



THERAPEUTIC EFFICACY OF OPEN VERSUS CLOSED KINETIC STRENGTH TRAINING WITH BILATERAL AFO FOR THE TREATMENT OF SPASTICITY DIPLEGICS GAIT CONDITIONS -COMPARATIVE STUDY

*KARTHIKEYAN T **PRADNYA ***BHADRINARAYAN

Background: It is a nonprogressive neurological disorder mainly affecting human locomotor systems. Functional Resistance Training is slowly gaining recognition among the Physiotherapists dealing with Cerebral Palsy. However, the practical application of this compound strength training has not been studied yet in developing the ambulatory skills of Spastic Diplegics. **Objectives:** To study the efficacy of 'functional resistance training with bilateral AFO' and compare it with conventional 'symptom based treatment approach' in improving gait parameters of spastic diplegics aged between 6 - 14 years. **Materials and Methods:** Single blinded experimental, comparative study done at NIMHANS Bangalore. 30 numbers of conveniently chosen Spastic Diplegics aged below 14 years were randomly divided into 2 groups. Group A & B (Experimental and Conventional respectively) were intervened for 1 hour therapy regularly for 2 months. GMFM 66, Stride length, Step length and Cadence were considered as the outcome measures. Pre and Post intervention values were tabulated and treated statistically using 't tests'. **Results:** Both the groups shown improvement after intervention. Inter-group comparison done using 'independent t test' reveals statistically significant progress in experimental group (GMFM (P=0.001), Stride length (P=<0.001) and step length (P=<0.001), and cadence compared to Group B. **Conclusion:** The present study indicates that closed kinetic strength training with bilateral AFO is significantly better than open kinetic approach to develop gait skills of spastic diplegic cerebral palsy.

DR.T.KARTHIKEYAN, PHD,D.LITT
PHYSIOTHERAPIST
NIMHANS
BANGALORE-29

INTRODUCTION

1. 'Cerebral Palsy (CP)', means a non progressive neurological disorder mainly affecting human locomotor systems. Children with cerebral palsy usually present with disturbance in muscle tone (largely hypertonic or spasticity), lesser muscle strength, pain & selective motor control.
2. These impairments limit the performance including locomotion thereby participation in daily life.
3. Velocity dependent hypertonicity or Spasticity (a classical sign of UMN lesion), is the most common problem in children with Cerebral Palsy.
4. Physiotherapists believe that it is not weakness but spasticity is the major problem that limits functional skills in children with Cerebral Palsy.
5. The therapeutic approach aims at reducing the spasticity and not to promote any kind of resistive training on the anti-gravity muscles.

OBJECTIVE

1. To find out the efficacy of open kinetic strength training approach on gait parameters with bilateral AFO to develop gait skills of spastic diplegics aged between 6-14 Years.
2. To find out the efficacy of closed kinetic strength training on gait parameters with bilateral AFO to develop gait skills of spastic diplegics aged between 6-14 Years.
3. To compare the efficacy of closed versus open kinetic strength training on to develop gait skills with bilateral AFO of spastic diplegics aged between 6-14 Years.

MATERIALS

Stop watch, Stationeries (Measuring tape, Pencil, chalk, Paper sheets), Resistance Bands / Free Weights, Balance board, Static cycle, Footstool, Stair steps, Wedge blocks & construction Rings

