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Research Article

Effectiveness of Functional Exercise Training on Aerobic Capacity Among Spastic Cerebral Palsy Children

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Abstract

Objectives: Cerebral palsy is primarily a disorder of movement and posture. Most of the cerebral palsy children struggle to do activities of daily life due to lack of cardiovascular endurance. Functional exercise training is a structured physical activity which uses more energy and is more intense than activities, which are part of daily living. The Study aims to show the effectiveness of functional exercise training on aerobic capacity among spastic cerebral palsy children.

Methods: Ten spastic cerebral palsy children were selected consecutively for the study and treated with functional exercise training for a period of 3 months, weekly two sessions of each 45 minutes. By step test $VO_{2\ maximum}$ was assessed before and after the end of 3 months to evaluate the aerobic capacity.

Results: The obtained data's were statistically analysed by paired 't' test at 0.005 level of significance and found that there was significant improvement in aerobic capacity following functional exercise training in spastic cerebral palsy children.

Conclusion: There was significant improvement in aerobic capacity following functional exercise training in spastic cerebral palsy children.

Keywords: *Spastic Cerebral Palsy; Functional Exercise Training; $VO_{2\ Maximum}$; Aerobic Capacity; Step Test*

Introduction

Cerebral palsy (CP) is primarily a disorder of movement and posture. It is defined as "A group of non-progressive, but changing motor impairment syndromes secondary to lesion or anomalies of the brain arising in the early stages of its development [1]. Incidence of cerebral palsy is 2 to 2.5 per 1000 live births [2]. Spastic cerebral palsy is more (77.4%) common among all the types of cerebral palsy's. Most children identified with cerebral palsy are boys [3].

Cerebral palsy is not a curable disease. Early physical therapy and proper rehabilitation will reduce the disabilities of cerebral palsy children. A multidisciplinary approach is necessary to rehabilitate a cerebral palsy child and among that physical therapy plays an important role in managing gross motor dysfunction. Physical therapy can be started as soon as the condition is diagnosed. The goals of physical therapy includes to foster independence by improving functional mobility, strengthen and encourage the growth of muscles, improve the ability to move all parts of the body and prevent joints from becoming tight or contracted. Positioning, adaptive devices, splints, casts and braces are used to support the limbs and minimise uncontrolled movements. Exercises help to improve the functional activities and make the child near normal. Scooters, wheelchairs and other devices are advised to increase mobility. The various techniques that are used to treat cerebral palsy children are proprioceptive neuromuscular facilitation, stretching, hydrotherapy, neuro developmental therapy, roots approach, sensory integration, ROM exercise, constrained induced movement therapy and myofascial release [4].

Aerobic capacity is also known as maximal oxygen uptake or maximum oxygen consumption ($VO_{2\ max}$). The maximum ability of a person to transport oxygen and utilize during physical activities is called $VO_{2\ max}$. Physical fitness is directly related to the $VO_{2\ max}$ of the children [5]. Peak oxygen uptake is strongly associated with health and disease in adulthood. Moreover, it is a strong indicator of functional capacity and mortality in adulthood [6]. Maintaining an appropriate level of aerobic fitness reduces the risk of disease and injury and increases the ability to work efficiently and to participate in and enjoy physical activity (sports, recreation, and leisure) [7]. Research consistently has shown that children with cerebral palsy have low $\dot{V}O_{2\ peak}$ values [8]. These low levels of $\dot{V}O_{2\ peak}$ affect both daily and recreational activities and could have significant implications for health in people with CP [9].

Functional exercise training is structured physical activity which uses more energy and is more intense than activities, which are part of daily living. Three areas of physical fitness are important for children, adolescents and adults with and without cerebral palsy. The first is aerobic fitness, the efficiency of the body to work for prolonged periods of time using oxygen as the fuel. Aerobic activities include walking, running and swimming. The second is anaerobic fitness, or the efficiency of the body to complete more strenuous activities that are much shorter in duration less than 15 seconds. These are the main forms of activity for children and include climbing stairs and games such as hide and go seek and tag. The third aspect of physical fitness is muscle strength. Increasing muscle strength aims to assist walking and improve the efficiency of doing other exercise [10].

