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A STUDY OF NMES AND PASSIVE STRETCHING VERSUS PASSIVE STRETCHING ALONE IN CEREBRAL PALSY

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Abstract : Introduction.: Cerebral palsy is a group of conditions that affect individuals from birth. It greatly impacts an individual's physical and emotional life and can present many challenges for the individual, caregivers, and family. Therefore, research into interventions that can improve the various symptoms of children with CP is critical. The aim of the study was to compare the effectiveness of NMES and passive stretching and passive stretching alone in the improvement of spastic diplegic cerebral palsy children. Methods. :The study was conducted on 20 children with two groups of 10 each. Group A was intervened with NMES and passive stretching whereas Group B was intervened with passive stretching. The outcome is measured by using goniometer prior to the treatment and the end of the treatment. In Group A subjects who received NMES and passive stretching and its overall effectiveness and improvement was found by using goniometer and the result was found by using paired 't' test value is 7.06. Which showed p=0.0001 is highly significant. This means that NMES and passive stretching is effective in overall improvement in ROM. In Group B subjects who received passive stretching alone and its overall effectiveness and improvement was found by using goniometer and the result was found by using paired 't' test value is 7.90. Which showed p=0.0001 is highly significant; this means that passive stretching is effective in overall improvement in ROM. Results. Comparison of group A and group B was done by using independent 't' test value is 1.5 which showed P value 0.0201(<0.05) which is statistically significant. Conclusions: The overall ROM of group A and group B was obtained and that says there is improvement in both groups. When compare the mean rank we can conclude that group A is better than group B in the improvement of ROM in the treatment of spastic diplegic cerebral palsy children**.**

Keywords: cerebral palsy, Neuromuscular Electrical Stimulation and Stretching

I. INTRODUCTION

Cerebral palsy (CP) is the most common childhood physical disability worldwide [1], affecting approximately 1.6 to 4 per 1000 live births worldwide [2]. CP is a group of permanent motor and postural developmental disorders that result in limited mobility and are due to non-progressive disturbances in fetal or infant brain development [3].

CP is often classified into various heterogeneous diagnostic subgroups such as spastic diplegia, hemiplegia, quadriplegia, ataxia, or mixed paralysis. (Das SP et al., 2019).

Due to the brain damage caused by CP, different aspects of a person's life are affected, including movement, balance, and gait. (Vitrikas K et al., 2020) Over time, many risk factors for CP have been identified. In the prenatal period, potential risk factors include maternal systemic illness as well as substance abuse, malnutrition, infections, and immune system disorders. (Reddihough DS. et al., 2003)

Currently, there is no specific treatment that can reverse the brain damage that leads to the complex clinical disability of CP [4]. However, there are many interventions, such as neurorehabilitation, orthopedics, and pharmacological treatments, that aim to correct the musculoskeletal changes caused by injury and improve activity levels, participation, and thus quality of life [4]. However, the number of interventions currently being implemented by physiotherapists is considered ineffective and unnecessary [5]. In 2017, the World Health Organization (WHO) launched the Rehabilitation 2030 initiative, calling on all stakeholders worldwide to work together to improve rehabilitation research [6].

Physiotherapy plays a vital role in the management of CP, with almost all people diagnosed with CP receiving physiotherapy services (Chiu HC et al., 2016). Given the role of physiotherapists in the management of CP, it is important that physiotherapists develop treatment interventions based on the latest international standards and locally relevant evidence [5].

Neuromuscular electrical stimulation (NMES) NMES is an emerging adjunctive technology that initiates or enhances skeletal muscle contractions through intact peripheral nerves, either as a surface stimulus via electrodes placed on the skin or directly applied to the muscle via implanted electrodes [6]. NMES applied via surface electrodes is the most common application because it is a noninvasive technique and is generally well tolerated. Electrodes are typically placed over motor points that innervate muscles [7]. The application of NMES to achieve functional movement is often referred to as functional electrical stimulation (FES) [8]. Low-intensity electrical stimulation of the nerves, called transcutaneous electrical nerve stimulation (TENS), is commonly used for pain management and has the potential to improve motor function in patients with neurodegenerative diseases [9]. Applications of NMES include the use of NMES-assisted strengthening, NMES-assisted gait, and NMES-assisted spasticity reduction.

