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Efficacy of Inhibition Techniques for Children with Infantile Hemiplegia: Paediatric Rehabilitation

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Abstract: **Background:** The neurophysiological approach designed for the patient with motor control problem deals with the activation or de-activation of sensory receptors, which is concerned with the interaction of somatic, autonomic and psychic factors and their role in the regulation of motor behaviour
AIM: To discover the efficacy of inhibition techniques for children with infantile hemiplegia
Objectives:
- ❖ To assess the level of spasticity of upper extremity for children with infantile hemiplegia
- ❖ To train the upper extremity function using inhibition techniques and
- ❖ To analysis the different between pre and post therapy values of MAS (Modified Ashworth Scale) for children with infantile hemiplegia.

Methodology: This study consists of 12 Children with infantile hemiplegia, were randomly assigned into two group. All children were assessed by using MAS (Modified Ashworth Scale). Based on the inclusion and exclusion criteria. Group A (experimental group) received inhibition techniques whereas Group B (control group) received conventional occupational therapy program.
A total of 12 children were participated with mean value of the age is 9.083 and 78% of male children and remain 22% where female children was participated in this study
Result: The result was analysed after the intervention of 8-week training program, The pre and post therapy value of conventional occupational therapy training for Children with infantile hemiplegia for control group, show the mean value of pre therapy 3.6666 and SD is 0.51639, S^2 Variance 0.2666 and post therapy mean value is 2.8333 and SD is 0.75277. S^2 Variance 0.56666. The 't' value is .7885 and 'p' value is less than <.005.

The pre and post therapy value of experimental group/Roods Inhibition technique training group for Children with infantile hemiplegia shows, the pre therapy mean value is 3.333 and the SD is 0.5163, S^2 Variance 0.26667 and post therapy mean value is 1.5 and SD is 0.54772, S^2 Variance 0.312. The '**t'** value is 10.1291 and P value is less than <.0001 Hence, this result shows that, there are significant changes were seen in control group / conventional occupational therapy training program whereas more significant changes were seen in experimental group/ Inhibition technique training program.
Conclusion: This study concluded that, The Roods inhibition technique has more effective in preventing upper extremity spasticity and to enhance quality of life for Children with infantile hemiplegia. Many of their Parents were also reported that, the Inhibition Techniques helps to improve daily living activity.
Keywords: Occupational Therapy, Infantile Hemiplegia, Inhibition Techniques, MAS: Modified Ashworth Scale, ADL: Activities of Daily Living.

1. INTRODUCTION

In south India found that 13% of strokes in the 0-9 age group were infantile hemiplegia. In north India identified intra cranial infection as the most common causes of recent onset for paediatric hemiplegia and there are 1.8 million people suffer from stroke. there are many interventions aimed at upper Motor Control and function in cerebrovascular accident patients in different way the Roods Approach intervention used for cerebrovascular accident patients to enhance hand function in everyday life.
Rood Approach is neurophysiological approach developed by Margaret Rood in 1940- Rood Approach deals with the activation or de-activation of Sensory receptors. The neurophysiological approach designed for the patient with motor control problem.
According to Rood motor functions and Sensory mechanism are interrelated. Roods basic assertion was that motor pattern are developed from primitive reflexes through proper sensory stimuli to appropriate sensory receptors.

1.2 Infantile Hemiplegia - Cerebrovascular Acident

Infantile Hemiplegia is a sudden loss of blood supply to the brain that damages and kills brain calls, thus resulting in neurological deficits related to the involved area of the brain. Hemiplegia is a paralysis of one half of the body, which also leads to stroke, is a complex dysfunction caused by lesion in the brain. The health organization defines stroke as an "acute neurologic dysfunction of vascular origin with symptoms and signs corresponding to the involvement of focal area of the brain.'' Stroke result in upper motor neuron dysfunction that produced hemiplegia or paralysis of one side of the body. Including the limbs and trunk and sometimes the face and oral structure that are contralateral to the hemisphere of the brain with the lesion.
Accompanying the motor paralysis may be a variety of dysfunction other than the motor paralysis. Some of these dysfunctions including sensory disturbance, visual disturbance, personality and intellectual changes and a complex range of speech and associate language disorders. The neurological deficits must persist longer than 24 hours to be labelled a CVA.

