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Impact of Task Oriented Training (Balance and Gait) in Hemiplegic and Diplegic Cerebral Palsy

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ABSTRACT

The aim of the study was to investigate the impact of task-oriented training (balance and gait) in hemiplegic and diplegic cerebral palsy. 30 children of cerebral palsy in which 15 were hemiplegic CP and 15 were diplegic CP participating in the study. All the subjects from specified source of data were assessed and those who fulfilled inclusion criteria were taken up for the study. All thirty subjects were randomly allocated in to t wo groups, Group [A] Hemiplegic CP and Group [B] Diplegic CP with 15 subjects in each. Each child was evaluated for their functional ability using the PBS, 10-meter walk test and Gait parameters prior to commencement of training. 40 children were assessed for eligibility. Out of which 4 children were excluded because they refused to participate in study, 6 children were not meeting the inclusion criteria. Total 30 children were randomized and divided in to two groups. Group A (N= 15) (Hemiplegic Cerebral Palsy), Group B (N=15) (Diplegic Cerebral Palsy). Total of 15 males and 15 females were participated in the study. In group A there were 9 males and 6 females and in group B there were 6 males 9 females. In group A Total 5 children had pre-natal causes for cerebral palsy whereas 10 reported postnatal. In group B 8 children had prenatal and 7 postnatal causes responsible for cerebral palsy. It concludes that there is no substantial effect of task-oriented training for children with hemiplegic and diplegic cerebral palsy. We can extend the study period and treatment sessions in subsequent research.

Keywords: Oriented training, balance, gait, hemiplegic and diplegic cerebral palsy

INTRODUCTION

Cerebral palsy is a non-progressive neurological condition resulting in motor impairments that can change over time. The problems may result directly from injury to an immature brain or indirectly from developmental disuse or compensatory movements [1]. Childhood motor disabilities such as cerebral palsy are frequently accompanied with sensory and cognitive dysfunctions as well as other medical disorders. Results from population-based research and national cerebral palsy registrations in the USA, Australia, and Europe show that there are roughly 1·8–2·3 incidences of cerebral palsy for every 1000 children [2].

According to the International Classification of Functioning, Disability and Health (ICF) [3], persons with cerebral palsy (CP) have deficiencies in bodily functions, including limited muscle strength, spasticity, and selective motor control. These disabilities may make it more difficult to participate in daily activities and execute certain tasks. For therapeutic interventions, increasing and optimising engagement and activities are crucial treatment objectives [3]. Hemiplegic CP (HCP) is the most prevalent type of CP, causing impairments in one hand's function

and problems with bimanual coordination. Deficits in upper extremity sensory perception, including restricted proprioception, stereognosis, and tactile discrimination, affect over 95% of children with cerebral palsy [4].

Children who have hemiplegic cerebral palsy (CP) are characterised by motor deficits that are primarily lateralized on one side of the body and involve more of the upper than lower limbs. These impairments may also make it more difficult for these children to participate in daily activities at school. These kids frequently pick up techniques for controlling bimanual tasks with just the unaffected hand, eventually ceasing to use the more affected hand. Due to a lack of spontaneous hand usage in daily life, this phenomenon—often referred to as "developmental disregard"—may result in asymmetrical motor development and the failure of the more affected extremity to develop [5]. In addition to having poor postural adaptation, children with spastic diplegic cerebral palsy (SDCP) often have limited capacity for perceptual neuromotor control, poor performance in stance stability in demanding sensory environments, delayed anticipatory adjustment, and inconsistent preparatory activation [6]. Patients with neurological impairment can benefit from task-oriented training, a rehabilitation strategy that is patient- and task-focused rather than therapist-focused1. It entails training to increase the patient's capacity to meet objectives for job completion, as well as to foster the development of effective compensatory methods and problem-solving abilities through increased adaptability in a variety of situations [7]. Task-oriented training is employed as a rehabilitation programme to increase muscular strength or function as well as a rehabilitation technique to enhance motor competence. As a successful treatment for people with central nervous system problems, it should involve particular tasks to improve function [8]. Task-oriented training is a brain rehabilitation strategy that supports functional systematisation by incorporating a patient's meaningful activity in addition to the desired outcome. It can be carried out by repeatedly training activities linked to everyday activities [8]. Because task-oriented training incorporates play activities as well as fundamental activities of daily living (ADLs) like reaching, gripping, and object manipulation, it essentially aids in improving daily activity performance and arm function [9].