Purpose of the Study

The purpose of the study is to find out the effectiveness of functional exercise training on aerobic capacity in children with cerebral palsy. The aerobic capacity of children was measured with $VO_{2\,max}$ by step test [11]. We hypothesized that functional exercise as a safe and beneficial intervention option for children with cerebral palsy.

Materials and Methods

Review Board of RVS College of Physiotherapy affiliated to the, The Tamil Nadu Dr MGR Medical University approved this single group pre and post-test experimental study and a written consent was obtained from the participants parents after giving clear instructions regarding the treatment procedure and its implications. The study was conducted in RVS Collage of Physiotherapy, Coimbatore. Ten clinically diagnosed spastic cerebral palsy children, classified under level I or II on the Gross Motor Function Classification System (GMFCS), who can able to follow simple verbal commands were consecutively selected for the study. Children treated Surgically and with neurotoxins were excluded from the study.

Functional exercise training was given for all the children, weekly two sessions each session lasted for 45 minutes and the same was continued for three months. The training program includes 3 phases warm up phase training phase and cool down phase. Training phase consist of 8 standardized task specific aerobic exercises.

S. No	Exercises
1.	Kicking the cone on one side, stepping to other side and kicking the cone on the other side and returning back to starting position.
2.	Kicking the ball in between 5 cones arranged in rows in a distance of 10 to 12 meters.
3.	Walking in a straight line in between two bins arranged in 6 - 8 meters distance and dropping balls in bins.
4.	Picking up a ball placed in a bin on one side, crossing the bench placed in between and dropping the ball in the bin on the other side. A total of 25 balls are given for this task.
5.	Form of group exercise, jogging in a circle around cones with balls placed at the centre. Following signal the child pick up the ball placed at the centre.
6.	Walking from a starting point to the mats which were placed at a difference distance with a weight on back (toy). Total of 3 mats are placed at various distances. Mat 1 is placed at 2 meter, mat 2 at 3 meters and mat 3 at 5 meters.
7.	Rings were placed in between two sticks in a distance of 10 meters. Picking one ring and putting it around one stick and running back again and taking another ring and putting it around the other stick and so forth.
8.	Removing a ring from stick and put that ring into another stick. A total of 25 rings are given.

Table 1: *Functional exercise training.*

Aerobic capacity of all the children were measured by$VO_{2\,max}$ using step test [12], at zero level and end of third moth of the study.

Results

Step test scores were analysed with paired 't' test and found significant at 0.005 level.

Intervention	Mean	Mean difference	SD	Paired 't' value
Pre-test	47.19			
Post-test	36.45	10.74	3.46	11.54*

Table 2: *Mean value, mean difference, standard deviation and paired 't' value between pre-test and post-test score of step test.*

Hence the calculated paired 't' value 11.54 is more that 't' table value 3.250 at 0.005 level. It is concluded that there is significant difference in aerobic capacity following functional exercise training in children with spastic cerebral palsy. That is there is significant difference in aerobic capacity following functional exercise training among children with spastic cerebral palsy.

