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STRENGTH MEASUREMENT FOR CHILDREN WITH CEREBRAL PALSY

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ABSTRACT

Cerebral palsy (CP) is a neuro-developmental disorder resulting from an injury to the developing brain. The primary impairments associated with CP include reduced muscle strength and reduced cardio respiratory fitness, resulting in difficulties performing activities such as dressing, walking and negotiating stairs. Exercise is defined as a planned, structured and repetitive activity that aims to improve fitness, and it is a commonly used intervention for people with CP. Aerobic and resistance training may improve activity (i.e. the ability to execute a task) and participation (i.e. involvement in a life situation) through their impact on the primary impairments of CP.

Background: To find the effectiveness of strength training in children with spastic cerebral palsy.

Variable: MMT.

Methodology: Subjects were selected and administered with strength training for 3 times a week for 8 weeks. Pre and post of MMT were compared.

Result: the data were processed by SPSS version 21, strength training in elbow flexors and elbow extensors showed $P<0.005$.

Conclusion: There was significant improvement in strength in both flexors and extensors.

Key words: *Cerebral palsy, Strength, MMT, Functional Activity*.

INTRODUCTION

The term “cerebral palsy” (CP) describes a group of disorders of the development of movement and posture, causing activity limitations that are attributed to non progressive impairments that occur in the developing fetal or infant brain. Motor disorders in people with CP are often accompanied by disturbances of sensation, cognition, communication, perception, or behavior or a seizure disorder, or both. Abnormal motor behavior (reflecting abnormal motor control) is the core feature of CP. It is characterized by various abnormal patterns of movement and posture related to defective coordination of movements or regulation of muscle tone. Hypertonia and hypotonia have the most dramatic secondary effects on the muscle. The well-observed effects of spasticity on skeletal muscle include decreased longitudinal growth of the muscle fiber length, decreased volume of the muscle, change in motor unit size, and change in the fiber type and neuromotor junction type. Muscles in children with CP are always very thin in addition to being short, which means that these muscles are also weak, as a muscle's strength is related to its cross-sectional area. By creating a significant contracture, the spastic muscle has great passive strength but low active strength compared with normal muscles.

Active strength is altered more in spastic children because of the difficulty of avoiding co-contraction, as there is less antagonist inhibition in spasticity. More than 50 years ago, Phelps proposed that resisted exercise "to develop strength or skill in a weakened muscle or an impaired muscle group" was an integral part of treatment in CP.

Shortly thereafter, physical therapists denounced strengthening for their patients with upper motor neuron syndromes based primarily on the clinical concern that such strong physical effort would exacerbate spasticity. However, scientific evidence has been accumulating in recent years that dispels this contention and supports the effectiveness of strength training for improving motor function in CP as well as in other neuromotor disorders. Muscle strength is related to motor performance and should be an integral part of a rehabilitation program that addresses other impairments which inhibit motor performance in this population, such as muscle–tendon shortening, spasticity, and coordination deficits.

It has been shown that even highly functional children with spastic CP are likely to have considerable weakness in their involved extremities compared to age-related peers, with the degree of weakness increasing with the level of neurologic involvement. If a child has at least some voluntary control in a muscle group, the capacity for strengthening exists.

In the absence of voluntary control, strength training is more problematic, but may be facilitated by the use of electrical stimulation or by strengthening within synergistic movement patterns. However, strengthening is only justifiable if the ultimate goal is to improve a specific motor skill or function.

However, hesitation and even resistance to their incorporation are still encountered despite the lack of evidence to suggest that strengthening is detrimental in the presence of spasticity and accumulating evidence to support this type of exercise. The purpose of this annotation is to summarize existing research on strength testing and training, primarily focusing on CP and address strength training effective in increasing force production and improving motor function and disability in CP and strength be measured reliably and in a valid way in cerebral palsy

METHODS:

Study Design and setting: The study was conducted, in White Memorial College of Physiotherapy Tamilnadu, India. The subjects in the study consisted of 20 spastic cerebral palsy children. The subjects were recruited using convenient sampling method.

Inclusion: Children with the age of 2-12 years were recruited for the study, were diagnosed as Spastic cerebral palsy.

Exclusion: Subjects with upper limb deformities, Current participation in other management strategies like botulinum toxin, serial casting and any orthopaedic surgery, Children undergoing strength training for the previous three months.

Tools: MMT – To measure elbow muscle power.

PROCEDURE:

The study was approved by White memorial College of Physiotherapy, Nagercoil review board and complies with the principle laid down in the declaration of Helsinki in 2005. A written informed consent was received from parents or care taker of the children prior to the study was administered.

The children received the strengthening exercise in sitting position with weight cuffs at the wrist. The children were asked to perform flexion and extension movement. The weights used were free wrist weights at 80% maximum. The subjects were administered with 4 sets of 5 repetitions for each muscle for the duration of 3times a week and for the duration of 8 weeks. The strength was measured every 2 weeks and load was increased every 2 weeks throughout the exercise regimen.MMT scale was used to measure the strength of flexors and extensors of elbow pre and post to training session. The results are tabulated and results were extracted using SPPSS version 21.The data are presented below.

RESULTS

Table 1: Descriptive Variables

S.no	Sex	Frequency	Percentage
1	Male	11	55.0
2	Female	9	45.0

Table 2: Comparison of elbow flexors and elbow extensors within group

Group	Phase of intervention	Mean	Standard Error	SD	t	p
Flexors	Before	2.80	.186	.833	-11 .606	0.001**
	After	3.45	.135	.604		
Extensors	Before	2.65	.220	.220	-1.317	0.000**
	After	3.65	.109	.109		

P < 0.001**

Table 3: Comparison of elbow flexors and elbow extensors between group.

Group	Phase of intervention	Mean	SD	Z	P
Flexors	Before	2.80	.833	-3.357	0.001**
	After	3.45	.604		
Extensors	Before	2.65	.220	-3.704	0.000**
	After	3.65	.109		

P < 0.001**

DISCUSSION:

Results show that there is significant improvement in strength training in both flexors and extensors P<0.005. This is supported by the study; there are significant Strength training programs for children with cerebral palsy showed inconclusive evidence for improving walking, despite improvements in strength. Recent studies have suggested that strength training with high movement velocity is more effective for improving walking than traditional resistance training[7]. In a study done by Aye strength-training program for hip and knee extensors has led to improved muscle strength and gross motor function in children with spastic diplegic cerebral palsy[8]. The effect size of the activities and variables related to gait, except for gait endurance, were medium to large. The effect size of individual muscles was large, but the effect sizes for ankle plantar flexor, hip abductor/adductor, and extensor were insignificant. Strengthening interventions are useful for increasing muscle strength in individuals with cerebral palsy, specifically in youth and children, and optimal exercise consisted of 40- to 50-min sessions performed 3 times per week. Although strengthening interventions may improve activities, including gait, more studies that are rigorous are needed to determine the contributions to gross motor function[9].

CONCLUSION:

The collected data indicated that there were improvement in terms strength in both flexors and extensor group children. The results suggest that weight training in spasticity in children with cerebral palsy can be useful. By increasing the strength of the muscle the functional abilities are improved vice versa. This study strongly recommends strength training in spastic children with cerebral palsy to improve their functional abilities.

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