MATERIALS AND METHODS

- Design of study – comparative study
- Sampling – convenient sampling
- Sampling method- Simple random sampling
- Sample size – 30 subjects (Group A N=15 hemiplegic CP, Group B N= 15 diplegic CP)
- Study Population were taken from Umeed Rehabilitation Center Lucknow & Chetna NGO Lucknow

Selection Criteria

Inclusion criteria

- Children diagnosed as diplegic and hemiplegic cerebral palsy of both genders.
- Aged between 5–15 years.
- Having sufficient co-operation and cognitive understanding to participate, able to communicate and follow the instructions.
- Able to perform sit to- stand task and walking with or without walking devices.

Exclusion Criteria

- Children other than diplegic and hemiplegic cerebral palsy.
- Children aged ≤5 years or ≥15 years.
- Unable to maintain standing for at least 5 minutes.
- Unable to sit unsupported for at least 5 minutes.
- Unstable seizures and other neurological disorder.
- Presence of shortening or deformities of the ankle, knee and/or hip joints.

- Any other medical condition which affects the participation in the therapy.

Dependent variables
- Task oriented training

Independent variables
- Balance
- Gait

MATERIALS
- Data Collection sheet
- Consent Form
- Mattress
- Watch
- Pediatric Balance Scale
- Inch tape
- 10 meter walk test
- Chair
- Ink Pad
- Stools.

PROCEDURE
- 30 children of cerebral palsy in which 15 were hemiplegic CP and 15 were diplegic CP participating in the study. All the subjects from specified source of data were assessed and those who fulfilled inclusion criteria were taken up for the study.
- All thirty subjects were randomly allocated in to two groups, Group [A] Hemiplegic CP and Group[B] Diplegic CP with 15 subjects in each. Each child were evaluated for their functional ability using the PBS, 10 meter walk test and Gait parameters prior to commencement of training. The procedure were explained to parents of all the children and written informed consent from the parents was taken. During the pre-assessment session footprints of all the children were taken with the help of ink on chart paper. The ink were put on the feet of child with the help of a piece of cloth and child were asked to walk on the chart paper fixed on the floor. For the measurement of stride length 2 footprints of affected sides from the middle portion of each walking trial were analyzed.

Stride length
The stride length was measured from the heel of the affected foot to the heel of the same foot when it again contacts the ground with the help of a measuring tape/scale.

Cadence
The cadence i.e., steps per minutes were counted with the help of stop watch.

Gait velocity
Gait velocity was studied at comfortable walking speeds. The mean of 3 repeated walking speed measurements was calculated in order to reduce measurement error. Both the Group A and B was given Task Oriented Training: 45 minutes for 6 days/ week. During training following strategies were considered:

1) Standing and reaching in different directions for objects located beyond arm's length to promote loading of the lower limbs and activation of lower limb muscles;
2) Sit-to-stand from various chair heights to strengthen the lower limb extensor muscles;
3) Stepping forward and backward onto blocks of various heights to strengthen the lower limb muscles;
4) Stepping sideways onto blocks of various heights to strengthen the lower limb Muscles;
5) Forward step-up onto blocks of various heights to strengthen the lower limb muscles;
6) Heel raise and lower while maintaining in a standing posture to strengthen the plantar flexor muscles.

For every fitness class, a task was given a period of five minutes. At each workstation, children were urged to put forth their best effort and received verbal comments and guidance to help them achieve better. The task's progression was taken into account based on each child's level of ability. Increases in difficulty were made to the amount of reps finished in five minutes at a

workstation and the height of the blood, in addition to extending the reach for standing distances and lowering chair heights during sit-to-stand exercises.

RESULTS

Data was analysed and tabulated with SPSS version 22nd (Statistical Package for Social Sciences) for windows and Microsoft Office Excel-2007. Mean, standard Deviation, Degree of freedom, confidence level, P value and significance were calculated to express the results.

- Unpaired' t test has been done for Inter Group
  Comparison of Pediatric balance test (PBS), Step Length, Gait Velocity and Cadence in between Group at Pre and Post intervention level.
- Paired' t test has been done for Intra – Group Comparison of Pediatric balance test (PBS), Step Length, Gait Velocity and Cadence in between Group at Pre and Post intervention level. The significant (Probability-P) has been considered as 0.05.

