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Original Research Article

A COMPARISON OF NEURODEVELOPMENTAL THERAPY WITH MYOFASCIAL RELEASE AND NEURODEVELOPMENTAL THERAPY ON GROSS MOTOR FUNCTION IN CHILDREN WITH SPASTIC CEREBRAL PALSY

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ABSTRACT

Aim and Objective: To study and compare the effectiveness of Neuro-Developmental Therapy (NDT) with Myo-Fascial Release (MFR) and NDT on gross motor function in children with spastic Cerebral Palsy (CP).

Method: The quasi-experimental study was conducted on 20 children with spastic CP in the age group of 2 to 12 years, including both genders, and patients with the scoring of Gross Motor Function Classification System (GMFCS) scale in between I to III. All the children were assessed using Gross Motor Function Measure -88 (GMFM-88) as an outcome measure. Group A received NDT with MFR and Group B received NDT alone. Both the groups received treatment for 4 Weeks. Re-assessment was done after 4- weeks of intervention using GMFM-88.

Results: A significant improvement in gross motor function was seen in both the groups with a mean difference of 18.89 in group A & 7.23 group B. The calculated 't' value using the paired 't' test for group A was 6.833 (P<0.001) & group B was 10.716 (P<0.001). When comparing between the groups using independent 't' test the mean difference was 11.67 and the 't; value was 4.1(P<0.001).

Conclusion: The present study concludes that NDT with MFR therapy is greater in improving the gross motor function than NDT in improving gross motor function in children with spastic CP.

KEY WORDS: Cerebral Palsy, Neuro-Developmental Therapy, Myo-Fascial Release, Gross Motor Function, Gross Motor Function Classification System, Gross Motor Function Measure -88.

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INTRODUCTION

Gross motor development in children is commonly described as the acquisition of motor milestones such as unsupported sitting, crawling, and walking. A child with Cerebral Palsy (CP) will be recognized by delayed gross motor development and the presence of abnormal movement and postural patterns [1].

A population-based study reported that about half of the children have mainly motor function affected, whereas the remainder also had accompanying major impairments adding to the disability, which affected the several areas of activity and participation [2].

An important physical therapy treatment approach for children with CP is Neuro-Developmental Therapy (NDT), a neurophysiological approach that aims at maximizing the child's

potential to improve motor competence and to prevent musculoskeletal complications [3].

NDT is based on conceptual model devised by the Bobath's in 1940 and has achieved popular acceptance through its empirical appropriateness. This approach focuses on encouraging and building upon normal movement patterns and normal postural reactions, while trying to reduce abnormal movement [4,5].

Myofascial restrictions can occur through prolonged poor postures and movement patterns in children with CP. It can take 3 to 6 months following postural stress for a myofascial restriction to develop. When fascia is inflamed or under stress it shrinks and the normally wet gelatinous ground substance that gives fascia its glide becomes hardened and binds down the tissue. This decreases flexibility, fluidity of movement and the ability to absorb compressive forces. When fascia becomes restricted it hardens and shortens creating enormous pull and entrapment of tissues such as muscles, nerves, blood vessels, organs or lymphatics. This can create abnormal strain patterns that can pull osseous structures out of proper alignment resulting in compression of joint surfaces which creates asymmetry [6,7].

A gentle pressure applied slowly allows a viscous medium to flow greater than a quick pressure, this is known as viscous flow phenomenon. The viscosity of the ground substance has an effect on the collagen and rearranges itself. As the collagen rearranges, the collagenous barrier is slowly released causing a change in the tissue length [8].

Myo-Fascial Release (MFR) provides a means to obtain tissue mobility. Since the tissue is continuous from the top of the head to the bottom of the feet, the use of MFR has a generalized effect on the whole body of the child [9].

Using both MFR and NDT approaches is essential; neither one is a replacement for the other. MFR techniques produce changes in tissue mobility that could not be obtained with NDT. By changing fascial mobility, muscle and tendon length, bony alignment ligamentous structures are affected, thereby changing the patient's potential for active movement [8].