STUDY DESIGN

Experimental Study,
Type - Comparative study

Inclusion Criteria

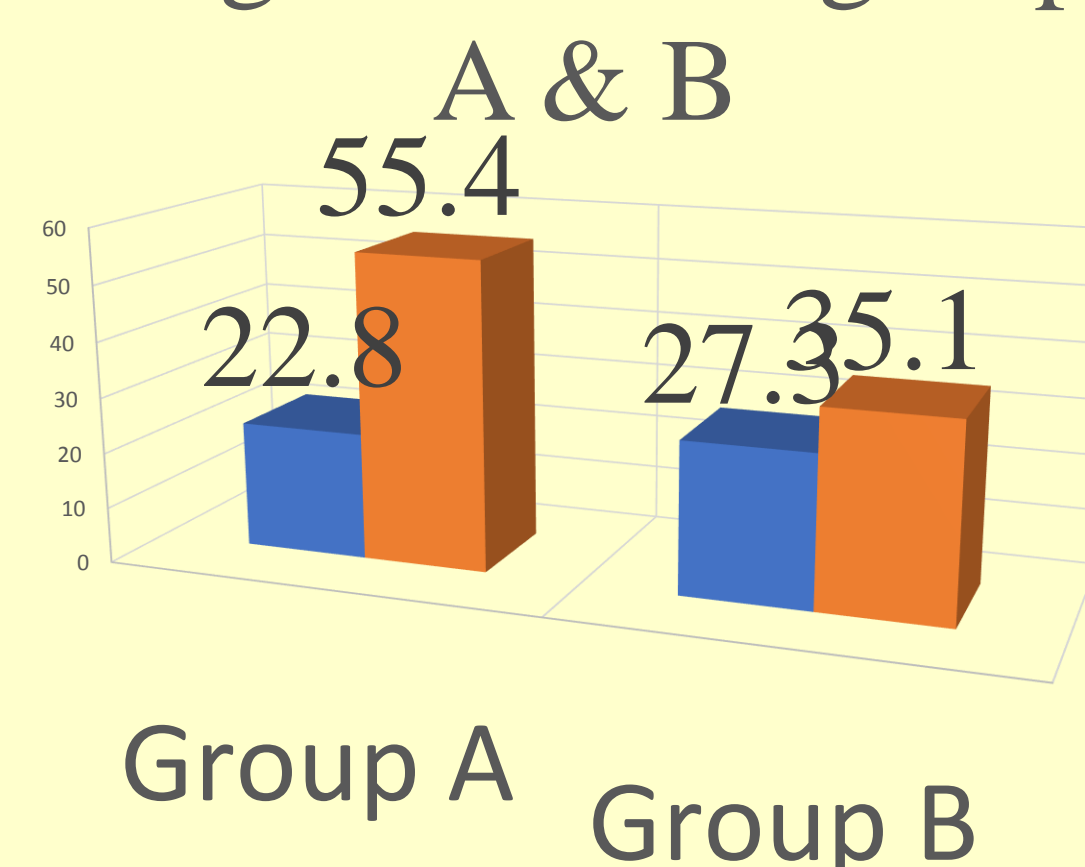
1. Age between 6-14
2. Both male and female children with Spastic Diplegic cerebral palsy with GMFCS level I and II
3. Lower limb Spasticity < 2 (as per MAS)

