



## EFFECT OF PLANTAR FLEXORS STRETCHING ON INCREASING THE ANKLE RANGE OF MOTION IN CHILDREN WITH DIPLEGIC SPASTIC CEREBRAL PALSY

### KEYWORDS

Cerebral palsy, Diplegia, Spastic, Plantar Flexors, Range Of Motion.

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### ABSTRACT

Children with spastic cerebral palsy experience increased muscle stiffness and reduced muscle length, which may prevent elongation of the muscle during stretch. Stretching performed either by the clinician, or children themselves is used as a treatment modality to increase/maintain joint range of motion. It is not clear whether the associated increases in muscle-tendon unit length are due to increases in muscle or tendon length. The purpose was to determine whether plantar flexor stretching increases the ankle range of motions in children with diplegic children with cerebral palsy.

### Introduction:

Cerebral palsy is a non progressive but not unchanging disorder of movement and posture due to an insult to or anomaly of the developing nervous system(1). Cerebral palsy presents a conglomerate of complexities(2). The diagnosis referred to lack of oxygen to the brain shortly before, after or during the birth process. Of every 2000 infants born, 2 are born with cerebral palsy. The underlying basis of the neuro developmental sequelae in cp is white matter damage collectively called periventricular leukoencephalopathy.(1)

The categorization of cerebral palsy is based on the parts of the body that are primarily involved diplegia, hemiplegia, triplegia and quadriplegia. In India the prevalence of cerebral palsy are around 45 per 1000, more in rural and less in urban populations. Infants under 1500 grams birth weight who survive have the possibility of cerebral palsy(1).

In paraplegia type of cerebral palsy the involvement of the lesion will be on both the lower extremities and always of spastic type. In India the prevalence of spastic paraplegic type is around 22% (7). Birth asphyxia is a major cause of cerebral palsy in India.

The major problems of CP is impaired control and coordination of voluntary muscles which is accompanied by cognitive delays or learning disabilities in 50-75% of children and by disorders of speech (25%), auditory impairments (25%), seizure disorders (25-35%) or abnormalities of vision(40-50%)(6). Ankle plantar flexor contracture is the major problem of cp because of spasticity. Stretching exercise and mobility exercises play a vital role in the cp rehabilitation. The muscles should be maintained at the appropriate physiological length for normal movement control and normal postural adjustments (1). In cerebral palsy because of delay or absence of normal movement muscles are usually in shortened position hence stretching of the muscles is essential to increase the neuromuscular control (1). Length of the muscles should be maintained not only through stretching but also through various other modes of stretching. The achievement of walking is the main goal of the physiotherapy intervention in children with cerebral palsy and it may influence the mobility and participation in daily activities. Stretching of plantar flexors plays a vital role in the mobility of cerebral palsied children.

Few studies have been carried out on application of stretchin in diplegic spastic cerebral palsy. So the need of the study is to find the effectiveness of stretching ankle plantar flexors of children with

diplegic spastic cerebral palsy.

### METHODOLOGY:

#### Materials and Methodology

**Study Design:** Experimental design

**Study Setup:** White Memorial College of Physiotherapy

**Sample Size:** 20 Subjects with spastic cerebral palsy. (Diplegia)

**Sample Technique:** Convenient sampling method is used to assign 10 subjects to each group

### SELECTION CRITERIA

#### Inclusion Criteria:

- Age: 3-8 years.(5)
- Children with Spastic Diplegia. (5)
- Spasticity Grade 1 To 3 According To Mas. (5)

#### Exclusion Criteria:

- Children with spastic hemiplegia, monoplegia.
- Subjects with limb length discrepancy.
- Those subjects having foot edema, foot bony deformities.
- Subjects with any surgical treatment of T.A.
- Children suffering from any medical disorders like seizures

### Materials Required

- Goniometer
- Tendon hammer

### OUTCOMING MEASURE

- To find out ankle dorsiflexion ROM using Goniometer.

### Procedure

- 20 Subjects with diplegic spastic cerebral palsy were selected by convenient sampling method.
- Both male and female were included in the study.
- Subjects are randomly distributed into two groups as:
  - Group A: 10 subjects
  - Group B: 10 subjects
- Informed consent was obtained from their parents before study.
- Their demographic profile and detailed medical history was collected through interviewing parents or caretakers and from previous medical history according to inclusion and exclusion criteria.
- Prior to treatment session their ankle dorsiflexion range of motion is assessed using goniometer.
- Values obtained from initial assessment are recorded as pretest

values

- After the intervention ,the subjects were assessed again to evaluate the ankle dorsiflexion range of motion using Goniometer.
- Final values are consider as post test values.

**Treatment protocol**

**Protocol 1**

- Group A received prolonged muscle stretch with ankle dorsiflexed on Tilt table.
- Duration:30 minutes per session per day for 5 days a week.(3,4)
- Table was tilted to 85 degree relative to horizontal.
- Straps were offered to provide adequate support.

**Protocol 2**

- Group B received Passive Dorsiflexion Range of Motion exercise for ankle.
- Duration: 30 minutes per session per day for 5 days a week.
- Position of the patient : Supine lying.
- Position of the Therapist: Standing beside the patient and facing the ankle joint of the patient.
- **Procedure:** One hand of the therapist grasping the lower leg region and his palm of other hand holding the heel of the patient. The Therapist hand which holds the heel will passively dorsiflex the ankle and stretches the tightened structures.

