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KEY WORDS: Cerebral palsy, Task oriented training, Conventional physiotherapy, Balance and Gross motor function.

Efficacy of Task Oriented Training on Balance and Gross Motor Function in Spastic Diplegic Cerebral Palsy Children

Mrs. Madhumathi. K* MPT (Paediatric Neurology), (PhD),Assistant Professor, School of physiotherapy, Vels Institute Of Science,Technology And Advanced Studies. *Corresponding Author

Dr. P. Senthil Selvam MPT (Ortho), PhD HOD, Assistant Professor, School of physiotherapy,Vels Institute Of Science,Technology And Advanced Studies.

Megala. K Intern, School of physiotherapy, Vels Institute Of Science, Technology And Advanced Studies.

ABSTRACT

BACKGROUND: Cerebral palsy (CP) is defined as "a group of permanent disorder of the development of movement and posture due to non-progressive lesion that occurred in the developing fetus or after birth". The term "cerebral" refers to the two halves or hemispheres of the brain and "palsy" refers to loss of impairment of motor function. It is a common neuro developmental condition encountered by paediatrician and physiotherapist. The majorities of children with cerebral palsy have difficulty in walking, poor balance control that leads to poor gait. **OBJECTIVE:** This is an experimental study to determine the efficacy of task oriented training and conventional physiotherapy on balance and gross motor function in spastic diplegic cerebral palsy children. **MATERIAL AND METHOD:** 30 children with spastic diplegic cerebral palsy who fulfilled inclusion criteria were randomly divided into two groups. One group received task oriented training and other received conventional physiotherapy for 45 minutes, 4 weeks. The balance and gross motor function were measured by PBS and GMFM-66 respectively. **RESULTS:** Result shows that both the groups improved significantly but task oriented training group is improved more than conventional physiotherapy group. **CONCLUSION:** This study suggests that task oriented training is more effective as compared to the conventional physiotherapy for balance and gross motor function in spastic diplegic cerebral palsy.

INTRODUCTION:

Cerebral palsy (CP) is defined as "a group of permanent disorder of the development of movement and posture due to non-progressive lesion that occurred in the developing fetal or after birth". The term "cerebral" refers to the two halves or hemispheres of the brain and "palsy" refers to loss of impairment of motor function[1]

With the incidence about 2-2.5 per 1,000 live birth cerebral palsy is the most common cause of physical disability in child[2]. Among four type of cerebral palsy, spastic cerebral palsy is the most common cerebral palsy in the children affecting 70-80% of patient. Diplegia is the commonest form among the cerebral palsy which comprises about 30-40% of children[3].

Spasticity is most common problem in children with cerebral palsy, an upper motor neuron syndrome it is characterized by increase in tonic strength reflex with exaggerated tendon jerk result in hyper excitability of stretch reflex [4]. Spastic diplegic cerebral palsy usually affects coordination and muscle control and increase muscle tone leads to tighten the muscles especially lower limb muscles and cause exaggerated reflex[5].

Cerebral palsy child has often disturbance in sensation, communication, cognition, perception, behaviour and find difficulty in walking and activity of daily living. Difficulty in walking and activity of daily living is due to muscle tone abnormality such as muscle weakness and spasticity[6]. Incase of spastic diplegic cerebral palsy, lower limb more severely affected than upper limb[1].

Incase of mild cerebral palsy toe walking is present due to tightness of Achilles tendon but incase of severe case on flexion of hip and knee and rigid of lower limb causes the adductor spasm that results in abnormal gait i.e. scissoring gait[1]. Cerebral palsy children have poor gait and reaching movement because of walking difficulty and poor balance control.

Balance is a neurophysiological process to maintains the stability of the body within the base of support. The balance control ability of child with cerebral palsy is affected especially in standing & sitting position [7]. Balance is maintained by quick and accurate response to internal and external stimuli. The balance deficit is most commonly in children with development disability, cerebral palsy, mental retardation, hearing impairment[8].

Balance and upright postural control are most important fundamental components of movement. The children with cerebral palsy have poor static and dynamic balance than healthy children[9]. Standing postural balance is most important for walking and upper limb activities[10].

