IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

To Compare The Effect Of Propioceptive Neuromuscular Facilitation And Neural Stretch On Balance And Gait In Spastic Diplegic Cerebral Palsy: A Comparative Study

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Abstract: This study has been undertaken to compare the effect of proprioceptive neuromuscular facilitation and neural stretch on balance in spastic diplegic cerebral palsy.The study was conducted on 30 patients having spastic diplegic cerebral palsy based on the inclusion and exclusion criteria. Selected subjects were divided in two groups by chit method: Group A- proprioceptive neuromuscular facilitation and Group B-neural stretch. Intervention was given for 6-weeks and 4days a week. The exercise duration lasted about 1 hour per session. Pediatric Berg Balance Scale and 10 Meter walk test was taken before starting the treatment and after the 6-weeks of treatment. All the data were normally distributed. For, Paediatric Balance Scale: Intra Group: Wilcoxon signed-rank Test, Inter Group: Mann-Whitney U Test. For, 10MWT: Intra Group: Paired T Test, Inter Group: Un-paired T Test. With p-value of 0.05, results showed significant improvement in paediatric balance scale In Group A and also showed significant improvement in 10MWT in Group A. Study concluded that that neural stretch was more effective than the PNF stretching in the subjects with spastic diplegic CP.

Keywords: Spasticity, Cerebral Palsy, Neural stretch, Balance, Proprioceptive Neuromuscular Facilitation.

I. INTRODUCTION

Cerebral palsy (CP) is an irreversible and non-progressive disorder caused by injury to brain before, during or after the birth. which is termed as non-progressive neurodevelopmental condition. The motor disorders of CP are often accompanied by symptoms of higher mental like perception, sensation, cognition, communication and secondary musculoskeletal problems. In spastic diplegic children, disturbance of balance, muscle weakness, spasticity and skeletal deformities results in abnormal gait pattern.In Diplegic CP patients, the children have weak postural balance controllability and less standing stability compared with hemiplegic cerebral palsy children. In spastic diplegic cerebral palsy, there are various approaches and techniques for the treatment of spasticity, balance impairment and gait deviation. It is also seen that proprioceptive neuromuscular facilitation is effective in treating spasticity. As no such study have been conducted on the effect of neural stretching in spastic diplegic cerebral palsy. So, the need of current study is to compare the effect of PNF and neural stretching (NS) on balance and gait in spastic diplegic cerebral palsy patients. The motor disorders of CP are often accompanied by symptoms of higher mental like perception, sensation, cognition, communication,and behaviour, by epilepsy and by secondary musculoskeletal problems.[1]

The Spastic CP type is described by exaggerated deep tendon reflexes (DTR), increased muscle tone, decreased muscle strength, and gait deviation. Nearly 70–77% of CP cases were spastic CP.[2]

Spastic diplegia (SD) is a motor impairment in the upper extremities as well as the lower extremities, even though the upper extremities less affected than the lower one. In the trunk marked weakness and hypertonia of the extremities were seen. The standing posture of the child with SD is flexion, adduction and internal rotation of the hip, with excessive flexion of the knee and equines foot. Activity limitation is seen due to constrained capacity to generate force more than the spasticity did.[3] In spastic diplegic cerebral palsy, the child suffers from brain injury which is non-progressive due to which during the growth development many secondary impairment occur such as spasticity, balance and gait which affects the activity of daily living. There are various approaches and techniques for the treatment of the spasticity, balance impairment and gait deviation. It is also seen that Proprioceptive neuromuscular facilitation is effective in treating spasticity.

As no such study have been conducted on the effect of neural stretching in spastic diplegic cerebral palsy, so the need of current study is to compare the effect of PNF and neural stretching (NS) on balance and gait in spastic diplegic cerebral palsy patients.

Aim:

To compare the effect of proprioceptive neuromuscular facilitation and neural stretch on balance in spastic diplegic cerebral palsy.

Population and Sample

30 patients with spastic diplegic cerebral palsy. The study was conducted on 30 patients having spastic diplegic cerebral palsy at physiotherapy department based on the inclusion and exclusion criteria.

Data and Sources of Data

Theoretical framework

Inclusion Criteria:

Children diagnosed as Spastic Diplegic cerebral palsy
Age between 5-12 years and both gender.
Gross motor function level I and II.
Written consent from their parents.
Spasticity range between 1 and 1+ grade according Modified Ashworth scale.
Able to follow simple verbal instructions.

