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EFFECT OF TASK – ORIENTED TRAINING ON HAND FUNCTION OF CEREBRAL PALSY SPASTIC DIPLEGIC

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ABSTRACT

Objective: To prove the effectiveness of Task Oriented Training on hand function of CP spastic diplegic (3-8years).
Study design: Intervention based study
Place and duration of study: Institute of Physical Medicine and Rehabilitation May 2011 to August 2011.
This study was conducted on 30 cp spastic diplegic children age group 3-8 years .the GMFCS level of these subject was I, II, or III with moderate hand function.
Quality of upper extremity skill test QUEST (Subtest B: Grasp) was used to assess the hand function of the subjects before and after intervention of six weeks training.
Result: Mean of pre- intervention and post intervention were compared to find out the effectiveness of Task oriented training in CP spastic diplegic children. Mean standard scores of QUEST (Sub test B: Grasp) before intervention was 38.57 (SD ± 7.68) whereas after giving task oriented training for 6 weeks the mean significantly changed to 45.56 (SD ± 9.07). Which indicates that task oriented training enhance the hand function of CP spastic diplegic children.
Conclusion: This study has provided a comprehensive rehabilitative approach that benefits CP spastic diplegic children in their function of upper extremity regardless of gender differences. Moreover it improved children gross and fine motor skills of hand required to perform daily living tasks.

Keywords: Task oriented training, hand function, CP spastic diplegic, hand manipulation, gross and fine motor skills.

INTRODUCTION

Cerebral Palsy (CP) is defined as a disorder of movement and posture that causes activity restriction; it is due to irreversible damage in the developing fetal or infant brain. The motor disorders of CP are often accompanied by disturbances of sensation, cognition, communication, perception, and behavior disorder.[1-2] the prevalence of CP differs across various areas, data and statistics for cerebral palsy estimates of CP ranging from 1.5 to more than 4 per 1000 live births(CDC).[3]
The spastic cerebral palsy is the most common type of CP, accounting for about 70-80% of cases that is classified into quadriplegia, hemiplegia and diplegic. Among them the more sever type is quadriplegia, causing disability of all four limbs while hemiplegia affects the half side of body. Whereas in diplegic cerebral palsy, lower extremities are severely involved than the upper extremities.[4] Though, functions of upper extremities are rarely examined by the physicians. Functional status of CP children can be categorized (with respect to gross motor activity) by using the five levels of gross motor function classification system for cerebral palsy (GMFCS levels I to V). Among them level I

represent less severity in contrast to level V, where it indicates severe impairment in gross motor abilities of these children in daily situations.[5]A longitudinal study conducted on CP children has shown limitation in hand function in all types of CP.[6]However, children with mild hemiplegia at early age could learn fine motor skills of hand in spite of their motor limitations.[7] Furthermore hand function of CP children is highly dependent on cognition.[8] Studies have shown that manual dexterity and fine motor control is also disturbed in CP a spastic diplegic child which limits their functional ability.[9] The marked limitation that is seen in CP spastic diplegic is atypical grasping pattern, incoordination of hand, impaired anticipatory control and poor dexterity skills.[10-13]It was highlighted in the work of Wright, Hunt and Stanley (2005) that children use different adjusting movements to hold the object thus limiting their manipulative efficiency.[14] Most of the studies in CP spastic diplegic were focused on impairment of lower extremity whereas very few studies have been conducted on hand functioning.[17, 22] Family usually does not focus on hand function of these children ultimately increasing patient's dependency for daily living activities. In occupational therapy the focus is to train them in activities of daily living skills (ADL) this is achieved by working on facilitation of upper limb thus improving gross and fine motor skills and helping the children to live more independent life.

Previous studies have proved that muscle strength and functional abilities of CP children can be improved through strength training.[15] Recently few researchers suggested that therapy based on task-oriented approach is more beneficial in the achievement of functional goals (Carr & Shepherd).[16-17, 20-22] Among them one of the studies has shown that upper limb task- oriented training can improve efficiency and dexterity of CP diplegic.[17] Task-oriented training is defined as the repetitive training of significant, functional activities or element of such activities, to acquire well-organized and effective motor skill.[18]The main focus of task oriented training is continuous practice of directed tasks oriented movement rather than idle movement of limb. A 13-years follow up study, provided fertile ground to task-oriented training for the improvement of hand function in CP.[19]Similarly, research conducted by Jodi (2007) in which he applied task oriented training for upper and lower extremities in two different groups, showed effectiveness of such training to be more beneficial in upper extremity in comparison with lower extremity.[17] Schneiberg (2010) study has validated the benefits of task oriented therapy in the improvement of upper limb function of CP.[20]

In-depth case study, conducted with 2 diplegic children in Japan indicated that the ability to get dressed by self, improves after the therapy. [21]Another study conducted by S. Yasser and G.M. Ellen (2009) in India signifies the importance of task-oriented training in lower extremity of CP children.[22]

As per author's knowledge, in Pakistan, conventional therapy is practiced by most occupational therapists for upper extremity training and no work has been done on task-oriented training. Therefore this study was designed to prove the effectiveness of task-oriented training to facilitate the hand function of CP spastic diplegic children.

