IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

TO EVALUATE THE IMMEDIATE EFFECTS OF MUSCLE ENERGY TECHNIQUE AND MYOFASCIAL RELEASE ON UPPER TRAPEZIUS MUSCLE IN INDIVIDUALS WITH NECK PAIN, IN JALGAON CITY: A COMPARATIVE STUDY

1Brijesh R. Vishwakarma, 2Dr. Shaily Parekh, 3Dr. Jaywant Nagulkar, 4Dr. Rajkumar Jayaraman, 5Dr. Mukesh Shinde

1Intern, 2Assistant Professor, 3Principal/Professor, 4Professor, 5Assistant Professor

1Dr. Ulhas Patil College Of Physiotherapy, Jalgaon,

2Dr. Ulhas Patil College Of Physiotherapy, Jalgaon,

3Dr. Ulhas Patil College Of Physiotherapy, Jalgaon,

4Dr. Ulhas Patil College Of Physiotherapy, Jalgaon,

5Dr. Ulhas Patil College Of Physiotherapy, Jalgaon

ABSTRACT

Introduction: The neck pain involving the upper trapezius mostly is the result of repetitive movement or constant holding of the neck in a fixed position for longer period. Due to which the upper trapezius develops tightness and results in reduced range of motion and ultimately developing neck pain.

AIM: To compare the immediate effects of the muscle energy technique (MET) and myofascial release (MFR) technique on upper trapezius muscle in individuals with neck pain.

METHOD: 74 patients with neck pain, aged between 20 years and 40 years in 2 groups as Group A (n=37) and Group B (n=37). Patients were evaluated at baseline and immediately after the intervention on the basis of NPRS and Cervical Goniometry.

RESULT: Patients in both the groups did not have any significant difference in the baseline characteristic data ($p>0.05$). Following the treatment both the groups showed significant decrease in the pain and improvement in the cervical range of motion. In comparison between the two groups there was no statistical significance which showed that both the intervention techniques are individually effective on neck pain.

CONCLUSION: The study showed improvements in reduction of pain and improvements in cervical range of motion in both groups, which suggest that use of MFR and MET can be implemented individually to reduce neck pain involving upper trapezius and have shown no harmful effects in any individual. But, Statistical significant difference was not found between both groups- group A and group B in the post intervention pain intensity and cervical range of motion.

Keywords: Goniometer, MET, MFR, NPRS, Upper trapezius

INTRODUCTION

Neck pain is one of the most common musculoskeletal problems in general population. Its prevalence worldwide ranges between 16.7% to 75.1%.[1] The commonly affected people are of age group between 20 years and 50 years, because people from these age group are more prone to mechanical stress due to their job at a desk with neck bent forward posture.[1][3] The bending moment of the head applies pressure on muscles and joints around the cervical vertebra, in addition to active myofascial trigger points of the suboccipital muscle which may induce tension type headaches, neck pain and cervical headaches, while reducing the mobility of the neck. [25]

The international association for the study of pain has given definition of neck pain as follows: "neck pain is arising from superior nuchal line to the tip of the first thoracic spinous process and laterally bounded by lateral border of neck.[1]

The upper trapezius muscle which originates from- medial one third ofsuperior nuchal line, external occipital protuberance and inserts in the posterior border of lateral one third of clavicle, is also known as postural muscle, which is prone to overuse during activity and can lead to spasm, hypertonus in the muscle and altered proprioceptive inputs. Tightness in the muscle reduces mobility of neck, limited range of motion develops the soft tissue tightness.[1][3]

In this study, two manual techniques namely: muscle energy technique (MET) and myofascial release (MFR) were used for the intervention making two groups for the two different intervention techniques.