Exclusion criteria

Uncooperative subjects
Receiving botulinum toxin injections or surgery no earlier than 6 months.
Presence of shortening or deformities of the ankle, knee and/or hip joints.

Out come measures: 10 meter walk test **&** Pediatric balance scale

INTERVENTION:

- The treatment was done under the supervision of the research therapist.

- Intervention was given for 6-weeks and 4days a week.

-The exercises were performed in supine lying, sitting and standing position the exercises were gradually introduced and the number of repetitions was determined on the basis of the patient's performance.
-The exercises were started with stretching followed by strengthening and aerobic exercise.

PROPRICEPTIVE NEUROMUSCULAR FACILITATION:

Proprioceptive neuromuscular facilitation aims to summate the effects of facilitation to increase the response of the neuromuscular mechanism man movement patterns are used on the basic of characteristic of all motor activity.

EXTENSION–ABDUCTION–INTERNAL ROTATION

Patient position: supine position

- Grip: distal hand holds the foot with the palm of the left hand along the planter surface. The thumb is at the base of the toast to facilitate toe flexion. Hold the medial border of the foot while the heel of my hand gives counter pressure along the lateral border. The right hand holds the postero-lateral side of the thigh.
- Elongated position: Traction the entire leg while moving the foot into dorsi flexion and inversion. Continue the traction and maintain the internal rotation as the leg lifted into flexion.
- Stretch: The proximal hand gives a stretch by raid traction action of the thigh. The forearm of the distal hand to traction up through the shin. While the stretch, the patient foot far into dorsiflexion.
- Movement: The toe flex and the foot and ankle plantar flex and event. The eversion promotes the hip internal rotation. These motions occur at the same time. The thigh moves down into extension and abduction, maintaining the internal rotation. Continuation of this motion causes extension with left side bending of the trunk.
- Resistance: The distal hand combines resistance to eversion with approximation through the bottom of the foot. The approximation resists both the plantar flexion and the hip extension. The resistance to the hip abduction and internal rotation comes from the resisted eversion. The proximal hand lifts the thigh back towards the starting position. The lift resists the hip extension and abduction. The placement of the hand coming from lateral to posterior, gives resistance to the internal rotation.
- End position: The foot is in planter flexion with inversion and the toes are flexed. The knees remain in full extension. The hip is in as much hyperextension while maintaining the abduction and internal rotation.
- Timing for emphasis: Repeated contractors are used to exercise the hyperextension hip motion.

EXTENSION–ABDUCTION–INTERNAL ROTATION WITH KNEE EXTENSION

- Grip: Stand on the right side of the table facing up towards the patients left hip. Right hand wason the patient's foot, the left hand on the thigh.
- Elongated position: The foot is in dorsiflexion with inversion. The hip and knee are in full flexion with the heel close to the right buttock. The kneeheelarealignedwitheachotherandlinedupapproximatelywiththerightshoulder.
- Stretch: Apply the stretch to the hip, knee, foot simultaneously. The proximal hand combine traction of the hip

through the line of the femur with a rotator motion to stretch the internal rotation. The distal hand stretches the foot further into dorsiflexion and inversion as you stretch the knee extension by bringing the patient sheelcloser to the buttock.

- Movement: The foot and ankle planter flex and evert. The hip motion begins next.
- Resistance: The distal hand resists the foot and ankle motion with arotatory push. By using the foot as handle, resist the knee extension by pushing the patients heel back toward the buttock the angle of this resistance at the foot resists the knee a hip rotation as well.
- End position: The end position was in straight leg pattern
- Timing for Emphasis: Prevent knee extension at the beginning of the range and exercise the hip motion. Lock in hip extension in mid-range and exercise knee extension. Lock in the knee before it is fully extended and exercise the hip extension.

EXTENSION–ABDUCTION–INERNALROTATIONWITHKNEEFLEXION:

- Grip: The grip on the foot contacts the active surface, dorsal and holds the side s of the foot to resist the rotator components. Using the lumbrical grip will prevent squeezing or punching the prevent foot.
- Stretch: The reflex comes from the rapid elongation and rotation of the hip, ankle and foot by both hands simultaneously little extra traction movement to the knee with distal hand to elongate the knee flexor muscles further.
- Movement: The foot and ankle plantar flex and event. The hip motion begins next. It is important that the hip and knee reach their end ranges at the same time.
- Resistance: The distal hand resists the plantar flexion and eversion and uses that force to resist the knee flexion as well. The force is back toward the starting position of the knee extension and foot inversion. The proximal hand resists the hip motion as it did for the SLP. As the hip approaches full extension, approximate through the thigh with the proximal foot.
- End position: The hip is extended with abduction and internal rotation. The knee was flexed over the side of the table and the foot was in plantar flexion with eversion.
- Timing for Emphasis: Lock in the hip extension at the important in the range and exercise the knee flexion.

