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RESEARCH ARTICLE

EFFICACY OF CONSTANT VERSUS INTERMITTENT STRENGTH TRAINING TO ENHANCE THE OPERATIVE ABILITIES IN CHILDREN WITH SPASTIC DIPLEGIA

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ABSTRACT

Background: The weakness of muscles results in impairment of motor skills affecting daily activities in children with cerebral palsy (CP). It has been reported that children with cerebral palsy when subjected to strengthening interventions produce improvements in functional abilities. This paper describes the effects of constant strength training of a school-based progressive functional development for children with CP.

Aims: To determine the outcome of continuous versus intermittent strength training using 10 metre walking test (10MWT) in improving the functional abilities in children with spastic diplegia.

Methods: Thirty (30) spastic diplegic children with Gross Motor Function Classification level I to II (GMFCS) aged 5 to 12 years were randomly enrolled. The children were equally distributed, 15 each in intervention group (Group A) and control group (Group B) and were subjected to 10MWT (32.8feet) before and after intervention. Group A received 5days of intervention every week for 8 weeks, whereas (Group B) was subjected to 3 days of intervention every week for 8 weeks. The start time was taken at 2 meters distance from the start up distance and three successive trials were taken. The average of three trials was considered.

Results: Continuous strengthening program had shown statistically significant alteration in functional outcome measured by (10MWT) ($P<0.05$)

Conclusion: There is a significant improvement on functional abilities and the walking speed in children who underwent constant strengthening training. The time taken to cover 10 meter distance also showed a marked reduction.

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INTRODUCTION

Cerebral Palsy is a common developmental disability first described by William Little in 1840's. Cerebral Palsy (CP) is a group of disorders due to non-progressive damage to developing foetal brain (Bax *et al*., 2005). The clinical hallmark is abnormal control of movement or posture that results in limitation of activity (Sahrmann and Norton, 1977; World Health Organisation, 2001; Prevalence and characteristics of children with cerebral palsy in Europe, 2007). Earlier studies reported an incidence of 2 to 2.5 per 1000 live births. In India prevalence of CP in the range of 1.5 to 2.5 per 100 live births (Asirifi, 1972). Sarva Shikha Abhiyan programme reports high incidence of disabilities children with cerebral palsy in India (Sarva Shiksha Abhiyan, 2005). According to the International Classification of Functioning, Disability and Health (ICF) (World Health Organisation, 2001). CP manifests with deficit functions of body such as decreased muscle power, spasticity and selective motor control. These impairments might bind the performance of daily activities in life. Improving and optimizing functional activities are significant goals for therapeutic protocol. Bax in 1964 reported that spastic diplegia is the most prevalent form of CP and it is characterized by motor in coordination that impairs functional abilities mainly in the lower extremities. The inability to walk is a major concern for the parents of children with cerebral palsy. Strengthening exercises in CP for whom limitation is a major contributor to their gait deficit may progress walking function (Diane, 2010). The impaired muscle functions in children with cp like spasticity, muscle weakness and loss of selective motor control, can affect their daily life activities. A recent study concluded that strength training for children with cp can progress or sustain their mobility, and found a strong relationship between muscle weakness and limitation of activities in children with cp (Scholtes *et al*., 2010). A short programme of pre-test and post-test strengthening exercise in a group circuit following training for children with CP was set for one hour twice a week. Practising functional ability exercise children moved between stations using treadmill walking, step ups, sit to stands and leg

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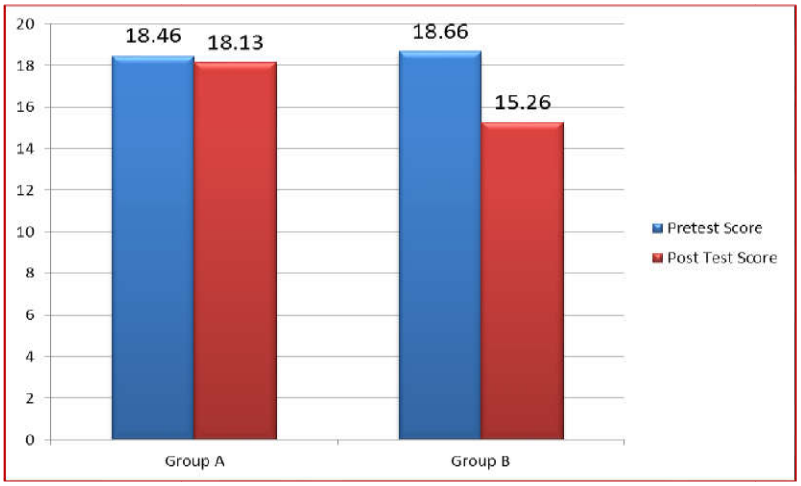
Table 1. 10 meter walk test