There are several scales to assess Gross Motor Function in children with Cerebral Palsy (CP). The original Gross Motor Function Measure (GMFM), an 88-item measure also known as the GMFM-88, is a criterion-referenced observational measure specifically developed to evaluate changes in gross motor function over time in children across the wide spectrum of ability levels in CP. The GMFM-88 has 5 dimensions: A-lying and rolling; B-sitting; C- kneeling and crawling; D-standing; and E-walking, running, and jumping. The GMFM-88 total score has been the measure most often chosen to detect changes in gross motor function in evaluations of various interventions. It is considered the gold standard for measuring gross motor function in children with CP [10].

Need for the study: MFR is safe, effective and designed to be utilized with appropriate modalities, mobilization, exercise, flexibility program, Neurodevelopmental therapy (NDT), sensory integration, and movement therapy. The goal of MFR in children with spastic CP is improved skeletal alignment with active postural control and independent function [6].

Some of the studies have shown that the NDT approach is effective in improving measures of motor performance in children with CP [3,11,12].

Since there is scarce literature on the combined effects of NDT and MFR on gross motor function in children with CP, there is a need for incorporating it in this study.

Objective: To compare the effectiveness of NDT with MFR and NDT on gross motor function in children with spastic CP.

MATERIALS AND METHODS

Materials used:

1. Mat
2. Short wooden stool
3. Wedge
4. Balance board
5. Bolster
6. Swiss ball
7. Play items like balls with various sizes and textures, cubes.

Study design: Pre and Post-test design with comparison treatments – A Quasi Experimental study design.

Study setting: Department of Physical Medicine

and Rehabilitation, PSG Hospitals and Ramakrishna mission vidyalaya, IHRDC, Coimbatore, Tamilnadu, India.

Population and sampling: Children with Spastic CP from PSG Hospitals and Ramakrishna mission vidyalaya, Coimbatore were chosen as population for the study. A total of 20 children with spastic CP, were randomly assigned into 2 groups. Group A of 10 participants. (NDT with MFR) and Group B of 10 participants. (NDT).

Criteria for sample selection: Children with spastic CP, Age group 2 to 12 years, Gross motor function classification system level I, II and III and Children who are able to follow simple commands were included.

Usage of anti-spastic drugs, Injection of Botulinum toxin during the study period, Orthopedic or neurological procedure during the study and Uncontrolled epilepsy were excluded.

Instrument & tool for data collection: GMFM-88 was used to measure the gross motor function in children with spastic CP. It is a standardized observational instrument. It comprises of 88 items with 5 dimensions and scored as 0-does not initiate, 1-initiates, 2-partially initiates and 3-completes for each item.

Techniques of data collection and interpretation: A written consent was obtained from the parent or caregiver who fulfilled the selection criteria and randomly assigned into two groups. Group A underwent combined NDT and MFR and Group B underwent NDT as per the needs of the child. GMFM-88 was used as an outcome measure.

During pre-test, each child of both groups was evaluated by using GMFM-88. Post-test was performed 4 weeks after the treatment using GMFM-88 and the results were compared.

Data collected from both the group of children were analyzed using Paired 't' test to measure the changes between the pre-test & post-test values of the GMFM-88 within the group. Independent 't' test was used to measure the changes between the groups.

RESULTS

34 children were assessed for eligibility in the present study and 22 were initially enrolled. Before random assignment, however, two families withdrew from the study. The remaining twenty children were randomly assigned to intervention program with 10 in Group – A and another 10 in Group – B. An algorithm representing the flow of cases in the study protocol is shown in figure – 1.

The pre and post-test values for both Group A & Group B were obtained before and after combined NDT with MFR and NDT only.