Neural Stretching for Lower Limb

- Top, left to right: Erect posture; slumped in mid and lower back; slumped posture with chin to chest.
- Bottom. Left to right: knee is fully extended; with knee fully extended and chin to chest, the ankle is fully raised in to dorsi flexion; while maintaining the foot in a raised position at the ankle, head is the lifted.
- Nerve slides with knee flexed and head down followed by head up, with toes up.
- Maintain straight legs and flex the neck.

Figure 1: INTERVENTION

Statistical tools and econometric models

Descriptive Statistics

Data was stored using Microsoft excel sheet.
Statistical analysis done in SPSS 21 version.

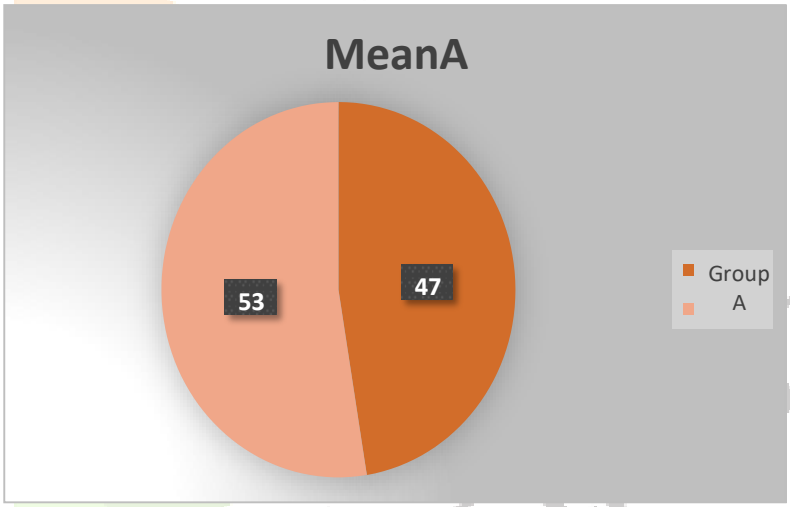
RESULTS AND DISCUSSION

The study involved 30 spastic diplegic cerebral palsy patients who completed the 6 weeks exercise protocol of PNF and neural stretch. Outcome measures including Berg Balance Scale and 10- meter walk test were taken on first and last day of treatment i.e. before and after 6 weeks.
Data was stored using Microsoft excel sheet. Graphs were also for made using the same.

Paired t Test and Unpaired t test used for the Statistical Analyzed.