Muscle energy technique (MET) can help to release and relax the shorten muscle and promotes the healing mechanism. Muscle energy technique is a method of treatment that involves the voluntary contraction of patients muscle in a precisely controlled direction against a counterforce provided by the operator. Muscle energy technique can be used to decrease pain, stretch tight muscles and fascia, reduce muscle tone, improve local circulation, strengthen weak musculature and mobilize joint restrictions.[1][5]

Myofascial release therapy is the manual application of a low-load and long duration stretch to the myofascial complex, which is intended to restore optimal length, decrease pain, and improve function. It has been hypothesized that fascial restrictions in one part of the body cause undue tension in other parts of the body due to fascial continuity.[8] Fascia responds to the mechanical intervention of myofascial release technique (MFR) in three related ways: The ground substance changes its volume and consistency. The cross-linkages between the fibres are broken by myofascial release technique. The inter-fibre distance is increased so that fibre affinity is reduced, resulting in increased extensibility in the tissue.[2][17][18][19][20][21][22][23]

Neck pain is one of the most common musculoskeletal problems seen in day to day life of healthy individuals affecting their physical and social functioning considerably and interfering with their daily activities.

A wide variety of treatment protocol for neck pain are available however, the most effective management remains an area of debate. Therefore, this study will add to the growing body of knowledge that if these two techniques yield comparable outcomes and if any one technique is superior to the other, which should be the alternate choice of therapy. In this study participants of age group 20 years to 40 years were included based on the inclusion criteria mentioned.

The purpose of this study is to find out whether MET and MFR have immediate effect on neck pain and to evaluate the most effective manual technique to relieve the neck pain immediately.

OBJECTIVES

- To evaluate the immediate effects of muscle energy technique on neck pain.
- To evaluate the immediate effects of myofascial release on neck pain.
- To compare the immediate effects of muscle energy technique and myofascial release on neck pain.

METHODOLOGY

1. Study design: Comparative study
2. Sample size: 74

   Cochran formula: $n^0 = z^2pq/e^2$

   $= (1.96)^2 \times (0.05) \times (1-0.05) / (0.05)^2$

   $= 72.99$

   $= 73$ (minimum)

3. Study population: 20 years to 40 years of age group
4. Study duration: 6 months
5. Sampling method: Simple random sampling
6. Study setting: Institution and in Jalgaon city
7. Criteria of selection:

A. Inclusion criteria

a. 20 years to 4 years of age group

b. Acute or sub-acute mechanical neck pain

c. 4-7 cm Pain Intensity on NPRS

B. Exclusion criteria

a. Cervical radiculopathy

b. Malignancy

c. History of cervical spine in previous 12 months

d. History of trauma

e. Fall/fracture in cervical spine

f. Herniation

g. Stenosis

h. Vascular syndromes such as basilar insufficiency, dizziness, vertigo, thoracic outlet syndrome

i. Patients suffering from psychological problems

8. Materials:

a. Pen

b. Assessment sheet

c. Consent form

d. Chair

e. NPRS scale

f. Goniometer

OUTCOME MEASURE

- **Numeric pain rating scale (NPRS):** The pain was assessed pre and immediately after the intervention using the NPRS scale. There was no significant difference in the pain ratings pre and post treatment between the two groups. But there was significant difference between pre and post intervention pain ratings within both the groups, which signifies that both the techniques are effective in alleviating neck pain immediately.
- **Goniometer (ROM):** The process of measuring the range of motion using goniometer is known as goniometry. There was no statistical significance in the range of motion pre and post treatment between the two groups. But there was significant difference post intervention in cervical range of motion within both the groups, which shows that both the intervention techniques are individually effective in alleviating neck pain.

PROCEDURE

❖ **Introduction to the procedure:**

- Ethical clearance was taken from the ethical committee of Dr. Ulhas Patil College Of Physiotherapy, Jalgaon prior to the commencement of the study.
- An experimental study was undertaken at Dr. Ulhas Patil College Of Physiotherapy in Jalgaon. 74 participants were randomly included based on inclusion and exclusion criteria mentioned earlier.
- A brief demographic data of all patients was obtained and a written consent was taken from all participants, and the treatment protocol was explained by the therapist. Participants, who met the inclusion criteria were randomly divided to Group A or Group B. Group A underwent Muscle energy technique for upper trapezius muscle, and Group B underwent Myofascial release for upper trapezius muscle.
- To rule out the exclusion criteria some special tests were performed: spurling's test, Distraction test, vertebral artery test, Upper limb tension test (ULTT). Range of motion for cervical spine was assessed pre and post intervention.