Passive stretching is a common treatment approach to counteract soft tissue tension. [10,11] Stretching can be performed manually by the therapist or patient or using other external devices such as splints, splints, or tilt tables. Despite the widespread use of passive stretching, there is a lack of research demonstrating its effectiveness and the principles of stretch-based techniques in spastic human muscles. [13,14]

Passive stretching involves applying mechanical forces at the end of the physiological range to extend the resting length of the tissue. The term static stretching is used to refer to low loads maintained for a long period of time. Stretching forces are applied by positioning the patient using a weighted traction and pulley system or a dynamic splint, continuous cast, or tilt table wedge. Prolonged stretches can be maintained for 20-30 minutes or for several hours as with a dynamic splint.

The aim of the study was to compare the effectiveness of NMES and passive stretching and passive stretching alone in the improvement of spastic diplegic cerebral palsy children.

Methods

The study design is Interventional comparative study. Simple Random Sampling is used in this research. A total number of 35 patients were screened out of which 20 patients were selected for the study each patient was screened initially by using a single selection Performa relevant to the inclusion and exclusion criteria. The subject who fulfill the selection bases were divide into two group as under.

GROUP A: Children with CP (5 males 5 females were treated with NEMS + passive stretching)

GROUP B: Children with CP (6 Males 4 Females were treated with Passive Stretching alone)

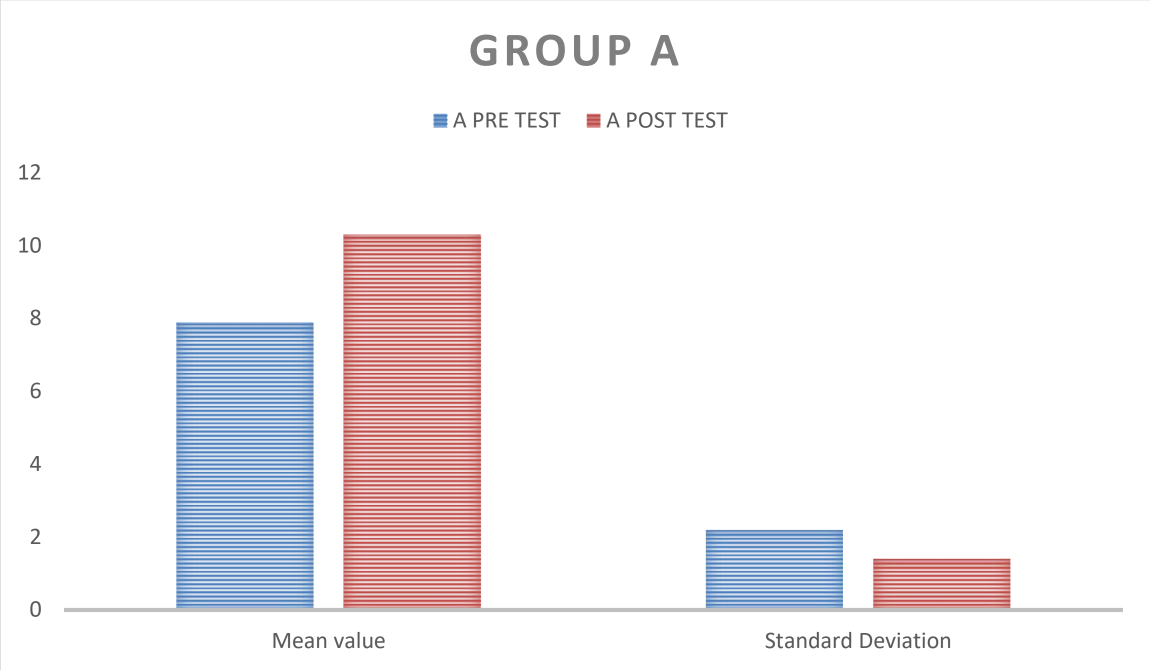
The study is conducted for eight week. The inclusion criteria are Patient diagnosed as cerebral palsy, Age group 3-11 years, both gender. The exclusion criteria are Contracture of the tendoachilles, and Bony deformity of the ankle and Other neuro muscular disorders. The outcome are measured by Ankle dorsiflexion PROM is measured by using universal goniometer and Modified Ashworth scale is used to screen the children