TABLE 1: MEAN AGE

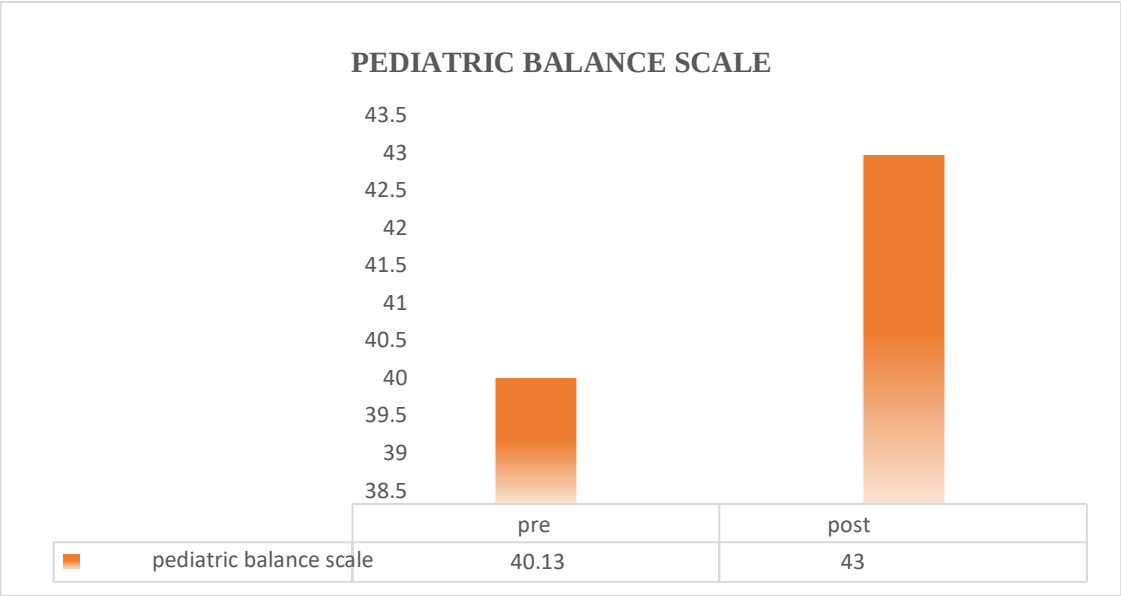
	MEAN AGE
Group A	7.4
Group B	8.2



GRAPH 1- GRAPH SHOWING AGE DISTRIBUTION

TABLE 2. INTRA-GROUP ANALYSIS OF PBS IN GROUP A

Group A	Mean	Std. Deviation	t-value	P value
Pre	40.13	3.50	2.07	0.05(S)
Post	43.00	6.65		



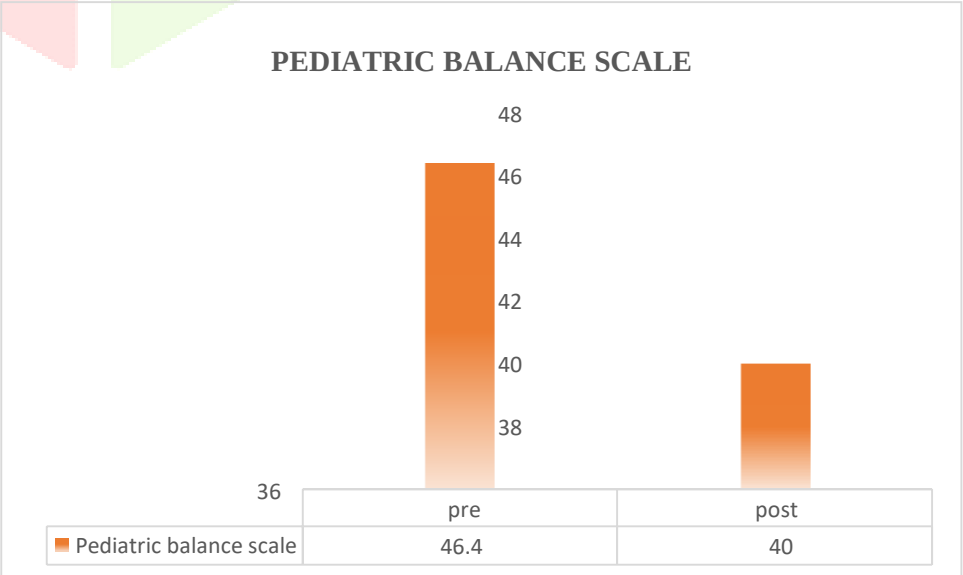
GRAPH:2 INTRA-GROUP ANALYSIS OF PBS IN GROUP A

INTERPRETATION:

- The values of mean have increased from 40.13 (pre) to 43 (post) which showed statistical improvement with p-value of 0.05 showing significant improvement in paediatric balance scale.

TABLE 3- INTRA-GROUP ANALYSIS OF PBS IN GROUP B

Group B	Mean	Std. Deviation	t-value	P value
Pre	46.46	4.48	7.19	0.000(S)
Post	40.00	3.54		