❖ **Procedure for muscle energy technique (Group A):**

a) The patient sitting erect on chair with back supported and the therapist was standing behind the patient placing his one hand over the shoulder of affected side and the other hand over the head. (Figure 1)

b) In order to treat all the fibres of upper trapezius, MET needs to be applied sequentially. In this clinical approach upper trapezius is subdivided into anterior, middle and posterior fibres. The flexed neck should be placed into three different positions of rotation (full rotation away from side being treated, half rotation away from side being treated, and slight rotation towards side being treated), always coupled with full side-bending away from the side being assessed, for precise treatment of the posterior, middle and anterior fibres, respectively.

c) The hypertonic muscle was taken, without force or 'bounce', to a length just short of pain, or to the point where resistance to movement was first noted. The patient gently contracted the affected hypertonic muscle away from the barrier (i.e. the agonist is contracted) for between 5 and 10 seconds, while the effort was resisted with an exactly equal counterforce. This resistance involved the practitioner / therapist holding the contracting muscle in a direction which would stretch it, where resistance not being offered. The patient was instructed to think in terms of using only 10 or 20% of his available strength, so that the manoeuvre is never allowed to develop into a contest of strength between the practitioner / therapist and the patient. After the effort, the patient was asked to exhale and to 'let go' completely, and only when this was achieved, the muscle was then taken to a new barrier with all slack removed - but no stretch - to the extent that the relaxation of the hypertonic muscles was now allowed. Starting from this new barrier, the procedure was repeated two or three times.[14][15] (Figure 1- A,B,C)

d) Stretching of muscles during MET, according to Lewit (1999), is only required when contracture due to fibrotic change has occurred, and is not necessary if there is simply a disturbance in function i.e in acute conditions.[14][15]

Figure 1A

Figure 1B

Figure 1C

- **PROCEDURE FOR MYOFASCIAL RELEASE (Group B):**

a) The patient sitting erect on chair with back supported and the therapist positioned himself behind the patient during the procedure and placed his hands over the affected side, i.e. one hand placed over the shoulder and the other hand is placed over the upper trapezius of the involved side.

b) MFR was applied unilaterally or bilaterally depending on whether the patient is having pain on one side or both the sides respectively, and on the affected side MFR was applied with soft fist or the pad of the thumb or knuckles. Sinking and then taking up a line of tension into the mid-belly of the trapezius. The line of tension was carried towards the trapezius attachment at the acromial process. This procedure was repeated while the patient drops their head forward and slowly rotated to the opposite side. This was repeated for 3-4 times with 20 seconds hold.[24] (Figure 2-A,B,C)

Figure 2A

Figure 2B

Figure 2C

STATISTICAL ANALYSIS

- Statistical analysis: Statistical analysis was done using SPSS statistical package of social sciences version 28.0.1.1. The paired and unpaired t tests were used for statistical hypothesis to compare the outcome measures, post-intervention scores within the group and between the groups respectively. Statistical significance was set at $p \leq 0.05$.

RESULT

- The present study included 74 participants who met the inclusion criteria out of 80 assessed individuals. The remaining 6 individuals did not meet the inclusion criteria hence they were not included in this study.
- In this study participants of age group 20 years to 40 years were included based on the inclusion criteria mentioned. The baseline characteristic data is mentioned in table 1.

