

## ORIGINAL ARTICLE



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# Effects of Lower Limb Strength Training and Functional Training in Spastic Cerebral Palsy

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## Abstract

Cerebral palsy (CP) is a group of disorders that affect a person's ability to move and maintain balance and posture. Spastic cerebral palsy is classified into three categories as spastic hemiplegic cerebral palsy, spastic diplegic cerebral palsy and spastic quadriplegic palsy. There are various treatment approaches that can be followed such as physical therapy, oro-motor rehab, modalities and myofascial release. Need of this study was to know about strength and functional training protocols that can be useful to the children of spastic cerebral palsy<sup>[2]</sup>. Another need of this study is that there are limited studies on this topic, this study can help in achieving result in minimum time with speeding rehabilitation of these cerebral palsy children<sup>[3]</sup>. In this study, changing of muscle strength and functional ability were seen from pre-treatment to post-treatment scoring done by MAS with respect to gross motor functions and MTUG with respect to gross motor functions<sup>[1]</sup>.

Based on this study we could infer that treatment protocol which is focused on both strength and functional training simultaneously, have better results in achieving gross motor function levels as compared to individual treatment protocol group<sup>[2]</sup>. We believe that if various technologies such as virtual reality devices or equipment and other modalities such as functional electrical stimulator, can come into practice, that can enhance the rehabilitation. Although the sample size was limited to 15 patients, but we could see the improvement to be statistically significant.

**Keywords:** Spastic cerebral palsy, strength training, functional training, GMFCS level, MTUG and MAS.

## Introduction

Cerebral Palsy refers to the group of various neurological conditions or disorders which alters the motor abilities, movements, muscle-tone or posture of an infant<sup>[3]</sup>. Most common type of cerebral palsy is spastic cerebral palsy which refers as increasing muscle tone leading stiffness. In these reflexes are also heightened<sup>[5]</sup>. Spastic cerebral palsy is characterized by: - stiff, tight

muscles (hypertonia) on one or both sides of the body, exaggerated movements, limited mobility, abnormal gait, crossed knees, joints don't full extend, walking on tiptoes, contractures<sup>[5]</sup>. There are various treatment approaches that can be followed such as physical therapy, oro-motor rehab, modalities and myofascial release.

**Need of the Study:** To understand about strength and functional training protocols that can be useful to the children of spastic cerebral palsy. These exercises based on strength training and functional training of the lower limb can help achieve and enhancing gross motor functions levels.

Another need of this study is that there are limited studies on this topic, this study can help in achieving result

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in minimum time with speeding rehabilitation of these cerebral palsy children.

**Hypothesis: Alternative Hypothesis:** - there is an effect of lower limb strength training and functional training in children with Cerebral Palsy.

**Null Hypothesis:** - there is no effect of lower limb strength training and functional training in children with Cerebral Palsy.

### Objectives of the study

- To determine the effect of strength training.
- To determine the effects of functional training.
- To compare effectiveness of combined strength and functional training.

**Aim of the Study:** To determine the effects of functional and strength training on the spastic lower limb among the children of Cerebral palsy

### Methodology

- **Inclusion Criteria:**
  - GMFCS level I, II,III with spastic CP patients
  - age group including 3 to 10
  - independent ambulation with /without gait assistance.
  - not taking any pharmacological medications.

- able to follow visual, auditory command and participate in program.

- **Exclusion Criteria:**

- age group above 10 yrs
- level IV, V
- neurological conditions other than cerebral palsy.
- orthopedic surgery in lower limb within 12 months.
- surgery during period of study.

### Procedure

Patients screening done on the basis of inclusion and exclusion criteria. Informed consent was obtained from the parents of the patients who met the criteria. Subjects were categorized into three groups according to their gross motor function levels and training protocol. Groups are strength training group, functional training group and strength and functional training group. Protocol was followed as 3 sessions per week which was lasted for 6 weeks. Home protocol was also being followed with this session. After completion of protocol, gross motor function levels were assessed and post reading were taken. Each group comprises of 5 subjects. Protocol was followed on as 3 sessions per week which was followed for 6 weeks.