METHODOLOGY

The present study was an intervention based study conducted at department of Occupational Therapy, Institute of Physical Medicine and Rehabilitation, Dow University of Health Sciences from May 2011 to August 2011. 30 CP spastic diplegic children ages ranging from 3 to 8 years were selected by convenience sampling method. Since the literature findings were based on non-parametric analysis, the sample size calculation was not possible statistically and minimum sample size of 30 patients was selected. Children with spastic diplegic on gross motor function classification system (GMFCS) level of I, II, OR III having no cognitive and perceptual disorder were enrolled for this study.

A pre-tested Performa of QUEST (sub test B: Grasp) was used to measure grasp activities of these subjects by using grasp items i.e, 1 inch cube, cereal and pencil or crayon.

Informed consent was taken from parents / care givers on behalf of their child. Furthermore, every child and care giver was explained about the benefit of task related training. Training session comprised of 45 minutes session for 6 weeks, in which participants were divided into two groups, 15 participants in each group were taken into task oriented training for 3 alternative days/week. Children were evaluated for their hand functioning before and after intervention through QUEST [sub test B. Grasp].

An intensive training program was designed by using warm up exercises and task related activities such as box and blocks for gross motor function and peg board and nine peg holes were used for fine motor skills.

Results were evaluated using SPSS 16. Mean value of before and after task oriented training were compared; Wilcoxon Sign Rank Test was used to see the difference between two groups, p-value of < 0.05 was considered statistically significant with confidence interval of 95%.

RESULT

30 CP spastic diplegic (15males & 15 females) were enrolled in this study age range between 3-8years, with mean age of 5.23 years.

Mean standard scores of QUEST (Sub test B: Grasp) before

TABLE:01
(MEAN VALUES BEFORE AND AFTER INTERVENTION)

	N	Mean	Std. Deviation	Minimum	Maximum
BI	30	38.57	7.686	20	49
AI	30	45.57	9.073	26	57

BI=before intervention
AI= after intervention

Wilcoxon Sign Rank test also indicated significant difference between two groups. (See Table: 02).

intervention (BI) were 38.57 (SD ± 7.68) whereas after giving task oriented training (AI) for 6 weeks the mean significantly changed to 45.56 (SD ± 9.07). Which indicates that task oriented training enhanced the hand function of CP spastic diplegic children. (See table: 01)

DISCUSSION

In this study, task oriented training was given to 30 CP spastic diplegic children, 15 males and 15 females for 6 weeks. Subjects mean age was 5.23years. The subjects demonstrated statistically significant change (P-value< 0.05) in their hand function. Researchers selected box & blocks, peg board and nine peg hole activities, in which subjects were supposed to practice these activities repetitively that helped them to improve their grasp, measured by QUEST (sub test: B), Mean value indicates statistically significant difference before and after task oriented training. i.e. mean score of QUEST (sub test B-Grasp) before task oriented training was 38.57 while after task oriented training QUEST (sub test B-Grasp) mean score changed to 45.57. Wilcoxon sign rank test gave significant difference in both groups. These findings support that task oriented training could improve the hand function of CP spastic diplegic children which correlate with result of another research conducted by Jodi(2007), that speed and dexterity of hand can be improved through task oriented training. [17] Parents of these subjects also reported that their children showed improvement in manipulating objects as well as they became more independent in their daily living activities. Comparable results were obtained by Matsumoto in his research conducted in Japan. [21]

Moreover, mean values for GMFCS level indicates that task oriented

TABLE: 02
(WILCOXON SIGN RANK TEST)

	AI - BI
Z	-4.797[a]
Sig. (2-tailed)	.000

Mean values taken out for GMFCS levels indicated that task oriented training was more effective for children that scores on GMFCS level II. (See Table: 03)

TABLE :03
(MEAN VALUES FOR GMFCS LEVELS, BEFORE AND AFTER INTERVENTION)

GMFCS Levels	No. Of Participants	Before Intervention Mean	After Intervention Mean
GMFCS I	6	39.1	46
GMFCS II	16	43.75	50.06
GMFCS III	8	27.75	32.25

GMFCS= Gross Motor Function Classification System

Mean values taken out to see the effectiveness of task oriented training with male and female population separately showed that task oriented training is effective for both groups. As no significant difference in mean values of before intervention for males (i.e.38.33, SD ± 7.06) and females (i.e. 38.80, SD ± 8.50) is observed when compared with mean of after intervention for males (i.e. 45.87,SD ± 9.25) and females (i.e. 45.27,SD ± 9.20).