1.2.1 Causes of Stroke

1.2.2 Ischemic Stroke:
Which causes 87% of total stroke. May be caused by a thrombus (blood clot causes blockage) or an embolus (travelling blood clot).

1.2.3. Hemorragic Stroke

Hemorragic stroke occurs when a rupture of a blood vessels results in bleeding into the brain. Hemorrhagic stroke account for approximately 10% of stroke but result in a significant higher death rate and most of the Infantile Hemiplegia causes, intra cranial infection

Roods Approach

Inhibition technique was coming under the roods approach. The rood approach is a neurophysiological approach developed by Margaret rood in 1940. Rood approach deals with the activation or de-activation of sensory receptors, which is concerned with the interaction of somatic, autonomic and psychic factors and their role in the regulation of motor behaviour.
This neurophysiological approach was designed for the patient with motor control problem. According to rood, motor functions and sensory mechanisms are interrelated. The approach is based on reflex/hierarchical model of the central nervous system, where the movement is facilitated or inhibited for rehabilitation purpose. Rood's basic assertion was that motor patterns are developed from primitive reflexes through proper sensory stimuli to the appropriate sensory receptors. Rood exploited the normal sequential development to get motor responses and establish proper motor engrams.

2.1. Facilitation Technique

Proprioceptive stimulation refers to the facilitation of muscle spindles, Golgi tendon organs. Joint receptors, and the vestibular apparatus. In general, proprioceptive stimulation gives the therapist and the client more control over the motor response. Proprioceptors adapt more slowly than exteroceptors and can produce sustained postural patterns. There is little or no neuronal recruitment in the proprioceptive system. Therefore, the motor response is thought to last as long as the stimulus is applied. Four types of proprioceptive facilitatory techniques are heavy joint compression, resistance, vestibular stimulation, and inversion.

2.2 Inhibitory Techniques

Inhibitory techniques are neutral warmth, slow stroking, light joint compression, and rocking in developmental patterns.

2.2.1 Neutral Warmth

The neutral warmth technique most likely affects the temperature receptors of the hypothalamus and stimulates the parasympathetic nervous system. Neutral warmth can be used for individuals with hypertonia, particularly those with spasticity and rigidity.
Non –invasive, nonthreatening approach of wrapping targeted body parts or entire body in blanket, towel, or sheet for 5-10 min. Client feels light pressure and warmth of wrap and often feels related resulting in decreased tone.

2.2.2. Gentle Rocking or Shaking

Rhythmical, controlled rocking or shaking movement that incorporates joints approximation and distraction. Commonly used at heat, shoulder, forearm, pelvic and lower extremity. Precise hand placement and manipulation skill are necessary.

The developmental sequences and roods concept of mobility superimposed on stability roods encourage movement as the individual gained mastery of the static position. The individual first must assume and be able to achieve a static position and then integrate coordinated movement while maintain the posture.
In the quadruped position, the child shift weight to a three-point stance so that one hand is free to reach forward to grasp and explore the immediate environment. Movement may begin by shifting the weight forward and backward.
In the quadruped position, individual with hemiplegia are assisted by achieving stability of the involved elbow when the therapist applies pressure and stretch to the triceps brachii and anconeus. As the therapist applies compression that is greater than body weight to facilitate co-contraction, the pressure exerted on the extended wrist and heel of the hand inhibits the wrist flexors.