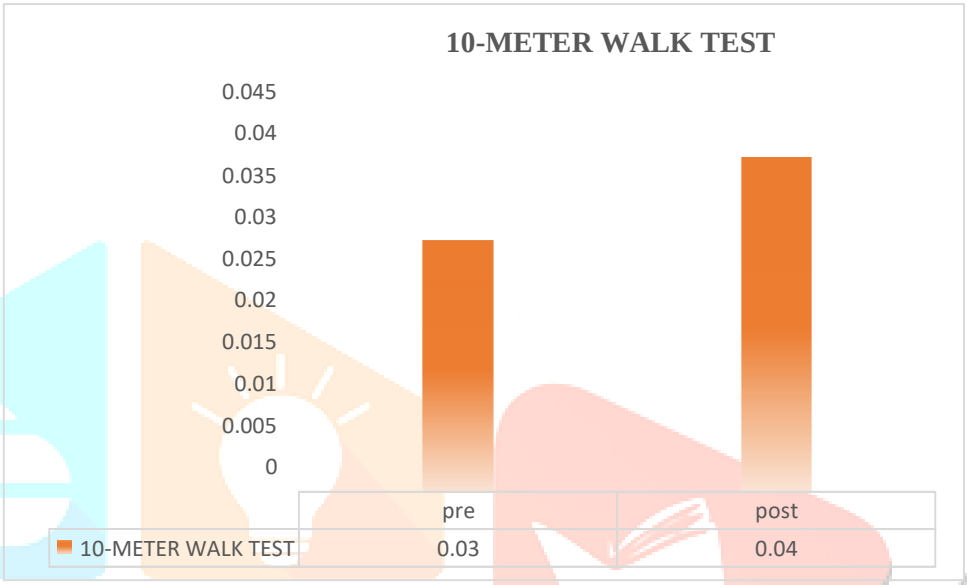
GRAPH:3–INTRA-GROUP ANALYSIS OF PBS IN GROUP B

INTERPRETATION:

- The mean average for PBS from 30.56 to 30.60 was not significantly improved. As per data reflects that P value is more than 0.05 which shows significantly not improved in PBS in Group B.

TABLE 4. INTRA-GROUP ANALYSIS OF 10-METER WALK TEST IN GROUP A

Group A	Mean	Std. Deviation	T value	P value
Pre	0.04	0.00	6.3	0.00(S)
Post	0.03	0.00		



GRAPH: 4– INTRA-GROUP ANALYSIS OF 10-METER WALK TESTIN GROUP A

INTERPRETATION:

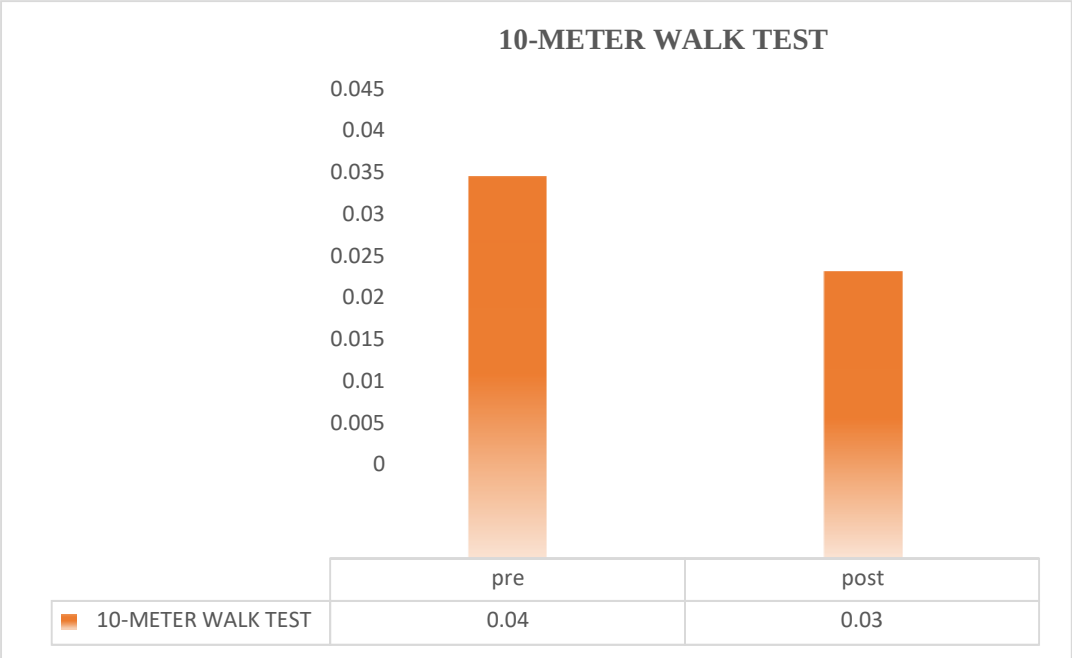
- The mean average for 10MWT improved from 0.498 to 0.433. As per data reflects that T value is less than 0.05 which shows significantly improved in10MWT in Group A.