Exclusion Criteria

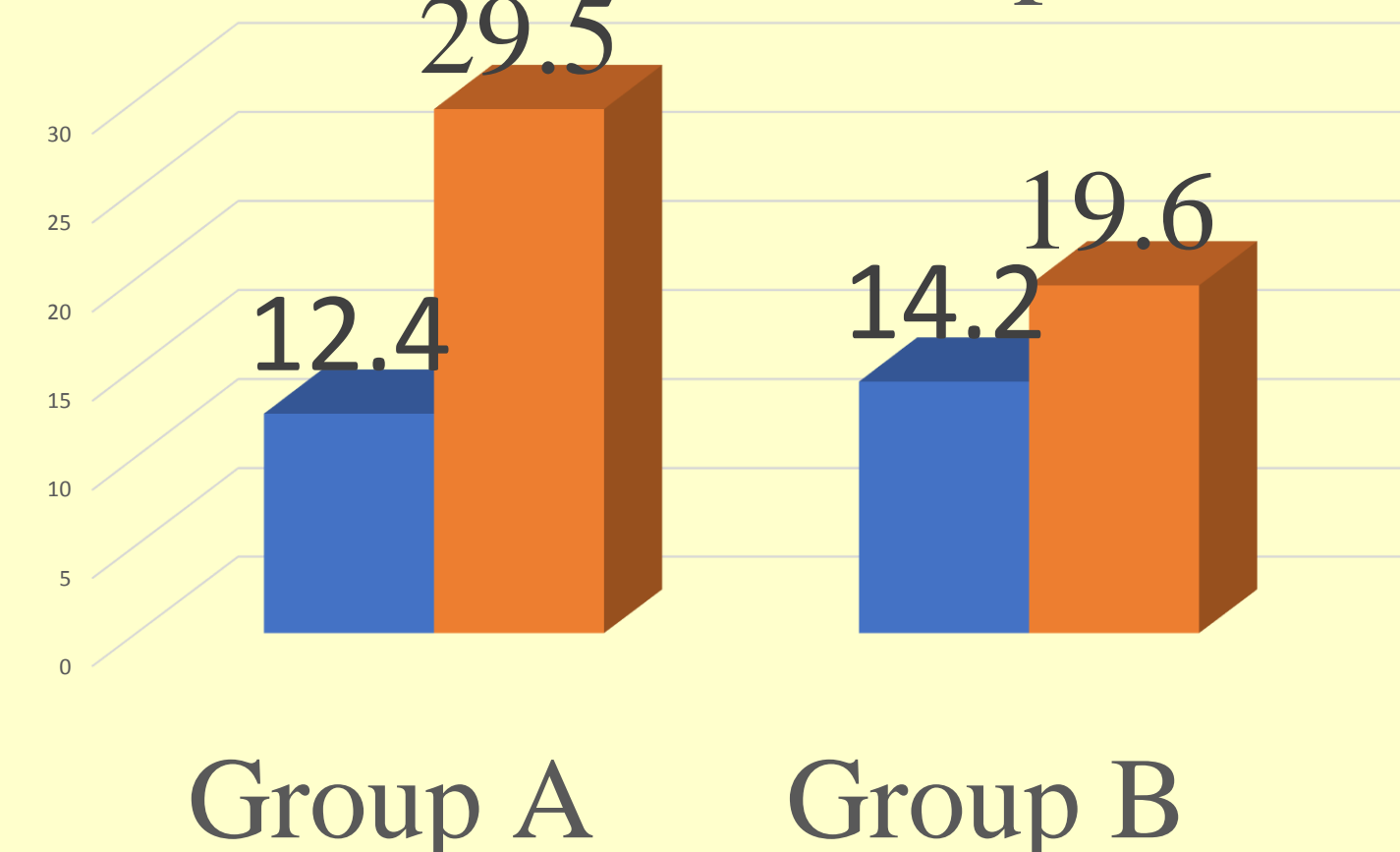
1. Any other Cerebral Palsy GMFCS III and above Visual impairment Sensory impairments
2. Perceptual and Cognitive Dysfunction Fixed Deformities
3. Regular seizure disorders
4. Regular Botox or related medication

1. The purpose of this study is to compare the efficacy of open versus closed kinetic strength training approach of gait skill in spastic diplegic cerebral palsy children aged between 6 - 14 years.
2. 30 children, age between 6-14 years of age, diagnosed with spastic diplegic Cerebral Palsy were selected.
3. Among them, 60% were male and 40% female. The subjects were randomly divided into two groups, one group receiving the efficacy of closed kinetic strength training approach (Group A) and other group the efficacy of open kinetic strength training approach (Group B).
4. The closed kinetic strength training was included with conservative gait treatment, reverse walking, sit to stand, squatting, stair climbing, over ground walking, obstacle crossing reach out activities etc.
5. The symptom based treatment was included with open kinetic strength training. GMFCS, Stride length, Step Length and Cadence were considered as the outcome measures.
6. Each session of therapy was carried out for approximately 1 hour duration 15 minutes warm up followed by 45 minutes treatment carried out for 3 months.

