

The Effectiveness of Neuro Developmental Therapy with Myofascial Release on Gross Motorfunction of Children with Spastic Cerebral Palsy

Kotilinga Reddi A¹, Dr. Ravi Shankar²

¹PhD in Physiotherapy, Capital University, Koderma

²Dean / Director, Department of Allied Science, Capital University, Koderma

Abstract: ***Objective:** This study analysed the effectiveness of Neuro-Developmental Therapy (NDT) with Myo-Fascial Release (MFR) on gross motor function in Children with spastic Cerebral Palsy (CP). **Methodology:** Children with Spastic CP (n=10) were selected for the study from Department of physiotherapy, Capital University based upon the inclusion and exclusion criteria. Then CP children underwent combined NDT and MFR. GMFM-88, QUEST & MTS was used as an outcome measure. During pre-test, each child was evaluated by using GMFM-88, QUEST, & MTS. Then intervention was provided for a duration of 3 days per week for 4 weeks then post test scores were recorded using tools. After statistical analysis done for obtaining the results. **Results:** After analysing and comparing the pre-test and post-test scores the result turned out to be significant ($p < 0.001$). **Conclusion:** It is concluded that Neuro-Developmental Therapy (NDT) with Myo-Fascial Release (MFR) can improve gross motor function in Children with spastic Cerebral Palsy (CP).*

Keywords: Neuro- developmental therapy, Myo-Fascial Release, Gross motor, spastic, Cerebral Palsy

1. Introduction

Cerebral Palsy is considered a neurological disorder caused by a non-progressive Brain injury or malformation that occurs while the child's brain is under development. Cerebral palsy (CP) refers to a group of disorders that affect muscle movement and Coordination. In many cases, cerebral palsy also affects vision, hearing, and sensation. The word —cerebrall means having to do with the brain. The word —palsyl means Weakness or problems with body movement. Cerebral Palsy affects body movement, Muscle control, muscle coordination, muscle tone, reflex, posture and balance. It can also Impact fine motor skills, gross motor skills and oral motor functioning. Cerebral palsy is the most common cause of motor disabilities in childhood. According to the Centres for Disease Control and Prevention (CDC), it affects 1 to 4 out Of every 1,000 children worldwide. Cerebral palsy is caused by abnormal development or damage in one or more parts of the brain that control muscle tone and motor activity (movement). The resulting impairments first appear early in life, usually in infancy or early childhood. Infants with cerebral palsy are usually slow to reach developmental milestones such as rolling over, sitting, crawling, and walking. Common to all individuals with cerebral palsy is difficulty controlling and coordinating muscles. This makes even very simple movements difficult.

CP is the most common childhood motor disability. A total of 2-2.5 of every 1000 Live born children in the Western world have the condition, incidence is higher in Premature infants & in twin births.

The SCPE has classified CP into three main groups, which are based on clear Neurological signs indicating pathology in the cerebral motor systems, e.g. spastic, ataxic, and dyskinetic CP

1) **Spastic CP:** Sanger et al 2003 defined spastic CP has increased tone, pathological Reflexes, either increased