TABLE 5- INTRA-GROUP ANALYSIS OF 10-METER WALK TEST IN GROUP B

GroupB	Mean	Std. Deviation	tvalue	Pvalue
Pre	0.03	0.00	6.41	0.00(S)
Post	0.04	0.00		

INTERPRETATION

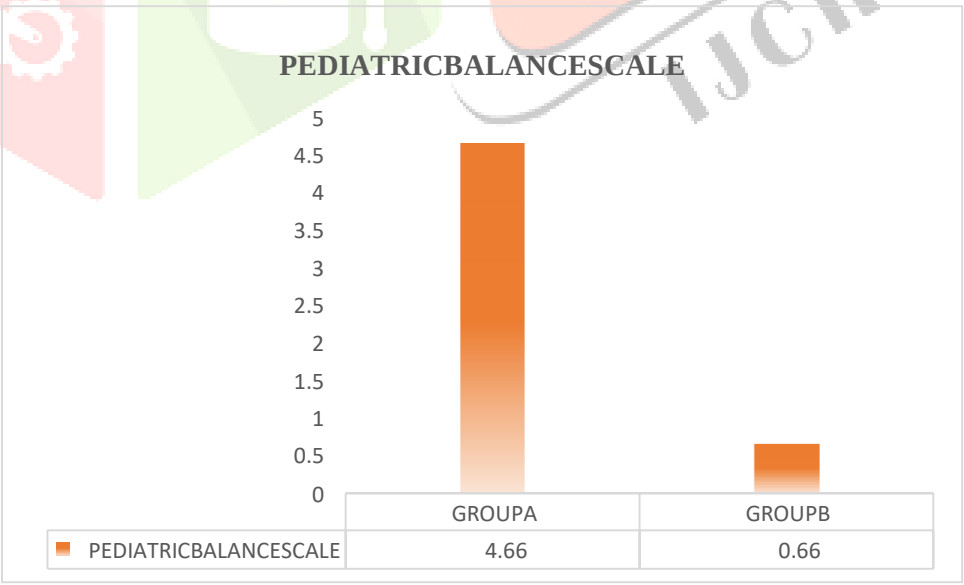
- The mean average for PBS from 30.56 to 30.60 was not significantly improved. As per data reflects that P value is more than 0.05 which shows significantly not improved in PBS in Group B.



GRAPH 5. INTRA-GROUP ANALYSIS OF 10-METER WALK TESTIN GROUP B

TABLE 6: INTER GROUP ANALYSIS OF PBS

GROUP	PEDIATRIC BALANCE SCALE	MEAN	SD	Z value	P value
A	POST	4.66	1.49	4.54	0.000(S)
B	POST	0.66	0.79		



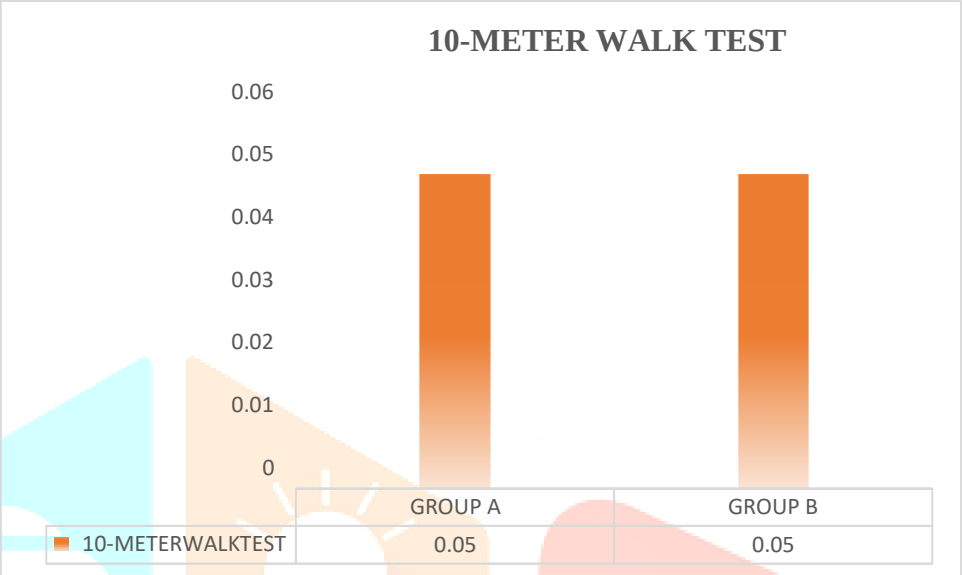
GRAPH 6: INTER GROUP ANALYSIS OF PBS

INTERPRETATION:

- The mean average for PBS from 4.66 and 0.66 respectively for group A and B as per data reflect that the p value is less than 0.05 which shows that the is significant difference between both groups.