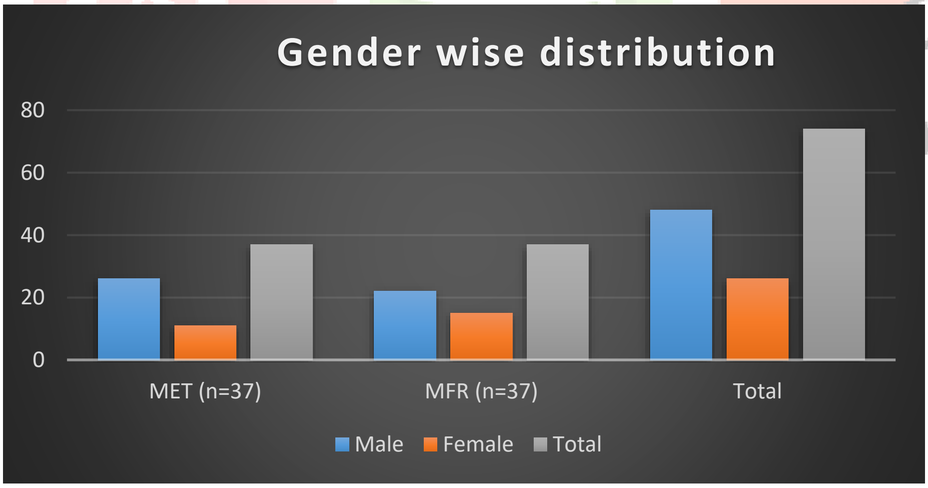
Variable	MET	MFR	t value	p value
Age (mean ± SD)	25.45 ± 3.91	25.37 ± 3.86	0.09	0.929
Pain Intensity pre intervention (mean ± SD)	5.35 ± 0.86	5.64 ± 0.82	-1.492	0.140
Work Duration (mean ± SD)	8.10 ± 2.23	7.59 ± 1.75	1.1	0.275

Table 1: Baseline characteristic data, SD= standard deviation

- The participants were equally divided into 2 groups by simple randomization method (chit method). Group A and Group B both consisted of 37 participants. Group A received muscle energy technique and Group B received myofascial release technique.
- The gender wise distribution in both the groups is shown in the Table 2 and Graph 1.

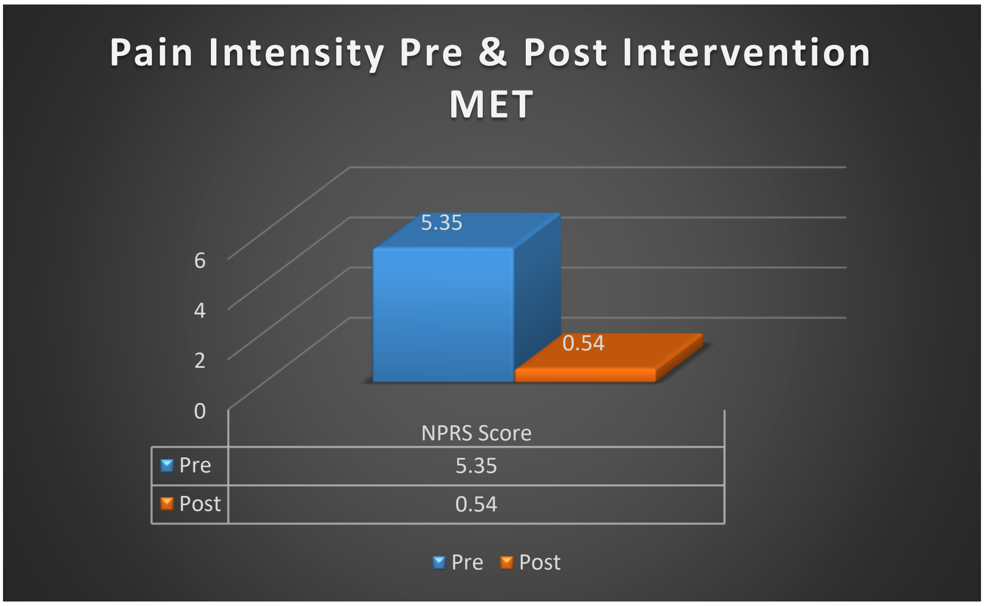
Gender	MET (n=37)	MFR (n=37)	Total
Male	26	22	48
Female	11	15	26
Total	37	37	74