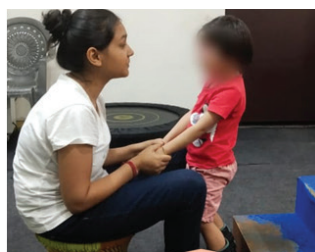


Fig.1: Sit to Stand with Weight Cuffs

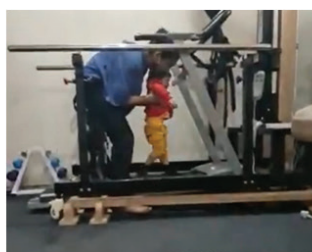


Fig.2: Treadmil Walking



Fig.3: One Leg Standing with Weight Cuffs



Fig.4: Strength Training with Weight Cuff



Fig.5: Strength Training with Theraband



Fig.6: Gait initiation with Posterior Walker



Fig.7: Tendam Walking for Gait Training

### Data Analysis

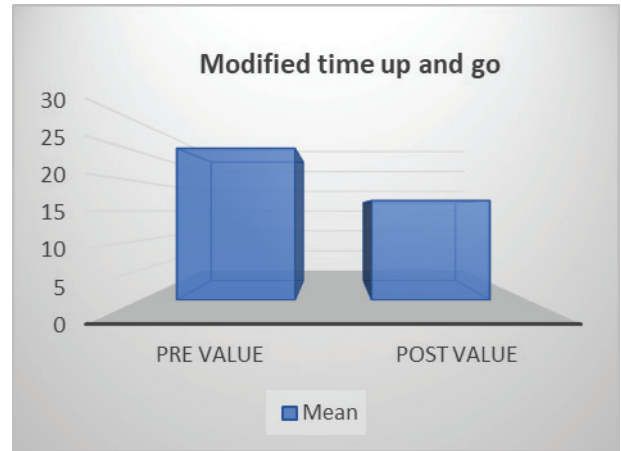
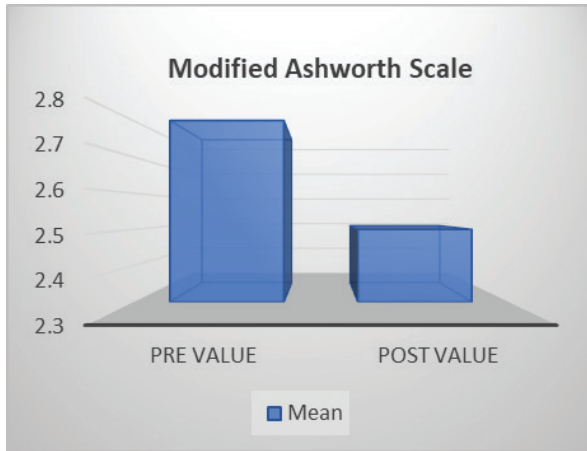
The analysis of the data was being done on 15 patients by using various scales such as MTUG, MAS, and GMFCS

and many more to examine various signs and symptoms of this condition. Time span taken for this analysis was over 1 month.

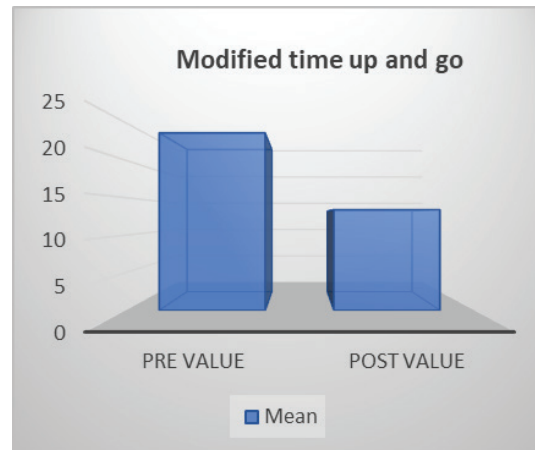
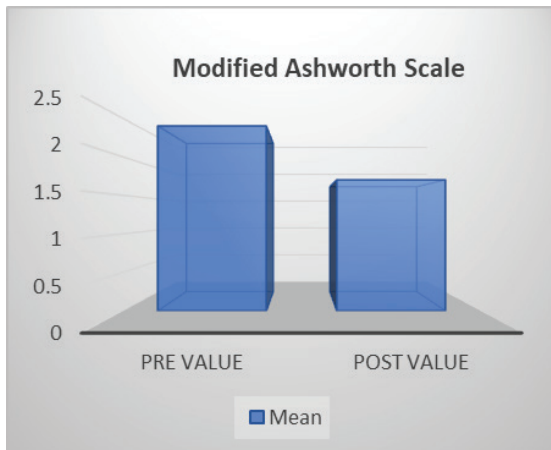
Pre and post evaluation were made which helped us to know the improvement in the signs and symptoms of the patients. Data was collected on the basis of strength and functional ability measured by MAS (pre and post value), MTUG (pre and post value).

The data analysis was done using descriptive analysis-mean standard deviation on MS Excel.