TABLE 7: INTER GROUP ANALYSIS OF 10-METER WALK TEST

GROUP	10-METERWALK TEST	MEAN	SD	Tvalue	pvalue
A	POST	0.052	0.006	4.25	0.001(S)
B	POST	0.05	0.004		



GRAPH 7: INTER GROUP ANALYSIS OF 10-METER WALK TEST

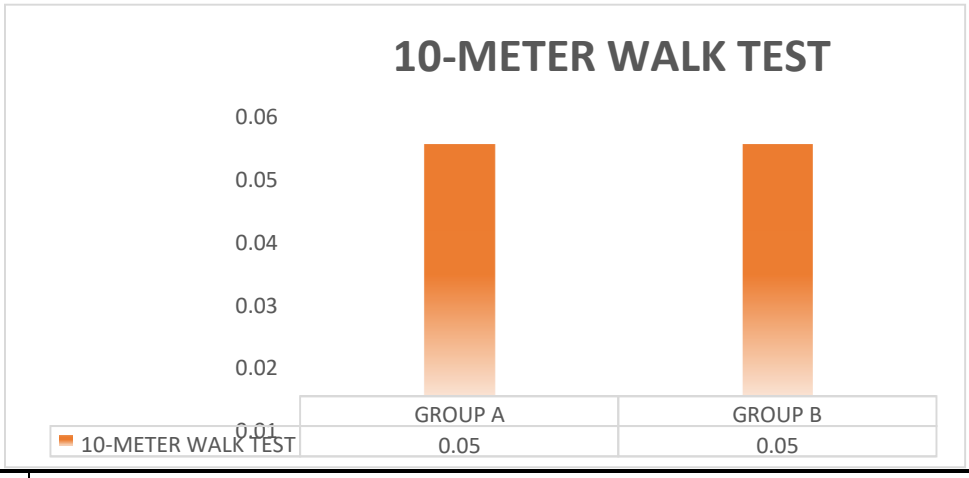
INTERPRETATION:

- The mean average for 10 MWT from 0.05 and 0.05 respectively for group A and B as per data reflect that the p value is less than 0.05 which shows that the is significant difference between both group.

TABLE 7: INTER GROUP ANALYSIS OF 10-METER WALK TEST

GROUP	10-METERWALKTEST	MEAN	SD	Tvalue	pvalue
A	POST	0.052	0.006	4.25	0.001(S)
B	POST	0.05	0.004		

GRAPH 8: INTERGROUP ANALYSIS OF 10-METER WALK TEST



INTERPRETATION:

- The mean average for 10-MWT from 0.05 and 0.05 respectively for group A and B as per data reflect that the p value is less than 0.05 which shows that there is significant difference between both groups.

Discussion:

The main objective of the study is to compare the effect of proprioceptive neuromuscular facilitation stretching and neural stretch on balance and gait in spastic diplegic cerebral palsy. 30 spastic diplegic cerebral palsy between the age 5-15 years were taken and divided into two groups. Group A (N=15) who receive conventional physical therapy with Proprioceptive neuromuscular facilitation technique and Group B (N=15) who receive conventional physical therapy with neural stretch.

The result shows statistically improvement post-intervention in both the groups but greater in group B on balance and gait in spastic diplegic CP. When compared both the groups, significant improvement is observed in the group B on balance & gait. Thus, the result of the present study rejects null hypothesis and supports the alternative hypothesis. In the present study, it was found that improvement was seen in balance and gait in spastic diplegic CP following conventional exercises with neural stretch. Neural stretch gives improvement by sciatic nerve sliding technique for the hamstring spasticity. The study done by Jame young Park et al. concluded that application of neurodynamic sciatic nerve sliding technique exhibit improves hamstring flexibility and postural balance of healthy adults.

The increase in the flexibility and reduction of the spasticity could be due to subjects reduce tolerance to stretch applied. Mechano-sensitivity is the ease with which neural tissue becomes active after application of mechanical stimuli. The more mechano-sensitive nerve is the more intense is the response. Neuro- dynamic stretch has been proposed to reduce this mechano-sensitivity; thus neural tissue can glide easily.