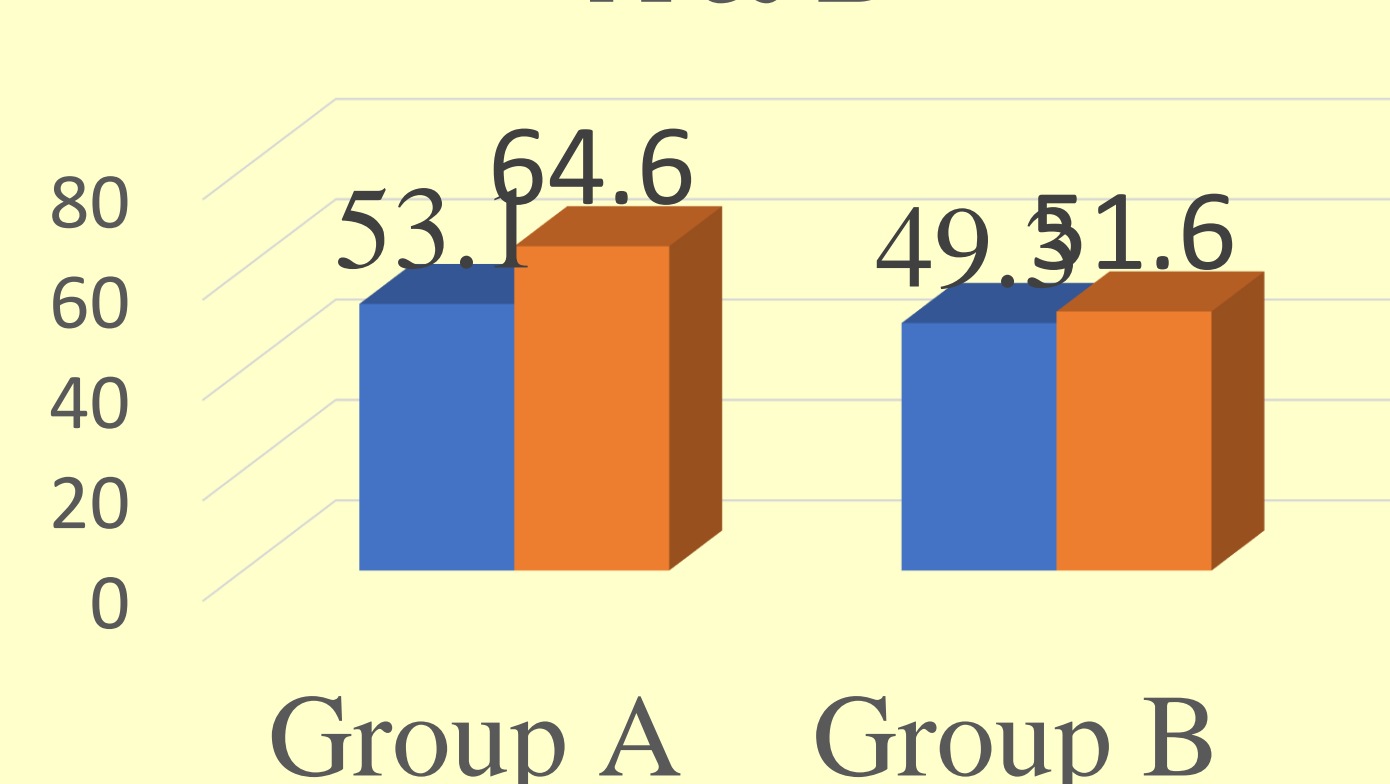
Comparison of stride length between group A & B



Comparison of step length between Group A & B



Comparison of GMF score between group A & B



DISCUSSION

S. no	Author name & Year	Methods	Outcome	Results
1	Blundel et al (2003)	N=30/3 Months/15 minutes warm up/45 treatment	GMFCS- Pre to Post	↑GMF, SL,SL, DF ↓PF, Cadence
2	Russell et al. (2005)	N=30/6 Months/15 minutes warm up/45 treatment	GMFCS- Pre to Post	↑GMF, SL,SL, DF ↓PF, Cadence
3	Liano et al. (2007)	N=30/3 Months/15 minutes warm up/45 treatment	GMFCS- Pre to Post	↑GMF, SL,SL, DF ↓PF, Cadence
4	Karthik et al 2018	N=30/3 Months/15 minutes warm up/45 treatment	GMFCS- Pre to Post	↑GMF, SL,SL, DF ↓PF, Cadence

CONCLUSION

The results of this study indicate that closed kinetic strength training with bilateral AFO is significantly better than open kinetic approach to develop gait skills for therapeutic treatment of spastic diplegic cerebral palsy.

RECOMMENDATIONS FOR FUTURE STUDIES:

1. An RCT using the same variables with a larger sample.
2. Involve larger samples from all types of CP categories of cerebral palsy.
3. Further studies can be conducted with higher age groups.
4. The long term effects need to be evaluated.

REFERENCES

1. Cerebral Palsy." National Center on Birth Defects and Developmental Disabilities, October 3, 2002.
2. Dodd KJ. Taylor NF.Daminano DL.A Systematic review of the effectiveness of strength training programs for people with cerebral palsy.*Arch Phys Med Rehabil* 2002;83:1157-64