2.2.3 Slow Stroking

Slow stroking has been described as an inhibitory technique. The individual lies in the prone position while the therapist provides rhythmic, moving, deep pressure over the dorsal distribution of the primary posterior rami of the spine.
The therapist applies fingertip pressure on both side of the spinous process to affect. The nerve endings and the sympathetic out flow of the autonomic nervous system. Application of firm, direct pressure to both side of spinous processes (primary posterior rami) from occiput to coccyx for up to 3 min, with client in prone.
May be accomplished with index and long digit in V position, stroking down the spine. As one hand reaches coccyx area, alternate hand begins to repeat stroking from occipital area to ensure continuous pressure.

2.2.4. Light Joint Compression

Joint compression of body weight or less than body weight can be used to inhibit spastic muscles around a joint. This technique may be used with individual who have hemiplegia, to alleviate pain and temporarily offset the muscle imbalance around the shoulder joint.
The individual can be sitting or lying in the supine position. The therapist places one hand over the individual's shoulder and the other hand under the flexed elbow joint. The arm is abducted 35- 45 and a compression force of body weight or less is applied through the longitudinal axis of the humerus.
This procedure compresses both the glenohumeral joint and the articulation between the humerus and ulna. Application of the pressure less than or equal to body weight to move bones on either side of a joint closer together.
Commonly performed at shoulder followed by moving humerus in small circle, resulting in decreased pain and stiffness. May also be accomplished by client in weight –bearing positions in which pressure is less than body weight.

Slow Rolling

Slow, passive rolling of client by therapist from side lying toward prone. The patient is placed in a side lying position (the hemiplegic patient should first lie with the involved side down). May include slow manual rotation of pelvic and trunk.
The therapist kneels behind the patient and places the hand on rib cage or shoulder. The patient is rolling slowly a sleeping to prone position and back again in rhythmic motion.

Deep Tendon Pressure

Deep tendon pressure at tendon insertion site of targeted muscle. May result in inhibition of muscle control. It can be applied manually and /or through devices such as splint. Positioning may be used to achieve an inhibitory the quadriceps muscle and the long finger flexors of the hand.

Maintained Stretch

Maintenance of affected muscle in elongated position. Positioning is the elongated position to cause lengthening of the muscle spindle to reset the afferent of the muscle spindle to a longer position so they become less sensitive to stretch.
Resistance can be applied manually or mechanically or by using of gravity and body weight. Resistance facilitates muscles contracture which is directly proportional to the amount of resistance applied. Improve kinaesthetic awareness and increasing strength are another two benefits gained from resistance.

3. METHODOLOGY

A Total of 12 Children with infantile hemiplegia; which include 8 male children, 4 female children were participated in this study. The children were selected at certain age group limit starting from age 8-11 years with right and left infantile hemiplegic in and around Chidambaram and GMCH,CD were selected for this study. All children were screened by using Modified Ashworth Scale (MA) before and after the intervention.
The following Children with infantile hemiplegia were not included in this study.

- Patient with cardiac problem. (Heart attack, arrhythmia, angina pectoris)
- Patients with left side hemiplegic with cardiac complications.

Children with following conditions were not included in this study:

- Abnormal /altered skin sensation.
- Peripheral vascular disease.
- Epilepsy

3.1. Procedure

Children were randomly assigned into two group. All **C**hildren were assessed by using Modified Ashworth Scale based on the inclusion and exclusion criteria. Group A (Control Group) received conventional occupational therapy training whereas Group B (Experimental Group) received inhibition technique. This training was conducted 45 minutes daily, 5 days / per week, over a period of 12 weeks.

3.2 Sample and Study Design

All patients were selected based on the simple random sampling with quasi experimental study.

3.3 Training Protocal / Program For Inhibition Technique

TIMING PROGRAM	MINUTES
Starting session	5
Neutral warmth	10
Gentle rocking and shocking	5
Slow stroking	3
Light joint compression	5
Slow rolling	4
Deep tendon pressure	3
Maintain stretch	5
Ending session	5
Total Minutes	45