TABLE: 04
(MEAN VALUES FOR MALES AND FEMALES BEFORE AND AFTER TASK ORIENTED TRAINING)

Gender		N	Minimum	Maximum	Mean	Std. Deviation
Males	Gender	15	1	1	1.00	.000
	BI	15	27	48	38.33	7.068
	AI	15	30	57	45.87	9.257
Females	Gender	15	2	2	2.00	.000
	BI	15	20	49	38.80	8.504
	AI	15	26	55	45.27	9.200

BI=before intervention
AI= after intervention

Grasp item was based on normal hand grasp as described in developmental literature: posture of the trunk and head were evaluated during grasp activities. The maximum pre-intervention score of normal posture was 3 and after intervention was also 3. Whereas Atypical posture possible score was 3 out of 5. Results showed sitting posture maximum value obtained in this population was 3 with mean value of 2.37 (SD ± 0.809), and atypical posture maximum value was 2 with mean value of 0.67 (SD ± 0.844)

TABLE: 05
(MEAN VALUES FOR SITTING POSTURE)

	N	Minimum	Maximum	Mean	Std. Deviation
Sitting Posture	30	1	3	2.37	0.809
Atypical	30	0	2	0.67	0.844

Grasp of a 1" cube was noted by palmer, radial palmer and radial digital. The maximum pre-intervention score possibly obtained was 3 and highest after intervention score possible to obtain was also 3. Results showed mean value for grasp of 1" cube by palmer, radial palmer and radial digital before intervention was 1.07 and after task oriented training we obtained mean score of 2.30, indicating that task oriented training is effective to enhance the 1" cube grasp of CP spastic diplegic.

TABLE: 06
(MEAN VALUES FOR GRASP OF 1" CUBE, BEFORE AND AFTER INTERVENTION)

	N	Mean	Std. Deviation
BI Grasp of 1" Cube	30	1.07	.450
AI Grasp of 1" Cube	30	2.30	.651

BI=before intervention
AI= after intervention

Grasp of cereal was noted by inferior scissor, scissor, inferior pincer, pincer and fine pincer. The maximum pre and after intervention score possibly obtained was 5. Results show mean value for grasp 0f cereal by inferior scissor, scissor, inferior pincer, pincer and fine pincer before intervention was 2.37. Whereas after task oriented training of six week this mean value changed to 3.53 showed that task oriented training is effective to enhance fine grasp of cereal in CP spastic diplegic.

TABLE: 07
(MEAN VALUES FOR GRASP OF CEREAL, BEFORE AND AFTER INTERVENTION)

	N	Mean	Std. Deviation
BI Grasp of cereal	30	2.37	.765
AI Grasp of cereal	30	3.53	.937

BI=before intervention
AI= after intervention

Grasp of pencil or crayon to check fine motor skills was noted by palmer supinate, digital pronate, static tripod and dynamic tripod. The possible pre and post intervention score was 4. Results showed that mean value for grasp of pencil or crayon before intervention was 1.10 and after task oriented training of six week the mean value obtained as 2.37. It indicates that task oriented training is effective to enhance fine motor grasp of CP spastic diplegic.

TABLE: 07
(MEAN VALUES FOR GRASP OF PENCIL, BEFORE AND AFTER INTERVENTION)

	N	Mean	Std. Deviation
BI Grasp of Pencil	30	1.10	.759
AI Grasp of pencil	30	2.37	.928

BI=before intervention
AI= after intervention

training was more effective for those who lie at GMFC level II i.e. their mean score improved from 43.75 to 50.62. The reason could be that large number of subjects enrolled for study lie at GMFC level II (16 out of 30 patients).

As per author's knowledge small work has been done on task oriented training for treatment of CP spastic diplegic, usually they are treated by using conventional therapy which is main the reason that large number of data was not available to correlate with results of present study.