Results

TABLE - 3 Showing Group A (NMES +PS)

VALUES	**GROUP A** ()	
GROUP 'A' MEAN VALUE	A PRE TEST	A POST TEST
	7.89	10.29
Standard Deviation	2.19	1.3.98
Paired 't' test value	7.019	
'p' value & Significance	P Value < 0.05 significance	

NMES= Neuromuscular Electrical Stimulation; PS = PASSIVE STRECHING;



GRAPH-1: The Mean Value for Gr.A

Table- 3 shows the comparative mean value, mean difference, standard deviation and Paired ‘t’-value between Pre versus post-test of group A

It explains, the paired ‘t’ value of 7.89 is greater than the tabulated ‘t’ value 2.198, which showed that there is statistical significant difference at 0.05 levels between pre versus post-test results. The pre-test mean is 7.89 and the post test mean is 10.29 and their mean difference is 2.40, which is shown in the Dorsiflexion PROM response to NMES and passive stretching for 8 weeks.

GROUP B Passive Stretching alone

TABLE - 4

VALUES	GROUP B	
GROUP ‘B’ MEAN VALUE	PRETEST	POST TEST
	7.19	8.79
Standard Deviation	2.28	2.38
Paired ‘t’ test value	7.89	
‘p’ value & Significance	P Value < 0.05 significance	

Table- 4 shows the comparative mean value, mean difference, standard deviation and Paired 't'-value between Pre versus post-test of group B