Table 2: Gender wise distribution in both the groups

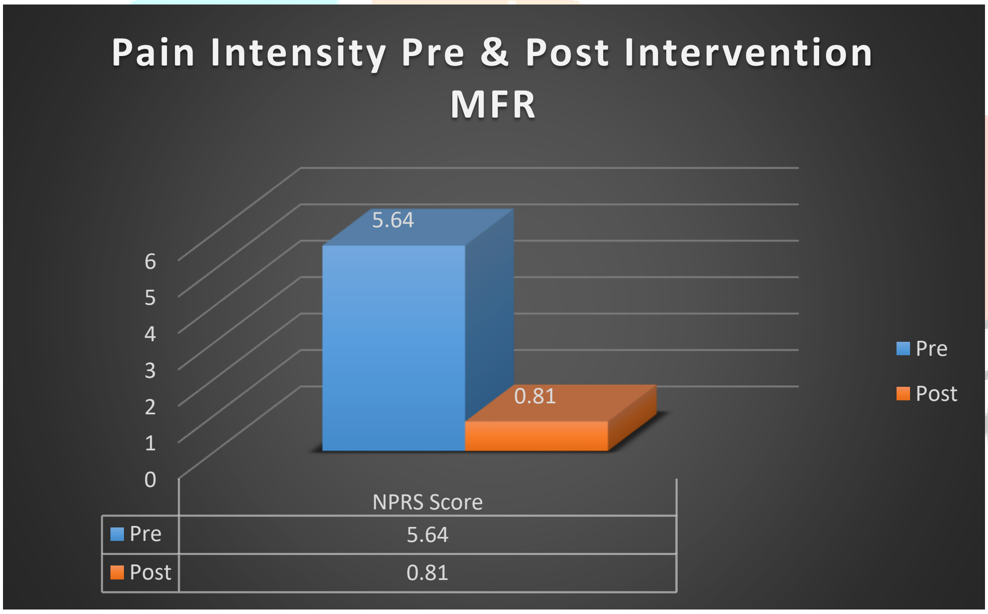


Graph 1: Gender wise distribution in both the groups

- Within group comparison of pre and post- intervention of pain intensity in Group A (MET) (Graph 2) and Group B (MFR) (Graph 3) demonstrated reduction of pain intensity with p values of <0.001 for both Group A and Group B. (Table 3)



Graph 2: Representing the comparison of pre and post intervention pain intensity within the group A participants.



Graph 3: Representing the comparison of pre and post intervention pain intensity within the group B participants.

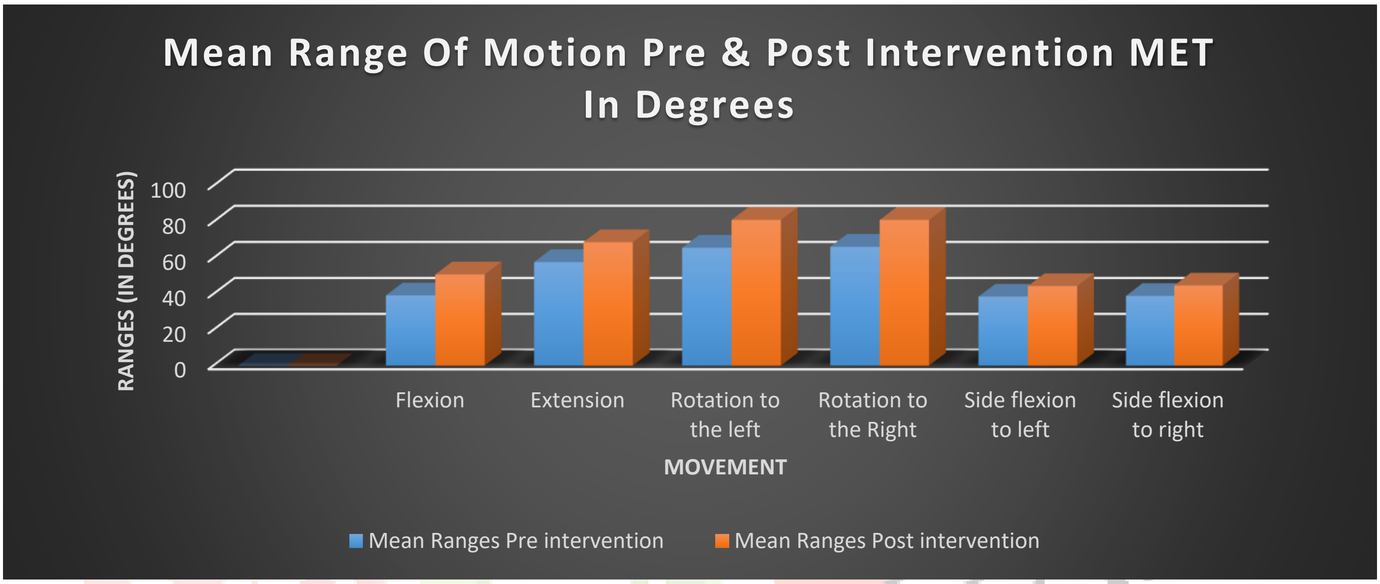
Group	pre/post NPRS score	mean ± SD	paired t value	p value	level of significance
MET	pre	5.35 ± 0.86	33.375	<0.001	Significant
	post	0.54 ± 0.60			
MFR	pre	5.64 ± 0.82	31.698	<0.001	Significant
	post	0.81 ± 0.70			
level of significance = p<0.05, SD= standard deviation					
NPRS= numeric pain raring scale					