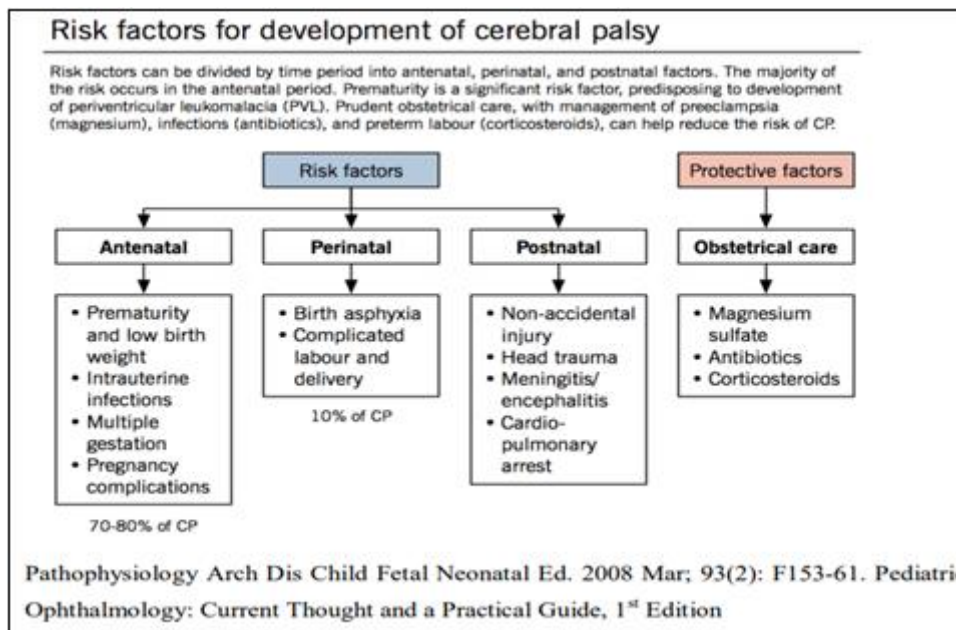
reflexes e.g., hyper-reflexia or pyramidal signs, e.g., Babinski Response, increased tone in spasticity is characterized by an increased resistance which is Velocity dependent. A spastic catch is felt some time after onset of movement. Clonus is often Associated with hyper-reflexia. It is considered pathological when it is prolonged or does Not stop spontaneously. Pathological posturing of lower limbs is characterized by internal Rotation of hip, hip adduction, equinus foot resulting in a scissored position.

- 2) **Dyskinetic CP:** Involuntary, uncontrolled, recurring and occasionally stereotyped Movements. The primitive reflex patterns predominate & the muscle tone is varying
 - **Dystonic CP:** Dominated by abnormal postures (may give the impression of Hypokinesia) and hypertonia (tone fluctuating, but easily elicit able tone Increase). Characteristics are involuntary movements, distorted voluntary Movements, & abnormal postures due to sustained muscle contractions (slow Rotation, extension, flexion of body parts)
 - **Choreoathetic CP:** Dominated by hyperkinesia and hypotonia (tone fluctuating, but mainly decreased). Chorea means rapid involuntary, jerky often Fragmented movements. Athetosis means slower, constantly changing, writhing Or contorting movements.
 - In some cases, however, it may be difficult to delineate these subgroups when Features are present from both. Then the term Dyskinetic CP should be used.
- 3) **Ataxic CP:** Loss of orderly muscular co-ordination, so that movements are performed With abnormal forces, rhythm and accuracy. Typical features include trunk and gait ataxia (disturbed balance) and past pointing (over or undershooting of goal directed movements); Tremor (mainly slow intentional tremor); low tone

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Spastic CP

Spastic cerebral palsy is the most common type, making up over 70 percent of all CP diagnoses. Spasticity is seen to be a positive feature of upper motor neuron syndrome. This is because it is due to a loss of inhibition of the lower motor neuron pathways, rather than a loss of connection to the lower motor neuron (or other pathways). This results from disordered sensorimotor control of movement due to a lesion of the upper motor neuron which regulates muscle control. Therefore, there is an imbalance of the signals between the central nervous system (CNS) and muscles, presenting as intermittent or sustained involuntary activation of muscles. All muscles have some tone to maintain function. For example, activation of antigravity muscles to maintain sitting or standing postures. In an individual with spasticity, there is a velocity-dependent increase 26 in muscle tone to passive movement. This creates an inability to stretch muscles or coordinate movements effectively. This inhibition can result from central nervous system pathology, such as:

- Cerebral Palsy
- Multiple Sclerosis
- Motor Neuron Disease
- Stroke Hypoxic Brain Injury
- Traumatic Brain Injury
- Parkinson's Disease
- Spinal Cord Injury
- Spinal Cord Compression
- Metastasis / Tumor

Spasticity can have an impact on an individual's function, affecting upper and lower limbs, as well as trunk. If this is not managed effectively, it can lead to fixed deformity contractures (changes to soft tissue), which affect skin care, comfort and hygiene, as well as complications for daily tasks.