Balance disorder constitute a major change in children with spastic diplegic cerebral palsy. The poor performance in balance control is cause due to lack of neuromotor control. The child with spastic diplegic child is also suffered by proprioception disorder[11].

Motor disorder results in loss of functional balance. Poor balance results in difficulties with functional task that involved in day to day living activities [12]. Among the functional impairments of children with cerebral palsy, the gross motor function is most common for general activity in life. The gross motor function in cerebral palsy children has been conceptualized in to two main features:- function and performance. The function means ability to accomplish motor activity and performance refers to the quality of motor activity[13].

The motor disability related with sitting, standing, walking and running appears main symptom in children with cerebral palsy [10].

The main objective of rehabilitation in patients with cerebral palsy includes improving walking, gait, posture and handling abilities such as reaching task, reaching forward to a target for example a toy [10]. Training balance in cerebral palsy directly improve the gross motor ability[14].

Task oriented training is defined as the repetitive training of significant functional activities to acquire well organized and effective motor skills [15]. This training is based on contemporary motor learning theories or model of motor control. The approach focuses on the interaction between the sensorimotor system components of strength, range of motion, endurance, sensory awareness, coordination, postural control & perceptual skills [16]. It is one form of rehabilitation program which helps to improve motor skill, muscle strength and function [3].

The task-oriented training intervention is effective treatment for improving the functional activities in a patient with central nervous system disorder [17]. This type training method gives an interesting task for children with diplegic cerebral palsy and it leads to effective functional movements and motor skills [3].

Task oriented training is mainly focused on task performance and the strengthening exercises of the specific lower extremity muscles [16]. Behaviour plays a significant role in this type of training which involves body movement in space & time. Attention & adjustment process are the two components that need to systemized subject accomplishment, communication & coordinated social activity [3].

The spatiotemporal adaptation of a child to the environment is obtained by behaviour & it is organized with intentional repetitions [3]. Therefore, the treatment should not only training the child, but also provide environmental adaptation, that stress a child functional behaviour [7].

Many studies reported that muscle strengthening exercises is not only increases muscle strength it also increases the motor function of children (Damiano DL et al. 1998, Dodd KJ et al. 2002, MacPhail HE et al. 1995) [16].

Some studies reported that task oriented training intervention is an effective approach for the functional condition with central nervous system disorder [17].

Conventional physiotherapy exercise like matt activities, stretching and strengthening exercise it is treatment according to the ability of the patient which includes training the strength, endurance, maximizing the flexibility and postural control. Conventional physiotherapy exercises preventing the complication of immobilization, contractures, and prevent development of abnormal posture. These exercises improve activity of daily living skill at the earlier [8].

This study investigates how a task oriented training program improves the gross motor performance and balance for children with spastic diplegic cerebral palsy. The study has been conducted to verify the effectiveness of task oriented training and develop a more effective therapeutic treatment for children with cerebral palsy.

MATERIALS AND METHODS

This was an experimental study, the 30 spastic diplegic cerebral palsy children of both genders within the age group 5-15 years, who can able to walk with or without support, and able to understand and follow the instructions were randomly divided into two groups. Cerebral palsy child who cannot able to walk with support, Vision impairment, Hearing problem, those who had Orthopaedics surgery up to 6 months / Botulinum toxin injection, Mental retardation, Cognitive impairment, IQ level less than 70 were excluded from the study. Paediatric Balance scale (PBS): PBS is used to assess the balance of the cerebral palsy children. Which has 14 functional tasks related to balance, were demonstrated to the child and asked to perform. Each task was scored from 0 to 4 based on their performance. Total score is 56. It has excellent absolute reliability (0.997) and validity. [9,12]. Gross Motor Function Measure (GMFM-66) Score sheet GMFM is used to measure the gross motor function. The score sheet has 66 items were scored from 0 to 3. Total score is 198. GMFM-66 has highly reliability (0.965-0.994) and high levels of validity (0.972-0.997). The other materials used are Swiss Ball, Wobble Board, Matt, Toys, Pen and pencil, Stop watch, Inch tape, Adjustable height bench, Chair with back support and arm rests.