3.4 Assessment Tools: Modified Ashworth Scale (Mas)

Grade	Description
0	No increase in muscle tone
1	Slight increase in muscle tone, manifested by a catch and release or by minimal resistance at the end of the range of motion when the affected part is moved in flexion or extension
1+	Slight increase in muscle tone, manifested by a catch and release or by minimal resistance throughout the remainder (less than half) of the range of motion
2	More marked increase in muscle tone through most of the range of motion. But affected part easily moved
3	Considerable increase in muscle tone, passive movement difficult
4	Affected part rigid in flexion or extension

NORMS	
RADE	DISCRIPTION
0-1+	Minimum level of spasticity
2-3	Moderate level of spasticity
3-4	Severe level of spasticity

6. Need for Study

Many children are suffered with infantile hemiplegia and lack of hand function due to spasticity which leads to dependent in day-to-day activities. The main purpose of this study was to find out the effectiveness of inhibition technique to prevent upper extremity spasticity and to enhance the performance of daily living task for Children with infantile hemiplegia.

7. Limitation and Recommentation

7.1 Limitation

- This study was conducted with limited sample size.
- Study was carried out with short duration.

7.2 RECOMMENDATION

- Study can be conduct with large number of samples.
- Extensive study may be recommended. Patients with cardiac complication may also be consider.
- Further research may conduct the effect of combination of inhibition technique and conventional occupational therapy for patient with cerebrovascular accident.

4. RESULT

A total of 12 were participated with mean value of the age is 9.083 and 78% of male children and remain 22% are female children was participated in this study

The result was analysed after the intervention of 12 week, The pre and post therapy value of conventional occupational therapy training for children with infantile hemiplegia for control group, show the mean value of pre therapy 3.6666 and SD is 0.51639, S^2 Variance 0.2666 and post therapy mean value is 2.8333 and SD is 0.75277. S^2 Variance 0.56666. The 't' value is .7885 and 'p' value is less than <.005.

The pre and post therapy value of experimental group/Roods Inhibition technique training group for Children with infantile hemiplegia shows, the pre therapy mean value is 3.333 and the SD is 0.5163, **S^2 Variance** 0.26667 and post therapy mean value is 1.5 and SD is 0.54772, S^2 Variance 0.312. The '**t'** value is 10.1291 and P value is less than <.0001

Hence, this result shows that, there are significant changes were seen in control group / conventional occupational therapy training program whereas more significant changes were seen in experimental group/ Inhibition technique training program.

Table: 1 Shows, Pre and Post Therapy Values Of Modified Ashworth (MA) Scale For Children With Infantile Hemiplegia Experimental Group / Roods Inhibition Techniques

S.No:	Pre- Therapy	Post – Therapy	
		1 TRAIL (4^{th} week)	2 TRAIL(8^{th} week)
1.	4	3	2
2.	3	2	1
3.	3	2	1
4.	3	2	1
5.	4	3	2
6.	3	3	2

TABLE: 2, Shows mean and SD of pre and post-therapy values of Modified Ashworth (MA) scale for Children with Infantile Hemiplegia

Pre-Therapy Values	Mean Value	SD	s^2 = Variance
	3.333	0.5163	0.26667
Post-Therapy Values	1.5	0.54772	0.312

TABLE: 3 Shows, the T and P value of pre and post therapy score of Modified Ashworth (MA) Scale for Children with Infantile Hemiplegia

t-Value	p-Value
10.1291	<.0001

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TABLE: 4 Shows pre and post therapy value of Modified Ashworth (MA) Scale for Children with Infantile Hemiplegia - (CONTROL GROUP) – Conventional OT Training

S.NO:	PRE-THERAPY	POST- THERAPY	
		1st TRAIL (4th week)	2nd TRAIL (8th week)
1.	4	4	4
2.	4	4	3
3.	3	3	3
4.	4	4	3
5.	3	3	2
6.	4	3	2