10 MWT	Pre test mean score	Standard deviation of pre test values	Independent 't' test value t=2.048	Post test mean score	Standard deviation of post test values	Independent 't' test value t=2.048	Dependent 't' test value t=2.145
Group A	18.46	1.40	0.63	18.13	1.45	4.97	1.98
Group B	18.66	1.46		15.26	1.53		19.85

Statistical comparison of 10 meter walk test between Group A and Group B using'-test.
a: t< 0.001-extremely significant; on comparing Group B with Group A
b: t< 0.001-extremely significant; on comparing Group A with Group B

Table 2. Comparing pre test – post test means 10 –MWT



Pictorial representation of the comparison between pre test and post test of Group A and Group B on 10 meter walk test.

presses, which determined the isometric strength and functional ability improvement in pre to post training. (Blundell *et al*., 2003) In a study 10 metre fast walk test (10MFWT) and 6 minute walk test (6MWT) evaluates in ambulatory children with cerebral palsy with GMFCS level I & II, shows adequate test-retest reliability with in short distance recommended to establish their fast pace (Thompson *et al*., 2008) The purpose of this study was to determine the effect of continuous versus intermittent strength training using 10MWT in improving the functional abilities in children with spastic diplegia.

MATERIALS AND METHODS

This was a clinical study conducted on 30 spastic diplegic children boys and girls aged 5 to 12 years. Based on the selection criteria 30 diplegic CP children with I & II levels on Gross motor function measurement (GMFCS) scale were selected by convenient sampling method and were assigned into 2 groups namely group A(invention group) and group B(Control group) with 15 children in each group. Subjects were excluded if they had any record of recent surgery, unable to walk indoor without support, unable to move the joint voluntarily with full range of motion, any fixed deformity, not able to follow instructions, visual and hearing impairment or any systemic illness. Prior to the participation, the study was explained to the parents and written informed consent was obtained from each of them. Institutional ethical committee approval was obtained. Each subject participated in 8 week bilateral, progressive resistance strengthening program to lower limb muscles. Group A (Experimental group) received continuous strength training program for 8 weeks, 5 days a week, and the session was 45 minutes to one hour, No rest were given in between the session. Whereas Group B (Control group) received intermittent, Strength training program for 8 weeks, 3 days a week with alternate basis, and the session was 45 minutes to one hour, rest were given in between the session. Subjects were assessed using GMFCS scale prior to the intervention protocol and the performance of pre intervention and post intervention was measured using 10 MWT. In 10MWT every child need to walk 10 meters (32.8feet) and the timing was noted. The start time was taken at 2 meter distance from the start up distance and three successive trials were taken. The average of three trials was considered for our study. Major group of lower limb muscles were strengthened using progressive resistance exercises. Results obtained from statistical analysis between pre-test and post test valves of group A and group B at 5% level of significance showed significant improvement in both scales for group A.

Statistical analysis

The collected data was analyzed using SPSS version 22. Descriptive Statistics was produced for pre and post 10MWT using GMFCS scale. Statistical analysis was done using the student't' test The pre-pre and post-post mean values were analyzed by unpaired't' test and paired 't' test was used to analyze pre-post mean values. Independent't' test was used to check the significant difference between two groups $P<0.05$ is considered to be significant.

RESULTS

Most of the children in Group B (control group) have showed statistically insignificant changes in both the pre test ($t=0.63$, $p<0.05$) and post test ($t=4.97$, $p<0.05$) in 10MWT. Whereas in Group A (experimental group) have shown significant changes in pre test ($t= 1.98$, $p<0.05$) and post ($t=19.85$, $p<0.05$). The pre and post tests of Group A and Group B are shown in Table 1 and Table 2.

DISCUSSION

The findings of this study are supported for two theories one theory is strengthening all major lower limb muscle are very essential in improving the functional abilities and walking speed in spastic diplegic cerebral palsy children (Perry, 1993; Damiano and Abel, 1998; Mac. Phail and Kramer, 1996) Second theory is frequency of the treatment sessions. When there is increased frequency of treatment sessions. When there is increased frequency of treatment session as in Group A Children underwent continuous strength training program. Showed significant improvement in functional abilities and walking speed comparing to the Group B children hard low frequency of treatment sessions as protocol followed by Intermittent strength training group (Parker *et al*., 2008; Harris *et al*., 1997; Blundell *et al*., 2003) This constant strength training resulted in statistically significant larger improvements (5%) muscle strength in the training group than in the control group. we propose that strength training should be incorporated as a regular exercise habit to maintain increased strength levels in children with cerebral palsy. (Fowler *et al*., 2007)

Limitation

The study was done in a single setup with fewer sample size which limits the generalization of the results on whole CP population. Though we planned to include the participants from 5 to 12 years old, except very few many parents whose child was above 9 years were unwilling to participate in the study.

Conclusion

The study shows that there was a significant improvement on functional abilities and the walking speed in children who underwent continuous strengthening exercise program. The time taken to cover 10 meter distance also showed a marked decrease in time to cover10 meter distance.

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