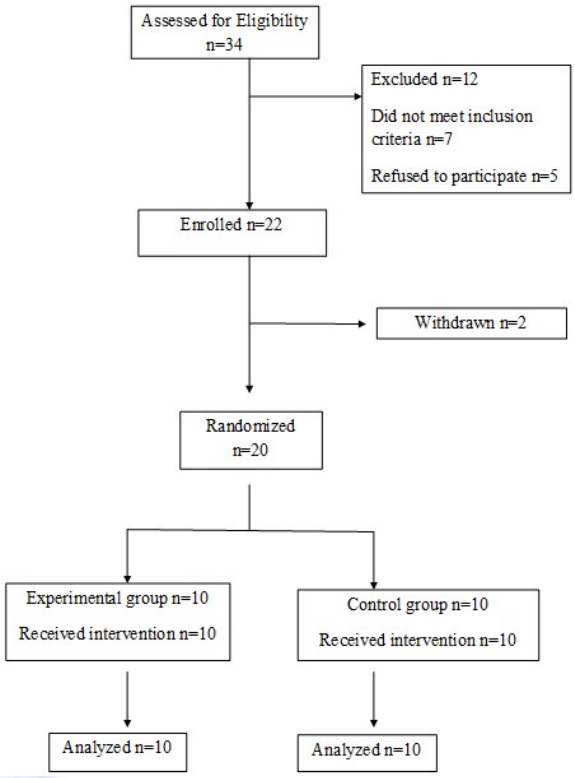


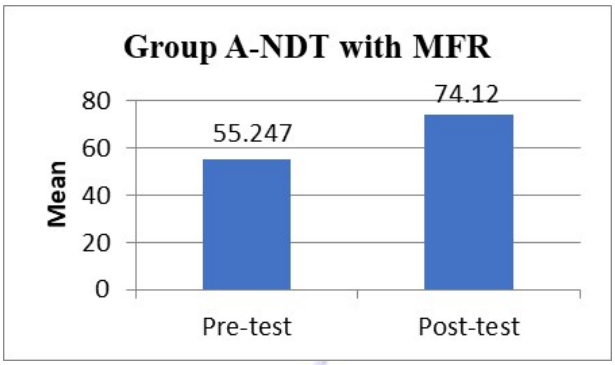
Fig. 1: Algorithm representing the flow of cases.

The improvement in gross motor function was assessed using GMFM-88. The mean, standard deviation and Paired "t" test values were used to find out whether there was any significant difference between pre-test and post-test values within the groups.

The Independent "t" test was used to find out the significant difference between the groups after Combined NDT with MFR and NDT only.

Table 1: Paired 't' test values, the Mean, Mean difference and Standard deviation (SD) of GMFM-88 in Group A.

	Group A	
	Pre-test	Post- test
Mean	55.247	74.12
Mean difference	18.89	
SD	8.75	
"t" Value	6.833	
"P" Value	P<0.001	

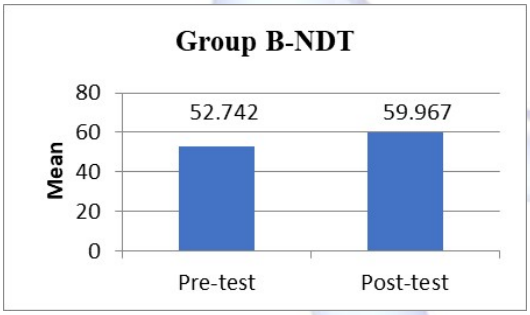


Graph 1: Mean values of Pre-test and Post-test in Group-A

Based on Table 1, and Graph 1 & 3 the mean values of pre-test and post-test in Group A was 55.247 and 74.120 respectively, mean difference of group A was found to be 18.89, Standard deviation was 8.75, the 't' value was 6.833 which was greater than the table value at p<0.001.

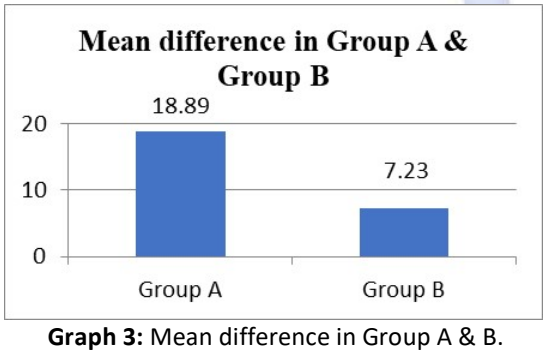
Table 2: Paired 't' test values, the Mean, Mean difference and Standard deviation (SD) of GMFM-88 in Group B.

	Group B	
	Pre- test	Post- test
Mean	52.742	59.967
Mean difference	7.23	
SD	2.13	
"t" Value	10.716	
"P" Value	P<0.001	



Graph 2: Mean values of Pre-test and Post-test in Group-B.