The stretching of the nerve along with nerve beds and fascial system which included any muscle may led to elongation of that muscle. Hence it improves the flexibility, increases the range of motion and also helps in reducing the tightness of the muscles which helps to improve balance and gait in the subjects with spastic diplegic CP.

Proprioceptive neuromuscular facilitation stretching is applied and it is known that it improves flexibility and range of motion. The mechanism on which PNF may work is by facilitating the neuromuscular mechanism and by stimulating the proprioceptors. PNF increases the ROM by increasing the length of muscle and the neuromuscular efficiency. The physiological mechanism for increasing the ROM and strength may be due to autogenic inhibition, reciprocal inhibition, and stress relaxation so, it help to lengthening the contracted structures, relax the hypertonic muscles, initiating the movements, strengthening the weak muscles and improving the control of the pelvis.

The reason for better balance and lower extremity function in Proprioceptive Neuromuscular Facilitation (PNF) group may be due to the way it utilizes the different proprioceptive information for stimulating nerve and muscles function.Improvementofbalanceabilitymighthaveresultedfromfacilitationofproprioceptive sense, leading to change in various supports leads to increase in stability of joints.

According to the current study it was observed that both PNF as well as neural stretch helps to improve the balance and gait pattern in the subjects with spastic diplegic CP by neuromuscular facilitation by different means but based on the statistical and clinical analysis it was seen that neural stretch was more effective than the PNF stretching in the subjects with spastic diplegic CP.

CONCLUSION

The study concluded that PNF and neural stretch both shows significant improvement on balance and gait in spastic diplegic CP. While comparing both the groups, the group B showed more significant improvement than the groupan on balance and gait. Thus neural stretching is more beneficial than PNF in improving the balance and gait pattern. Therefore it can be included in the treatment of the cerebral palsy patients to improve their quality of life. If the balance and gait pattern improves the subject will be more independent in performing the activities of daily livings.

LIMITATION:

Small Sample Size and Short duration of study.

Ethical Clearance: Taken from institutional ethical committee.

Source of funding: Self

Acknowledgement:

Our heartfelt appreciation goes to all participants who generously volunteered to participate in the study; they deserve our utmost respect in keeping faith in us. We would like to express my sincere gratitude to my research Guide. His resourceful knowledge right from its inception to the conclusion that we have been able to complete this Study.

REFERENCES:

- Mutch L,Albertan E, Hagberg B,Kodama K,Perat MV Cerebral palsy epidemiology: where are we now and where are we going? Dev Med Child Neurol(1992) 34; 547-551.
- Reddihough D,raphuh RT, Cerebral palsy in childhood.:5. 2004(12):56-91
- Damiano D, Abel M, Romness M, Oeffinger D, Tylkowski C, Gorton G, Comparing functional profiles of children with hemiplegic and diplegic cerebral palsy in GMFCS Levels I and II: are separate classifications needed?
- Developmental Medicine & Child Neurology.2007 Feb13;48(10);797–803.

- Bohannon RW, Smith MB. Interrater Reliability of a Modified Ashworth Scale of Muscle Spasticity.(2017)
- Franjoine MR, Gunther JS, Taylor MJ. Pediatric Balance Scale: A Modified Version of the Berg Balance Scale for the School-Age Child with Mild to Moderate Motor Impairment: Pediatric Physical Therapy. 2003;15(2):114–28.
- Franjoine MR , Pediatric Balance Scale: A Modified Version of She Berg Balance Scale for the School-Age Child with Mild to Moderate Motor Impairment. Pediatr Phys Therapy. (2012) 15: 114-128.
- Her JG, roval KP, Reliability of the Pediatric Balance Scale (PBS) in the Assessment of the Children with Cerebral Palsy. Phys Theray Sic 24:(2018): 301.
- Her JG, Woo JH, Ko JY , Reliability of the Pediatric Balance Scale (PBS) in the Assessment of the Children with Cerebral Palsy. Phys Ther Sci (2011) 24: 301-305.
- Chrysagis N, Skordilis EK, Koutsouki D, Validity and clinical utility offunctional assessments in children with cerebral palsy. Arch Phys Med Rehabil95(2014):369- 374.
- Pirpiris M, Wilkinson AJ, Rodda J, Nguyen TC, Baker RJ, Walking speed in children and young adults with neuromuscular disease: Comparison between two assessment methods. Journal of Pediatric Orthopaedics (2003) 23: 302-307.