Table 3: Within group comparison of pre and post- intervention of pain intensity in Group A (MET) and Group B (MFR)

- Within group comparison of pre and post intervention of cervical range of motion in Group A (MET) (Table 4 and Graph 4) and Group B (MFR) (Table 5 and Graph 5) demonstrated increase in the cervical range of motion like Flexion, Extension, Rotation to the left, Rotation to the right, Side flexion to the left and Side flexion to the right with the p values of <0.001 which is statistically significant. (Table 6)

Movement	Mean Ranges (In Degrees)	
	Pre	Post
Flexion	39.2973	50.973
Extension	57.8378	68.8108
Rotation to the left	65.7838	81.1622
Rotation to the Right	66.2973	81.1622
Side flexion to left	38.6216	44.4865
Side flexion to right	39.027	44.8378

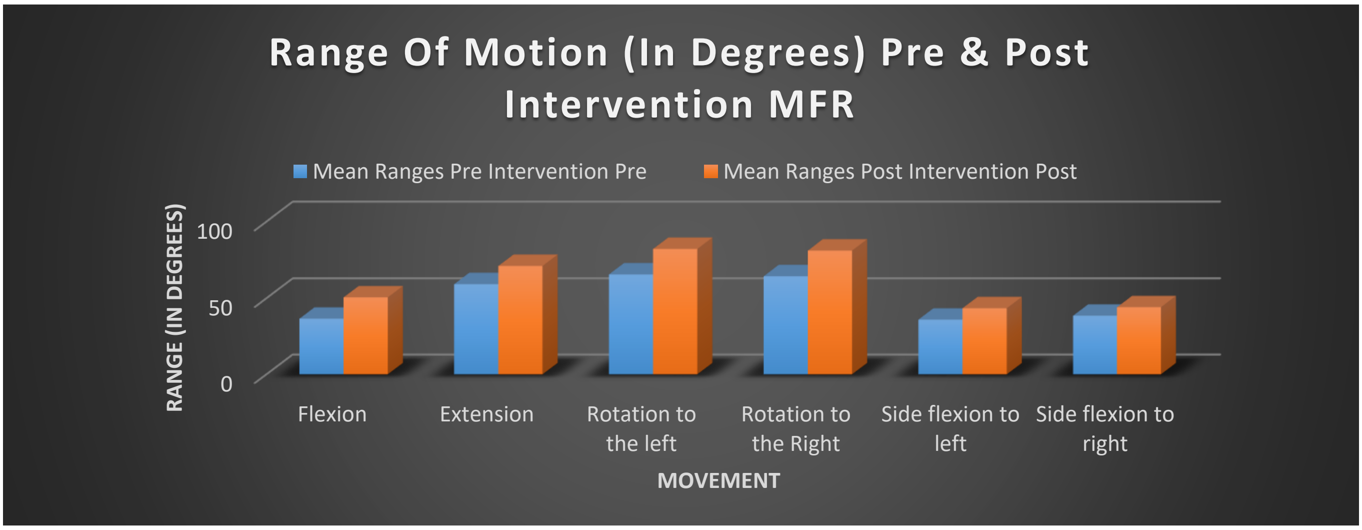
Table 4: Representing the mean pre and post intervention cervical range of motion of Group 1



Graph 4: Representing the mean pre and post intervention cervical range of motion of group A