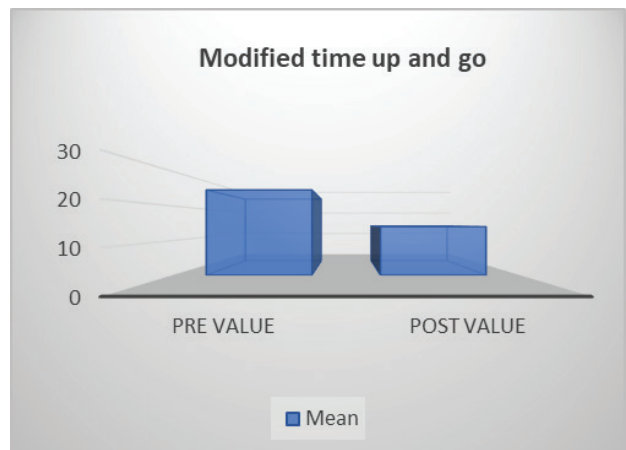
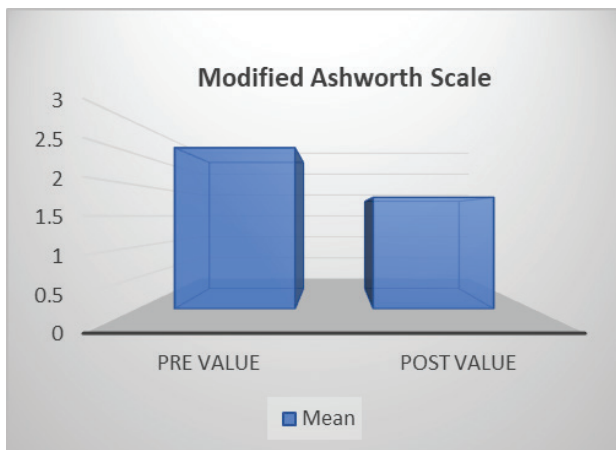
### RESULT



Graph 1: Group 1 strength training MAS and MTUG Mean



Graph 2: Group 2 functional training MAS and MTUG Mean



Graph 3: Group 3 strength and functional training MAS and MTUG Mean

## Discussion

Strength training and functional training both are very essential component for enhancing the life and gross motor function of the lower limb. This is an experimental study in Reborn Physiotherapy clinic and neuro rehab center OPD was done. 15 subjects were taken of age group 02 yrs - 10 yrs. These subjects were divided into three groups which were asked to follow protocol under the strength training group and functional training group and last for following protocol of both the training.

**Group 1: Strength Training Protocol Followed:** Subjects were having low muscle strength and spastic muscles with the baseline assessment of MAS ( $2.8 \pm 0.83$ ), MTUG ( $25.6 \pm 3.3$ ) and gross motor function was level 3. Strength training was done in which strength was enhanced which showed good result the scales as MAS ( $2.0 \pm 0.6$ ), MTUG ( $16.8 \pm 5.4$ ) and on the gross motor functions of the patients which improved to level 2. This group has the minimum effect on gross motor function.

**Group 2: Functional Training Protocol Followed:** Baseline for this group assessment was MAS ( $2.4 \pm 0.54$ ), MTUG ( $23.6 \pm 2.07$ ) and gross motor function scale level was some of level 2 and some was of level 3. Functional training emphasized on functional aspects of the lower limb. This group has shown major improvement in achieving gross motor functions from level 3 and level 2 to level 2 and level 1 respectively. This can be concluded with other scales post value as of MAS ( $1.7 \pm 0.27$ ) and MTUG ( $13.6 \pm 2.4$ ).

**Group 3: Strength and Functional Training Protocol Followed:** To observe the changes baseline assessment were followed as MAS ( $2.6 \pm 0.54$ ), MTUG ( $24.6 \pm 1.3$ ) and gross motor function scale was of level 2. This group has the maximum improvement in the gross motor functions as strength and functional both trainings are taking place. Their post-value assessment significant changes as MAS ( $1.8 \pm 0.27$ ), MTUG ( $14.6 \pm 1.9$ ) and gross motor function changed to level 1. These combined exercises helped in achieving the maximum result.

## CONCLUSION

In conclusion, group 3 in which functional and strength training exercises were performed showed the maximum improvement in enhancing the gross motor function level. This result was achieved as combination of functional and strength training increases mobility, enhance muscle functions, improve muscle tone, increased proprioception, reduced fall of fear, improve balance, reduce ambulatory phase, improving gait pattern. More research should be conducted in this field especially with the growing technological aspects especially with the virtual reality which will help to assist and decrease the load on the therapist side as well as mechanical advantage. We got a significant result for our study however it would be better to have larger population data so that to have the better outcome result.

**Ethical Clearance:** Taken

**Conflict of Interest:** Nil

**Source of Funding:** Self

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