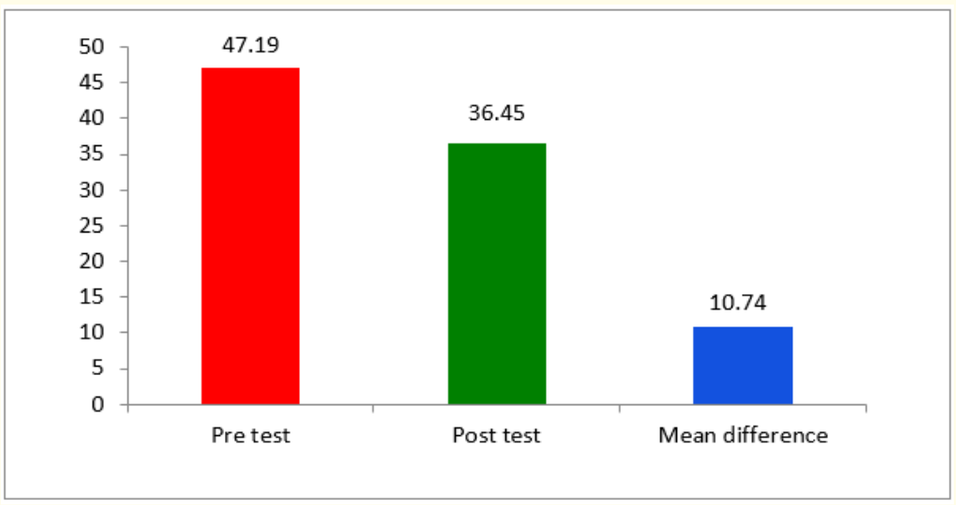

Figure 1: *Graphical representation of pre-test, post-test and mean value of step test.*

Discussion

The major findings was that the functional exercise training programme increases aerobic capacity in children with spastic cerebral palsy. The positive effect was maintained for a period of one month following cessation of training. but the follow up results were not discussed in the present study. The study has limited to small sample size of single experimental group but the findings are in agreement with other studies which have shown that functional exercise training programme in cerebral palsy is associated with improvements in aerobic capacity. Olaf*., et al.* (2007) conducted a study on adolescents and children with cerebral palsy to evaluate the aerobic and anaerobic capacity following 8-week training program. Seven to eighteen years old 86 cerebral palsy children participated in the study. It was concluded that anaerobic capacity (P = .004) and aerobic (P < .001) showed significant training effect. A significant effect was also found for athletic competence (P = .005), muscle strength (P < .001and agility (P < .001). When added to standard care physical therapy exercises improve fitness, involvement level, and excellence of life in children with cerebral palsy [13].

Conclusion

Functional exercise training program is effective in improving aerobic capacity among children with spastic cerebral palsy.

Bibliography

1. Mutch L., *et al*. "Cerebral palsy epidemiology: where are we now and where are we going?" *Developmental Medicine and Child Neurology* 34.6 (1992): 547-551.

2. Rosen MG and Dickinson JC. "The incidence of cerebral palsy". *American Journal of Obstetrics and Gynecology* 167.2 (1992): 417-423.

3. Chitra Sankar and Nandini Mundkur. "Cerebral Palsy-Definition, Classification, Etiology and Early Diagnosis". *Indian Journal of Paediatrics* 72.10 (2005): 865-868.

4. Susan B O' Sullivan. "Physical rehabilitation". Jaypee brothers, 5th edition (2013): 357, 678, 759.

5. Armstrong N and Welsman JR. "Aerobic fitness: what are we measuring?" *Medicine and Sport Science* 50 (2007): 5-25.

6. Brill PA., *et al*. "Muscular strength and physical function". *Medicine and Science in Sports and Exercise* 32.2 (2000): 412-416.

7. Carnethon MR., *et al*. "Prevalence and cardiovascular disease correlates of low cardiorespiratory fitness in adolescents and adults". *Journal of the American Medical Association* 294.23 (2005): 2981-2988.

8. Lundberg A. "Maximal aerobic capacity of young people with spastic cerebral palsy". *Developmental Medicine and Child Neurology* 20.2 (1978): 205-210.

9. Fernhall B and Pitetti KH. "Limitations to work capacity in individuals with intellectual disabilities". *Clinical Exercise Physiology* 3.4 (2001): 176-185.

10. Thomas D O'Brien., *et al*. "Systematic review of physical activity and exercise interventions to improve health, fitness and well-being of children and young people who use wheelchairs". *BMJ Open Sport and Exercise Medicine* 2.1 (2016): e000109.

11. Duygu Turker., *et al*. "The effects of goal directed therapy on gross motor function and functional status of children with cerebral palsy" (2015).

12. Payam Heydari., *et al*. "Step Test: a method for evaluating maximum oxygen consumption to determine the ability kind of work among students of medical emergencies". *Electron Physician* 9.3 (2017): 4020-4026.

13. Olaf Verschuren., *et al*. "Exercise Training Program in Children and Adolescents With Cerebral Palsy: A Randomized Controlled Trial". *JAMA Pediatrics* 161.11 (2007): 1075-1081.

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