Effects of Spasticity

- Abnormal posture
- Difficulty in hygiene and dressing
- Difficulty in movements

- Difficulty in sitting and transfers
- Inhibits muscle growth

Negative Effects

- Joint subluxation or dislocation
- Leads to contractures
- Masks contraction in the antagonist muscle pain
- Pressure sores
- Shortening and stiffness of the soft tissues
- Extensor tone in the limbs help standing 28

Positive effects

- Preserve bone density
- Preserve muscle bulk

Classification of Spasticity into various components of spasticity into sub-definitions

- 1) Intrinsic Tonic Spasticity: Exaggeration of the tonic component of the stretch reflex (manifesting as increased tone)
- 2) Intrinsic Phasic Spasticity: Exaggeration of the phasic component of the stretch reflex (manifesting as tendon hyper-reflexia and clonus), and
- 3) Extrinsic Spasticity: Exaggeration of extrinsic flexion or extension spinal reflexes.

2. Common Treatment Techniques

Neuro-Developmental Techniques

It is used to promote normal movement and posture and to inhibit abnormal movement and posture. Specific techniques include joint compression and stretching to provide sensory-motor input and to guide motor output. Neuro Developmental Treatment, despite being commonly used as a therapy for children with CP, has not been found to have strong evidence for its use. Neuro Developmental Treatment (NDT) originated with work by Bobath and Bobath in the 1940s for the treatment of individual with neurological disorder of posture and movement. The Bobath's developed the approach specifically to guide the therapist who manage and treat individual diagnosed with CP.

NDT is a holistic and interdisciplinary clinical practice model, the theory of NDT into what is presently accepted as the dynamic systems theory. In this way NDT is a —living concept it adapts and grows as knowledge of the brain 's functions are revealed. Using the dynamic systems theory, NDT Trained therapists are able use the variety of treatment techniques. These particular techniques encourage active use of proper muscles and diminish involvement of muscle not necessary for the completion of a particular task. NDT based on the theory that inhibiting or modifying impairments of spasticity and abnormal reflex patterns can recover movement, for infants handling techniques promote active movement and thus they experience normal movement sensations.

Bobath concept aims to improve gross motor function and postural control by facilitating muscle activity through key points of control assisted by the therapist (Bobath 1990; Dos Santos 2015; Velickovic 2005). Although the basic concept has not changed, it has evolved to reflect developments in understanding of movement dysfunction in children with central nervous system damage.

NDT involves task-specific postures and movements. It centres on and emphasizes functional activities and participation in relevant daily life situations. The main aim of NDT is to improve the quality of life of patients with neurological lesions by optimizing their level of activity and participation (Mayston 2008).

3. Theoretical Framework

NDT as a neuromuscular and functional re-education technique now includes neuro plasticity as a basis how the brain can change and reorganize itself and its processes based on practice and experience

- Facilitation of normal postural alignment and movement patterns
- Demand should be placed on the involved side during developmental and functional activities
- Sensory feedback (manual contact, visual integration, somatosensory reinforcement) is essential to recovering function
- Treatment includes looking at the whole person and specific functional needs; recovery vs. compensation

Myo Fascial Therapy:

Myofascial therapy can be defined as —the facilitation of mechanical, neural and psycho physiological adaptive potential as interfaced by the myofascial system. The purpose of deep myofascial release is to release restrictions (barriers) within the deeper layers of fascia. This is accomplished by a stretching of the muscular elastic components of the fascia, along with the cross links, and changing the viscosity of the ground substance of fascia. Myofascial Release (MFR) techniques are utilized in a wide range of settings and diagnoses; pain, movement restriction, spasm, spasticity, neurological dysfunction, i.e., cerebral palsy, head and birth injury, Cardiovascular Accidents (CVA), scoliosis. Myofascial release and Static stretching are expected to have an effect on the spastic/tight muscles; efficacies of these methods need to be established in clinical practice. Moreover, there are few studies done on