In Group B the mean values of pre-test and post-test was 52.742 and 59.967 respectively mean difference was 7.23, Standard deviation was 2.13, 't' value was 10.716 which was greater than the table value of at p<0.001 which is shown in table 2 and graph 2 &3.



Graph 3: Mean difference in Group A & B.

Table 3 shows the independent 't' test results performed between Group A and Group B to analyze the significance of NDT with MFR and NDT only in spastic CP.

Based on the table 3, the calculated 't' value was 4.1, which was greater than the table value at P<0.001. This shows that MFR along with NDT improved the gross motor function in Spastic CP children.

Table 3: Independent 't' test values, Mean Difference and Standard deviation (SD) of GMFM– 88 between Group A & Group B

Outcome Measure	Mean Difference	SD	"t" Value
GMFM-88	11.67	8.75* 2.13**	4.1 (P<0.001)

* Group A; ** Group B

DISCUSSION

The aim of this study was to compare the effectiveness of NDT with MFR and NDT on gross motor function in children with spastic CP.

34 children were assessed for eligibility in the present study, and 22 were initially enrolled. Before random assignment, however, two families withdrew from the study. The remaining twenty children were randomly assigned to intervention program with Ten going to the Group – A and another ten going to Group – B.

The findings showed that both the groups showed improvements in the gross motor function. Group A which underwent NDT with MFR showed greater improvement in the gross motor function than Group B which underwent NDT only.

This can be explained as NDT improves the posture, postural control and alignment in children with CP. This correlates with many studies which evaluate the postural control using NDT based protocol and they concluded that NDT based protocol improved the postural control but no change in the muscle tone in children with CP [13,14].

Similarly, in another study, Sherry W. Andrt et al.,2008 [15] evaluated the efficacy of NDT-based sequenced trunk activation protocol for change in gross motor function using GMFM -88 as an outcome measure. The experimental group received a dynamic co-activation trunk

protocol and the controlled group received a parent-infant interaction and play protocol. The NDT-based protocol group showed significant improvement in gross motor function than the control group.

These studies supported the idea that NDT is improving the gross motor function in children with CP. In the present study both the groups received NDT as a treatment. The results suggest that NDT improved the gross motor function in children with CP.

MFR reduces the muscle tone, improves the motor function and quality of life in children with CP [16,17].

This statement has been proved in a randomized controlled trail, which analyzed the effectiveness of osteopathy in the cranial field, MFR, or both versus acupuncture in children with moderate to severe spastic CP. In which GMFM and the mobility domain of Wee FIM showed a significant improvement. No statistically significant improvements were seen among patients in the acupuncture treatment group. And the study concluded that treatments using osteopathy in the cranial field, MFR, or both improved motor function in children with moderate to severe spastic CP [16].

And in another study Sandra L. Whisler et al., 2004 [17] evaluated the effects of MFR on children with CP. Benefits were observed in the children with CP including decreased spasticity, improved body symmetry, improved tone, and improved range of motion, ambulation, alertness and cooperation. They concluded MFR may be of value to reduce spasticity or muscle tone and improve the quality of life in children with CP.

In the above-mentioned studies, they proved that MFR is having impact in the muscle tone and the range of motion in the children with CP which would improve the gross motor function. This supports the results of the present study in which group A showed a greater and significant improvement than group B. This result would be because of the MFR which reduces the muscle tone & improving the range of motion along with NDT which improves the postural control and mobility. Subsequently there is a greater improvement in the gross motor function in children with spastic CP.

CONCLUSION

This study incorporated combined NDT with MFR treatment and their influence in gross motor function of children with spastic CP. It was found that the NDT with MFR improved the gross motor function in children with spastic CP.

Therefore, from the literature available and the statistical analysis of the data obtained, the study concluded that, NDT with MFR is greater in improving the gross motor function than NDT in improving gross motor function in children with spastic CP.

ABBREVIATIONS

NDT- Neuro-Developmental Therapy
MFR- Myo-Fascial Release
CP- Cerebral Palsy
GMFM- Gross Motor Functional Measure

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Conflicts of interest: None

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