PROCEDURE:

Thirty spastic diplegic cerebral palsy children of both the gender within the age group 5 to 15 years were selected by the simple random sampling method and included in this study. All subjects who satisfied the inclusion and exclusion criteria were selected after taking acceptance through the consent form from the parent for the participation in this study. Out of them fifteen were allotted in Group A (n=15) an experimental group (task oriented training) and Group B (n=15) a control group (conventional physiotherapy.)

Both task oriented training and conventional physiotherapy were given for a period of 4 weeks, 45 minutes for 1 session, 5 sessions per week and totally 20 treatment sessions. The balance and gross motor were assessed by using paediatric balance scale and gross motor functional measure (GMFM-66) respectively.

Both groups were started with warm up stretch for major muscle group that includes stretching of TA, knee flexor, adductors and hip flexor for 5 minutes. Outcome parameter pre-test and post-test values were measured and analysed statistically before and after 4 weeks of exercises programme.

GROUP A (EXPERIMENTAL GROUP):-
TASK ORIENTED TRAINING:-

- **FOR BALANCE:**
  - Swiss ball
  - Activity on wobble board (standing on wobble board in open eyes)
- **PLAY ACTIVITY:**
  - Kicking ball rolled by therapist while stand by alternate right/left foot.
  - Sitting on table and reaching an object in different directions.
  - Stepping forward, backward and sideways on to blocks of various height.
  - Squatting
  - Stand in full base of support and reach the object to improve standing balance.
  - Sit to stand from various height chair.
  - Walking in parallel bar crossing various obstacles.
  - Walking over various surfaces like cushion.
  - Play around by throwing and rolling a gym ball.
  - Pick up an object from the floor in a standing position, then in a kneel standing position, raise right/left foot the front and then stand (assistive if necessary)

Each task was performing 2 sets and 5 repetition for each exercise. Therapist also given a verbal feedback and instruction aimed to improve performance. The progression of task was considered according to ability of each child. The progression was including increase the number of repetition and increase complexity of the exercise such as distance reached in standing, reducing the height of chair during sit-to-stand and the height of the blocks.

GROUP B (CONTROL GROUP):-
CONVENTIONAL PHYSIOTHERAPY:-

- Matt Activities
- Specific stretching exercise for tightened lower limb muscles
- Lower limb strengthening Exercise
- Weight bearing activity
- Kneeling and Half-kneeling
- Full range free exercise

The subjects in this group performed exercises based on conventional physiotherapy. A 5 minutes of warm up exercise

before starting the treatment and 5 minutes of cool down exercise after treatment period were given.

RESULTS:

All statistical analysis was performed on IBM compatible micro computer using Statistical Package for the social sciences (SPSS 17.0). The mean and standard deviation (SD) were used to describe the continuous data.

Table 1 show the pediatric balance scale (PBS) Task oriented training mean value of 48.33±2.89 and conventional physiotherapy mean value of 44.13±0.73

Table 2 show the Gross Motor Functional Measure (GMFM-66) Task oriented training mean value of 172.93±4.27 and Conventional physiotherapy mean value of 170.27±5.60.

The results of the study showed statistically significant improvement in the two groups (Group A and Group B) when compared pre and post intervention. However, Task oriented training (Experimental group) showed more increase in balance and gross motor function than that of Conventional physiotherapy (Control group).

DISCUSSION:

The purpose of this study is to determine the efficacy of the Task oriented training and Conventional physiotherapy on improving the balance and gross motor function in spastic diplegic cerebral palsy. Pre and post treatment scores of paediatric balance scale (PBS) and Gross motor functional measures (GMFM-66) scores are recorded.

Paediatric balance scale (PBS) showed P value <0.0001 considered extremely significant in both two groups but Task oriented training (TOT) group showed more significant result for improved balance ability whereas when compared to other group control group showed less improvement.

Gross motor functional measure (GMFM-66) is used to measure the gross motor function, the result showed P value <0.0001 considered extremely significant in both two groups but Task oriented training (TOT) group showed more significant result for improved gross motor ability whereas when compared to other group conventional group showed less improvement.

The task- oriented approach involves repeat training with task-oriented activity and is also based on the motor learning. This training provides interesting task while encouraging the functional movements. The Task oriented training effective for improvement in functional performance of cerebral palsy children (NicholsDS etal.,1996)[18].