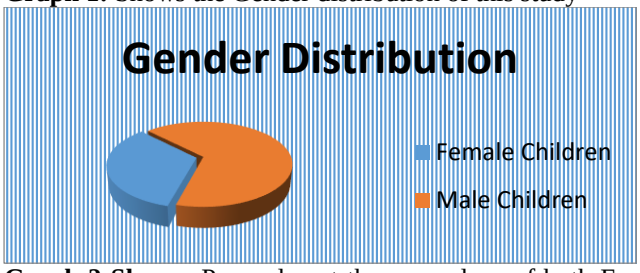
TABLE: 5 Shows, the Mean and SD of Pre and Post Therapy Value of Modified Ashworth (MA) Scale for Children with Infantile Hemiplegia

Pre-Therapy Values	Mean Value	SD	s^2 = Variance
	3.6666	0.51639	0.2666
Post- Therapy Value	2.8333	0.75277	0.56666

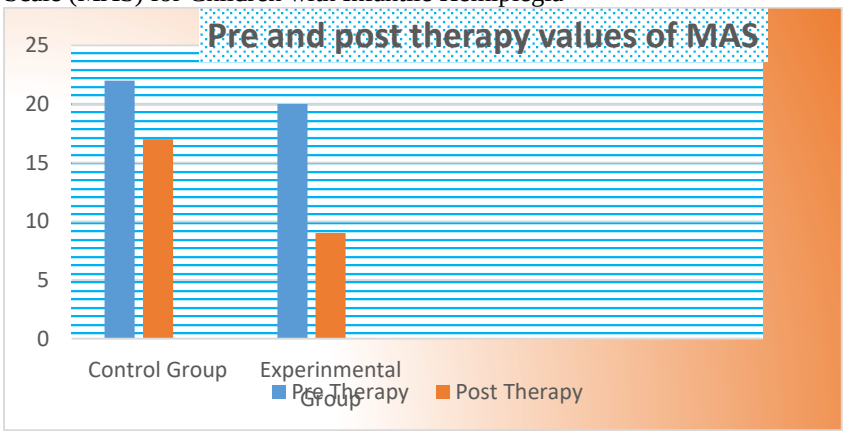
TABLE: 6 Shows the T and P Value of Pre and Post-Therapy Score of Modified Ashworth (MA) Scale for Children with Infantile Hemiplegia

t-Value	p-Value
.7885	<.0005

Graph 1: Shows the Gender distribution of this study



Graph 2 Shows: Pre and post therapy values of both Experimental and Control group of Modified Ashworth Scale (MAS) for Children with Infantile Hemiplegia



5. DISCUSSION

The purpose of this study was to analyse the effects of inhibition technique for Children with Infantile Hemiplegia to prevent upper extremity spasticity and to enhance to enhance the performance of daily living task. This study consists of 12 children with randomly assigned into two group that is controlled group (conventional occupational therapy training) and experimental group (inhibition technique), were selected based on the inclusion and exclusion criteria. All children were screened by Modified Ashworth Scale (MAS).

Pre therapy assessment were taken on the day of examination, Control group were received conventional occupational therapy training. In this training includes scooter board, beg board, fine motor activity each activity carried 5-10 minutes with duration of 45 minutes per session. 5 session per week, totally 12 weeks training program was conducted for this study.

Experimental group were treated with inhibition technique training program. This training program includes movements unaffected side, slow rolling, slow stroking, gentile rocking and shaking, light joint compression, deep tendon pressure and neutral warmth and each activities required 3-10 minutes with repetition. This training program were given 5 session per week up to 12 weeks.

The result was analysed after the training program the result shows, that for both control group and experimental group significantly difference in the day-to-day activity training between these two groups. The score of Modified Ashworth Scale (MAS) were shows, significantly improvement was seen in the inhibition technique /experimental group for Children with Infantile Hemiplegia

Inhibition techniques reduce spasticity as well as which make them independent in daily living activities. Therefore, this study was more effective in the treatment of upper extremity spasticity while enhance quality of life for Children with Infantile Hemiplegia

6. CONCLUSION

This study concluded that, The Roods inhibition technique has more effective in the treatment of upper extremity spasticity while enhance the quality of life for Children with Infantile Hemiplegia. Parents were also reported that the Inhibition Technique improve day –to- day living activity.

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