**RESULTS:**

The statistics were done with the help of SPSS 21 version.

**Table 1:** Descriptive data:

S.no	Male	Female	Age Mean
Experimental Group	6	4	6.3+ 7.0
Control group	5	5	6.0+7.0

The above table show the descriptive data of male and female ratio and their mean age of children involved in study.

**Table 2:** Pre test values of experimental and control group in Left and right ROM

S.no	Number	Mean	SD	Std Error mean
Experimental Group Pre test Left	10	7.400	2.3781	.7520
Control group pretest –Left	10	4.550	1.9643	.6212
Experimental Group Pre test Right	10	5.800	2.3118	.7311
Control group pretest –Right	10	6.000	2.4152	.7638

The above table shows the experimental and control group of cerebral palsy children before treatment and ROM its statistics given

**Table 3:** Post test values of experimental and control group in Left and right ROM

S.no	Number	Mean	SD	Std Error mean
Experimental Group Post test Left	10	12.400	2.4129	.7630
Control group pretest –post Left	10	6.250	1.8295	.5786
Experimental Group Post test Right	10	10.600	2.6331	.8327
Control group post test –Right	10	8.000	2.4152	.7638

The above table shows the comparison of pre and post within group of experimental and control group.

**Table 4:** Comparison of Experimental and control group

S.no	Mean	SD	t value	P value
Experimental and Control group Left ROM	-5.0000	.9718	-16.270	.000
Experimental Group and Control group–Right ROM	-4.8000	1.0055	-15.095	.000

The above table shows the comparison between groups

**Graph:** shows comparison of Experimental and Control group between group

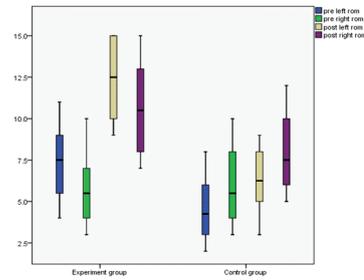


Figure 1: Box plot distribution of pre and post left and right ROM for experiment and control group

**DISCUSSION:**

The existing evidence suggests that physiotherapist need to consider what may be the limiting factor of ankle dorsiflexion to select the most appropriate treatments and interventions. Physiotherapist performs several therapeutic interventions, such as stretching, manual therapy, electrotherapy, ultrasound, and exercises, to increase ankle dorsiflexion. Improvements in active ankle-dorsiflexion ROM after static stretching were added to standardized treatments. The stretching intervention may increase flexibility before pain perception and allow the viscoelastic properties of junctions between muscle and tendon to overcome the stretch reflex or increase the stretch tolerance. We included this study in our systematic review because stretching has been accepted as part of the standard-of-care treatment to restore ankle-dorsiflexion ROM, and we considered that the standardized effect sizes allow us to compare the interventions performed in earlier studies.

Our study also shows improvement prolonged muscle stretch with ankle dorsiflexion on tilt table had increased ROM. This can be proved by the P value 0.000 which is less than .005. Restoring normal ROM of ankle dorsiflexion with cerebral palsy children quickly restore full functional abilities. In addition, strength of ankle plantar flexor and eversion range of motion is significantly correlated with balance stability. Knee flexor and ankle dorsiflexors are involved in lifting the lower limb during the swing phase of gait, thereby allowing sufficient clearance of the toes over the ground; which is important in the prevention of tripping

**CONCLUSION:**

The cerebral palsy children in experimental group who underwent with prolonged muscle stretch with ankle dorsiflexion on tilt table had increased ROM when compared to conventional group who received passive, dorsiflexion ROMexercise for ankle. This proves that the ROM would be improved by prolonged muscle stretch with ankle dorsiflexion in spastic diplegic children.

**REFERENCES**

1. V. C. Jacob, Hema Biju, Alok Sharma. Neuro Rehabilitation A Multidisciplinary approach, 2012.
2. Darcy Ann Umphred. Neurological rehabilitation, 1995.
3. Odeen.I. Evaluation of the effects of muscle stretch and weight load in patients with spastic paraplegia, Scand Journal of Rehabilitation and Medicine, 1981, 13:117-121
4. Tremblay.F. Effects of Prolonged muscle stretch on reflex and muscle activations in children with spastic cerebral palsy, 1990, 171-180
5. Preet Kamal Kaur. Effect of single session of prolonged muscle stretch on spastic plantarflexors of children with quadriplegic and diplegic spastic cerebral palsy, 2010, 46-50
6. Bradshaw and Perret, Mental retardation: Definition, classification, and systems of support (9th ed.)
7. Singh. Pratibha.D. Cerebral Palsy Management, Indian Journal of Pediatrics, 2004, 71(7): 635-639
8. Masafumi Terada, Brian G. Pietrosimone, and Phillip A. Gribble, Therapeutic Interventions for Increasing Ankle Dorsiflexion After Ankle Sprain: A Systematic Review, J Athl Train. 2013 Sep-Oct; 48(5): 696-709.
9. Soo-Kyung Bok, Tae Heon Lee, and Sang Sook Lee, The Effects of Changes of Ankle Strength and Range of Motion According to Aging on Balance, Ann Rehabil Med. 2013 Feb; 37(1): 10-16.