Facilitation – inhibition techniques to Task oriented approach with functional activities based on central nervous system disease rehabilitation has changed from neuromuscular facilitation (BarbeauH etal.2001)[19].

Furthermore, the repetitive performance of task can be improving the effective motor pattern and reach optimum functional performance (Johnson, 1984; Magill, 2004)[20]. Task oriented training provides interesting task to the children with spastic diplegic cerebral palsy (BlundellSW etal.,2003)[21].

A study done by MK Franklin shaju in year 2016 proposed that efficacy of Task oriented training on mobility and balance among spastic diplegic cerebral palsy children, concluded that both Task oriented training and conventional group shows more improvement in mobility and balance were measured by time up &go test and PBS respectively.[3]

According to the pervious study, the children with diplegia is a large percentage of the children affected by cerebral palsy showed remarkable progress in balance ability (Yum Kim et al., 2013).[7] Van Peppen et al demonstrated the increased treatment intensity with help of repetitive task-oriented methods will improve motor and functional recovery.

In another study, a task-oriented exercise program the functional mobility includes sit to stand, step up and step down, walking and running that have positive effects in the lower limb muscle strength and balance (peungsuwan etal.,2017).[22]

The form of Task oriented training performed in home setting effective in improving motor function and balance abilities and GMFM score in children with cerebral palsy (Drouin et al.,1996).[23]

The study reported that, the effectiveness of task-oriented training in enhancing both motor function and balance abilities on the application of a motor program consisting of task-oriented training to children with cerebral palsy (Katz-Leuer et al.,2009).[24]

Repeated training of a task has the potential to improve the motor performance such as coordination, balance, strength, endurance and physical conditioning (Bunton et al.,1993)[25].

The training programs includes functional activities performed in every activity and these training significantly improve the GMFM score and ability to perform day-to-day activity (Salem and Godwin,2009)[26].

This study was conducted to investigate the effects of a Task oriented training focused on the balance and gross motor function of children with cerebral palsy. A change in the gross motor functional measure (GMFM) Score indicates an improvement in ability to perform gross motor skills and change

Table 1: Paediatric balance scale (PBS):

EXERCISE	MEAN VALUE		STANDARD DEVIATION		t-VALUE	p-VALUE
	PRE-VALUE	POST VALUE	PRE-VALUE	POST VALUE		
TASK ORIENTED TRAINING (GROUP-A)	43.20	48.33	3.28	2.89	10.7677	<0.0001
CONVENTIONAL PHYSIOTHERAPY (GROUP-B)	41.93	44.13	0.80	0.73	11.000	<0.0001

Table 2: Gross Motor Function Measure (GMFM-66):

EXERCISE	MEAN VALUE		STANDARD DEVIATION		t-VALUE	p-VALUE
	PRE-VALUE	POST VALUE	PRE-VALUE	POST VALUE		
TASK ORIENTED TRAINING (GROUP-A)	166.07	172.93	4.20	4.27	14.7143	<0.0001
CONVENTIONAL PHYSIOTHERAPY (GROUP-B)	166.93	170.27	5.62	5.60	14.3486	<0.0001

in paediatric balance scale (PBS) score indicates an improvement in the ability to maintain balance.

The results support the alternate hypothesis that Task oriented training is more effective for balance and gross motor function in cerebral palsy children as compared to the conventional physiotherapy training.

The children in both groups following Task oriented training and Conventional physiotherapy showed significant improvements in balance and gross motor function.

Both the groups (Task oriented training group and Conventional physiotherapy group) improved after post intervention level in balance and gross motor function but Task oriented training group improved much better than Conventional physiotherapy in spastic diplegic cerebral palsy children.

CONCLUSION:

The result showed that both Task oriented training (TOT) and Conventional physiotherapy were effective in improving balance and gross motor function among spastic diplegic cerebral palsy children.

But when comparing both groups, Task oriented training group showed more improvement in balance and gross motor function and is statistically significant than Conventional physiotherapy group.

LIMITATIONS OF THE STUDY:

The limitation of this study includes, Small sample size, short duration of the study, and no follow up after 4 weeks.

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