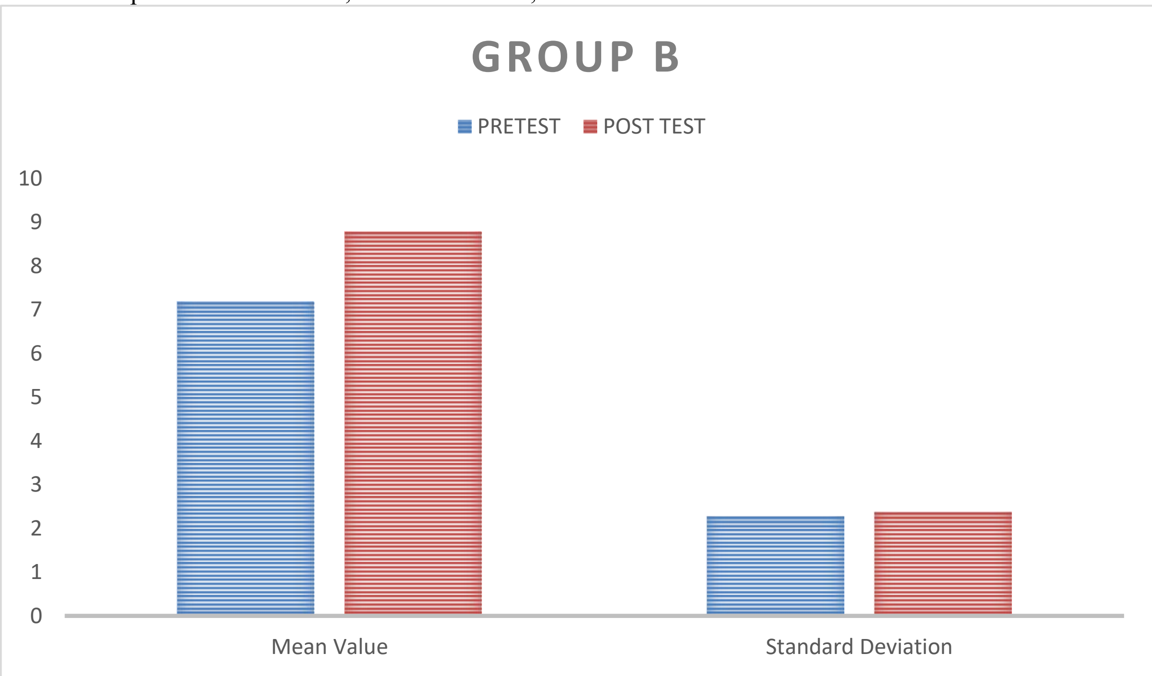


Figure 02: The Mean Value Of Pre And Post Test Values Of Group B

It explains, the paired 't' value of 7.89 is greater than the tabulated 't' value1.29, which showed that there is statistical significant difference at 0.05 levels between pre versus post-test results. The pre-test mean is 7.19 and the post test mean is 8.80 and their mean difference is 1.70, which is shown that there is considerable increase in ankle dorsiflexion prom in response to passive stretching alone.

GROUP A AND GROUP B

VALUES	NMES And passive Stretching Vs Passive Stretching Alone	
Post test mean Values	Group A	Group B
	10.30	8.80
Standard Deviation	1.42	2.39
Independent 't' test value	1.5	
'p' value & Significance	P Value < 0.05 significance	

Table- 5 shows the comparative mean value, mean difference, standard deviation and Unpaired't'-value between Group A and Group B.

It explains, The unpaired't' value of 1.5 is greater than the tabulated 't' value 1.29 which showed that there is statistical significant difference at 0.05 levels between mean of Group A 2.40. The pre-test versus post-test mean of Group B is 1.70 and their mean difference is 0.70, which shows that ankle dorsiflexion prom is better in group A than in group B. Therefore the study rejects the null hypothesis and accepting the alternate hypothesis.

DISCUSSION

The purpose of the study is to compare the effectiveness of NMES and passive stretching vs. passive stretching alone in the management of spastic diplegic cerebral palsy

Kalkman et al reported that the range of motion of the joint increased acutely after passive stretching, but there was no change in fascicle twitching and lengthening torque. Theis et al studied the acute effects of passive stretching on fascicle length in children with cerebral palsy. The authors reported that muscle and fascicle length increased immediately after passive stretching. Another study by Theis et al investigated the effects of a long-term passive stretching method on muscle-tendon unit mechanics in children with cerebral palsy and reported that passive stretching can reduce muscle stiffness by changing fascicle stress rather than relaxing fascicle length. Novak et al reported that manual stretching is an ineffective method for preventing contractures. In our study, an increase in passive range of motion and a decrease in spasticity were observed in children with cerebral palsy after passive stretching.

O'Reilly et al found that preterm (or) multiple births accounted for 55% of children with spastic diplegia. Solomonov et al conducted a 3-month randomized study of 55 children and concluded that NMES can promote improvement in lower limb function by reducing spasticity.

Susan P. O. Sullivan conducted a 4-month study on 60 children and reported that passive stretching within the physiological end range of motion using an inhibition splint (or) splint improved ROM and reduced muscle tension.

Pin T et al conducted a controlled study on children with cerebral palsy and concluded that stretching for a longer duration would improve rheumatoid memory and reduce muscle spasticity around the target joints.

Low JL et al conducted a randomized study on 65 subjects using different instruments to measure their ROM and concluded that passive ROM measurements using a universal goniometer were more reliable

Bohannon et al conducted a study on 35 patients with spasticity and concluded that the modified Ashworth scale was the best method to determine the degree of spasticity.

From this study, it can be seen that both NMES and passive stretching, as well as passive stretching alone, can produce effective results. In contrast, NMES and passive stretching are superior to passive stretching alone and can be used as the first choice for the treatment of spastic diplegia.

CONCLUSION

The overall ROM of group A and group B was obtained and that says there is improvement in both groups. When compare the mean rank, we can conclude that group A is better than group B in the improvement of ROM in the treatment of spastic diplegic cerebral palsy children.

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