Myofascial release to reduce spasticity which showed immediate & short-term effect. There are insufficient published evidences available for effect of MFR technique on spasticity, so present study is focus on to find out the effectiveness of Myofascial Release on Gross Motor Function. 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, we 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, 70 organs or lymphatic 's. This can create abnormal strain patterns that can pull osseous structures out of proper alignment resulting in compression of joint surfaces which creates asymmetry. A gentle pressure applied slowly allows a viscous medium to flow greater than a quick pressure; this is known as viscous flow phenomenon.

4. Methodology

4.1 Sample

Children with Spastic CP from Department of physiotherapy, Capital University were chosen as population for the study. A total of 10 children with spastic CP, were randomly assigned into a group based on inclusion criteria like Age group 2 to 12 years, Gross motor function classification system level I, II and III, Children who are able to follow simple commands were included, Written consent form. And few are excluded on the basis of Usage of anti-spastic drugs, Orthopaedic or neurological procedure during the study, Uncontrolled epilepsy, being unable to understand the commands necessary for the procedure, Visual and auditory deficits UE fixed deformities / contractures prior orthopaedic surgery, Mental retardation associated with CP etc.

4.2 Instruments

Out Come Measures

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.

4.3 Procedure

A written consent was obtained from the parent or caregiver who fulfilled the selection criteria and randomly assigned into a group based on inclusion and exclusion criteria. During pre-test, each child of the group was evaluated by using GMFM-88.

A pre-treatment evaluation was done using the GMFM- 88 scores. The parents/ legal guardians were explained about the effects of MFR, and were asked to examine their child 's skin constantly for any discomfort. If any such discomfort

was seen the parents/ guardians were asked to report immediately and medical help was provided if needed.

Subject were received Myofascial Release along with conventional, NDT treatment subjects were positioned in supine with the affected upper extremity exposed. The subjects were given enough privacy and their parents were allowed to be with them throughout the treatment. The subjects were instructed to inform if any discomfort was felt during the treatment procedure.

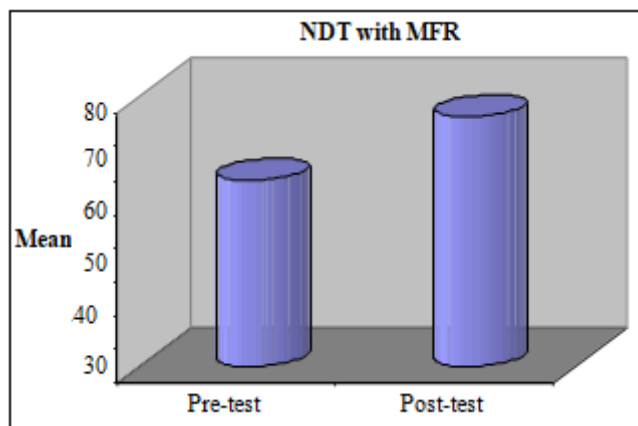
Subjects who received Myofascial release were evaluated for areas of restriction of fascia in upper extremities. The treatment area was cleaned with water using cotton and the area was dried before applying MFR. The part to be released was kept in supported and relaxed position.

Subject received treatment 3 days per week for 4 weeks. At the end of 4th week subjects were evaluated with GMFM- 88 obtain post test score.

5. Result

Table 1: Paired 't' test values, the Mean; Mean Difference and Standard Deviation (SD) of GMFM-88

	Pre-test		Post-test
Mean	55.247		74.12
Mean Difference		18.89	
Standard Deviation		8.75	
"t" Value		6.833	
"P" Value		P<0.001	



Graph 1: Mean values of Pre-test and Post-test

Results showed the mean difference is 18.89 with SD of 8.75 and the P value <0.001 which indicate the study turned out to be significant.

6. Conclusion

The present study concludes that NDT with MFR therapy is greater in improving the gross motor function.

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.

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