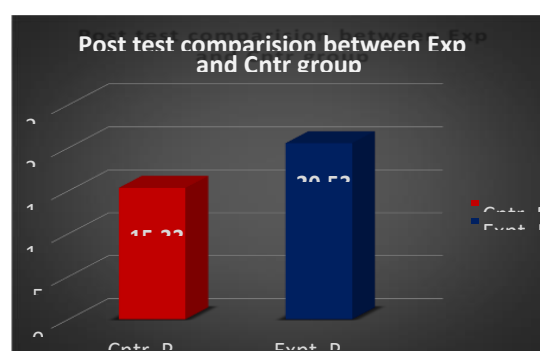


TABLE 4.3 - Statistical analysis between the post- test scores of the control and experimental group

Test	Mean	SD	N	Z value	p value
Cntr Post	15.3333		15	-4.189	0.001*
Expt_Post	20.533		15		

*Significant at 5% alpha level

FIGURE NO 4.3- Comparison of post – test values of the control and experimental group.



5. Discussion

The aim of the study was to find out the effect of task-oriented approach to improve hand dexterity skills.

The samples were selected from the study from Premavasamgerugambakkam and Mirth child developmental center. A total of 30 patients with spastic cerebral palsy were selected and divided equally into two groups, control group and experimental group, 15 samples in each group.

The levels of hand dexterity in both experimental and control group was measured using Box & Blocks test. The experimental group alone underwent task- oriented approach for a period of 2 and half months and control group underwent conventional occupational therapy intervention.

Table 1 & Figure 1 showed the statistical analysis of pre and post of Box & Blocks test in control group. The p value of 0.001 is lesser than 0.05, **alternate hypothesis is accepted**. Hence, there is statistically significant difference between pre- test and post test scores in the Control Group of the BBT. This suggests that the intervention received by the control group had significant improvement. The results indicated that there was a significant improvement in hand dexterity skills. The results were obtained with the conventional occupational therapy program.

The findings of this result in accordance with the previous study done by **R1. Yasuaki Kusumoto**^{1*}, **Kenji Takaki**², **Tadamitsu Matsuda**³, **Osamu Nitta** suggested that the results proved the improvement of



recovery in impaired functions through occupational therapy.

Table 2 & Figure 2 showed the statistical analysis of pre and post - test of Box & Box blocks test. The p value of **0.001** is less than 0.05, **alternate hypothesis is accepted**. Hence, there is statistically significant difference in Experimental Group between pre-test and post test scores of BBT. This suggests that the intervention received by the experimental group had significant improvement. The results indicated there was an improvement in hand dexterity skills. The results were obtained with task-oriented approach. **R11. MIKEL J WHEELER (2009)** suggested that the results proved the effect of task-oriented training on motor function of affected arm.

Table 3 & figure 3 showed the statistical analysis of post-test of Box & Block test in between control and experimental group. The **p value of 0.00 is lesser than 0.05, alternate hypothesis is accepted**. Hence, there is statistically significant difference in post test scores between Experimental and Control Group of the BBT. This suggests that the intervention received **by the experimental group had more improvement when compared to the control group**. The results indicated that there was more significant in experimental group when compared with the control group. It proved the effect of task-oriented approach in improving hand dexterity skills. This result is supported by the previous article **R8. Wendy A. Tomhave,BA, Ann E.Vans** suggested that the results proved the importance of hand dexterity.

CONCLUSION

The study investigated the effect of task-oriented approach to improve hand dexterity skills among cerebral palsy children.

The study was conducted over a period of 3 months. Totally 30 clients with cerebral palsy. 15 samples were in control group and 15 samples were in experimental group. Pre- test and post-test for both groups by using Box & Blocks test. Experimental group underwent task-oriented approach whereas control group received only conventional occupational therapy.

LIMITATIONS AND RECOMMENDATIONS

LIMITATIONS:

- The duration of the study was shorter.
- The study was done on small sample size.

RECOMMENDATIONS:

- The same study can be replicated in a large sample size and individual to generalize the result.
- Long term follow up can be done for the neurological patient to identify long term effects of task-oriented approach among cerebral palsy children.

- Task oriented approach can be used in various other neurological conditions

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- **Source of Funding:** Self
- **Conflicting Interest:** None
- **Ethics Clearance:** Approval from Institution Scientific Review Board (ISRB) was obtained prior to the study.

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