CONCLUSION

This study has provided a comprehensive rehabilitative approach that benefits CP spastic diplegic children in their function of upper extremity regardless of gender differences. Moreover it improved children gross and fine motor skills of hand required to perform daily living tasks.

REFERENCES

1) M. Max et al, Proposed Definition and Classification of Cerebral Palsy. Developmental Medicine & Neurology; April 2005, Vol 47: Pg. 571-76.
2) M. Firas , H. Simona Bar, and K. Amir, Lack of Predictive Control in lifting series of virtual objects by individuals with diplegic Cerebral Palsy. IEEE Trans Neural Syst Rehabil Eng; 2011 Oct 6.
3) Data and statistics for cerebral palsy. Available at http://www.cdc.gov/ncbddd/cp/data.html.
4) Cerebral Palsy. Available at http://www.emedicinehealth.com/cerebral_palsy/article_em.htmhttp://www.emedicinehealth.com/cerebral_palsy/article_em.htm
5) P. Robert, R.Peter, W.Stephen et al. Gross Motor Function Classification System for Cerebral Palsy. Dev Med Child Neurol; 1997, 39: 214-23.
6) Arner M, Eliasson AC, Nicklasson S et al. Hand Function in Cerebral Palsy. Report of 367 Children in A Population-Based Longitudinal Health Care Program, J Hand Surg Am; Oct 2008, 33(8): 1337-47.
7) Hanna SE, Law MC, Rosenbaum PL et al. Development of Hand Function Among Children With Cerebral Palsy Growth Curve Analysis For Ages 16 To 70 Months; July 2003, 45(7): 448-55.
8) Exner,C.E., and Hendersson.(1995). Cognition And Motor Skills. In. Ann-Christen eliasson"improving the use of hands in daily activities. Physical and occupational therapy in pediatrics; 2007; 27: 4: 37-60.
9) N. Berker and M. S. Yal. In Cerebral Palsy: Orthopedic Aspects and Rehabilitation. Pediatric Clinics of North America; 2008; 55: 1209-25.

10) Ann-Christen eliasson. Improving The Use Of Hands In Daily Activities. Physical and occupational therapy in paediatrics; 2007; 27 4: 37-60.
11) Jenson G.D and Alderman M.E. The Prehensile Grasp of Spastic Diplegic. Pediatrics; 1963, 31(3): 470-73.
12) Eliasson, A. C, Gordon et al. Impaired Anticipatory Control Of Isometric Forces During Grasping By Children With Cerebral Palsy. Developmental medicine and child neurology; 1992, 34: 216-25.
13) Eliasson A. C, Gordon et al. Basic Coordination of Manipulative Forces of Children with Cerebral Palsy. Developmental medicine and child neurology; 1991; 33: 661-70.
14) Wright, M.G, Hunt et al. Object/Wrist Movements during Manipulation in Children With Cerebral Palsy. Pediatric Rehabilitation; 2005, 8(4): 263-71.
15) Bly L. A Historical and Current View of the Basis of NDT. Pediatric Physical Therapy; 1991; 3: 131-35.
16) Carr, J. H., Shepherd et al. A Motor Learning Model for Rehabilitation. 1987.
17) Jodi Crompton, Christine Imms, Anne T McCoy, et al. Group-Based Task-Related Training For Children With Cerebral Pals; A Pilot Study.; 2007; 27(4): 43-65.
18) Horak, F.B. (1990). Assumptions Underlying Motor Control for Neurologic Rehabilitation, In. Jodi Crompton, Christine Imms, Anne T McCoy, et al. Group-based task-related training for children with cerebral palsy: a pilot study, Phys Occup Ther Pediatr. 2007; 27(4):43-65.
19) Ann-Christin Eliasson, Hans Forssberg, Ya-Ching Hung, et al. Development of Hand Function and Precision Grip Control in Individuals With Cerebral Palsy, A 13-Year Follow-up Study. Pediatrics; October 1, 2006; 118 (4): 1226 -36.
20) Schneiberg S, McKinley PA, Sveistrup H et al. The Effectiveness Of Task-Oriented Intervention And Trunk Restraint On Upper Limb Movement Quality In Children With Cerebral Palsy; 2010; 52(11): 245-53.
21) Matsumoto Kyoko, Hara Yoshiharu. Hand Manipulation for dressing skills through Occupational Therapy for Two Children with Spastic Diplegia. Journal of Japanese Association of Occupational Therapists; 2001; 20 (2): 163-70.
22) Salem Y, Godwin EM. Effects of Task-Oriented Training on Mobility Function in Children with Cerebral Palsy; 2009; 24(4): 307-13.