Table 1: Demographic data of children. P<0.05* shows a statistically significant result. The above table showing demographic and baseline characteristics included age, PBS, 10 meter walk test, stride length, cadence, gait velocity

	Mean	Variance	Observations	Pooled Variance	Hypothesized Mean Difference	df	t stat	P(T<=t) one-tail	t Critical one-tail	P(T<=t) two-tail	t Critic two-ta
Hemi PBS	31.28571	40.8352	14	41.65044	0	26	-3.107	0.00226	1.705618	0.00453	2.055
Hemi 10 Meter Walk Test	31.71429	86.5275	14	78.70604	0	26	0.9586	0.1733	1.705618	0.3466	2.055
Hemi Stride Length	14.81429	1.19055	14	1.203544	0	26	-0.327	0.37303	1.705618	0.74606	2.055
Hemi Cadence	81.28571	50.2198	14	45.71429	0	26	-1.509	0.07163	1.705618	0.14327	2.055
Hemi Gait Velocity	20.82786	50.9412	14	61.49609	0	26	-0.846	0.20254	1.705618	0.40508	2.055

40 children were assessed for eligibility. Out of which 4 children were excluded because they refused to participate in study, 6 children were not meeting the inclusion criteria. Total 30 children were randomized and divided in to two groups. Group A (N= 15) (Hemiplegic Cerebral Palsy), Group B (N=15) (Diplegic Cerebral Palsy).

Total of 15 males and 15 females were participated in the study. In group A there were 9 males and 6 females and in group B there were 6 males 9 females. In group A Total 5 children had pre-natal causes for cerebral palsy whereas 10 reported postnatal. In group B 8 children had prenatal and 7 postnatal causes responsible for cerebral palsy.

DISCUSSION

The current study compared how task-oriented training affected gait and balance metrics in cerebral palsy patients with hemiplegia and diplegia. When participant demographic data was analysed, there was no statistically significant difference discovered, indicating that subjects were matched based on baseline characteristics. PBS, Stride Length, Gait Velocity, and Cadence score did not significantly differ before the intervention, indicating that the two groups are statistically matched at the baseline level (Tables 1 and 2, 3 & 4). When balance training is tied to a task, it works better. Exercises that involve sitting to stand improve standing up and may lower falls.

Exercises that are task-oriented are effective in enhancing strength, balance, and functional mobility. Children with cerebral palsy can benefit from task-oriented programmes by having better fundamental functional ability, balance, and walking efficiency. These programmes can also offer

direction on training techniques. To create an intensive training programme, it is necessary to take into account the patient's capacity, task specificity, frequency, and scheduling while designing a task-oriented programme. The study's results are unmatched with those of any other person.

There are several obstacles during the investigation that could have an impact on the findings. It can be challenging to teach the kids an exercise programme because four out of thirty kids have hearing issues. They are experiencing some hearing issues with the instructions. Additionally, there are two kids who struggle with vision, making it difficult for them to comprehend the training regimen they must adhere to. They are adjusting to the environment with little difficulty. Teaching the kids who had both physical and behavioural issues was an extremely challenging task. However, the staff members that work with the children were also quite helpful, and the parents of the children were very accommodating. It's convenient to finish the study on time thanks to the support of all the teachers and parents.

Limitations

- Sample size was small
- Study lacks in giving the information regarding duration of lasting effects of training.
- Duration of study was less
- Specific tools for evaluation were not used.
- Shorter treatment duration i.e., only for 4 weeks, there was No follow up after 4 weeks of intervention and Repetition of each task was not fixed
- progression was considered according to each child's capacity

FUTURE ASPECTS

- Similar Study should be carried out with a larger sample size.
- Study should be done with follow up to identify and understand lasting effects of training
- Duration of training should be large to understand effect long duration on the task-oriented training.
- In future, study can be done on other type of cerebral palsy, stroke.
- Parkinson's disease & Multiple Sclerosis by keeping fixed number of repetitions to see effect of Task-Oriented Approach

CONCLUSION

It concludes that there is no substantial effect of task-oriented training for children with hemiplegic and diplegic cerebral palsy. We can extend the study period and treatment sessions in subsequent research.

Declaration by Authors

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