Movement	Mean Ranges (In Degrees)	
	Pre	Post
Flexion	36.67	50.67
Extension	59.29	71.16
Rotation to the left	65.62	82.24
Rotation to the Right	64.45	81.21
Side flexion to left	36.05	43.54
Side flexion to right	38.62	44.21

Table 5: Representing the mean pre and post intervention cervical range of motion of Group 2



Graph 5: Representing the mean pre and post intervention cervical range of motion of group B

Group	Movement	Pre / Post Intervention	Mean ± SD	Paired t	p	Level of significance
MET	Flexion	Pre	39.29 ± 5.48	-17.195	<0.001	Highly Significant
		Post	50.97 ± 4.21			
	Extension	Pre	57.83 ± 7.02	-13.211	<0.001	Highly Significant
		Post	68.81 ± 4.37			
	Rotation to left	Pre	65.78 ± 9.94	-10.939	<0.001	Highly Significant
		Post	81.16 ± 3.01			
	Rotation to right	Pre	66.29 ± 7.05	-13.387	<0.001	Highly Significant
		Post	81.16 ± 4.02			
	Side flexion left	Pre	38.62 ± 5.95	-10.224	<0.001	Highly Significant
		Post	44.48 ± 5.58			
	Side flexion right	Pre	39.02 ± 6.08	-10.452	<0.001	Highly Significant
		Post	44.83 ± 5.53			
MFR	Flexion	Pre	36.67 ± 4.78	-17.757	<0.001	Highly Significant
		Post	50.67 ± 4.06			
	Extension	Pre	59.29 ± 7.06	-11.077	<0.001	Highly Significant
		Post	71.16 ± 4.90			
	Rotation to left	Pre	65.62 ± 10.52	-12.155	<0.001	Highly Significant
		Post	82.24 ± 3.95			
	Rotation to right	Pre	64.45 ± 9.40	-13.505	<0.001	Highly Significant
		Post	81.21 ± 4.19			
	Side flexion left	Pre	36.05 ± 5.81	-11.513	<0.001	Highly Significant
		Post	43.54 ± 5.97			
	Side flexion right	Pre	38.62 ± 4.86	-10.407	<0.001	Highly Significant
		Post	44.21 ± 5.62			
level of significance = p<0.05, SD= standard deviation, MET, MFR						

Table 6: Within group comparison of pre and post intervention of cervical range of motion in Group A (MET) and Group B (MFR)

- Between group comparison of pre intervention of pain intensity demonstrated statistical non significance with p value >0.05 (0.14), and post intervention comparison of pain intensity also demonstrated statistical non significance with p value >0.05 (0.091); which indicates that both the intervention techniques have equal effects on neck pain in terms of reduction of pain intensity which was assessed using Numeric Pain Rating Scale (NPRS). (Table 7)

Pain Intensity	MET	MFR	t value	p value	Level of significance
Pre intervention (mean ± SD)	5.35 ± 0.86	5.64 ± 0.82	-1.492	0.14	Not significant
Post intervention (mean ± SD)	0.54 ± 0.60	0.81 ± 0.70	-1.775	0.08	Not significant
level of significance= p<0.05, SD= standard deviation					

Table 7: Between groups comparison of pre and post intervention pain intensity assessed using Numeric pain rating scale (NPRS)

- Between group comparison of pre intervention of all cervical range of motion demonstrated statistical non significance with p >0.05 except cervical flexion which showed statistical significance with p <0.05 ; whereas comparison of post intervention of all range of motion demonstrated statistical non significance with p >0.05 except cervical extension which showed statistical significance with p<0.05; which indicates that both the intervention techniques have equal effects on neck pain in terms of cervical range of motion which was assessed using and universal goniometer. (Table 8)

Movement	Pre / post-intervention	Range of motion (°) (Mean ± SD)		t value	p value	Level of significance
		MET	MFR			
Flexion	Pre	39.29 ± 5.48	36.67 ± 4.78	2.191	0.032*	Significant
	Post	50.97 ± 4.21	50.67 ± 4.06	0.309	0.758	Not Significant
Extension	Pre	57.83 ± 7.02	59.29 ± 7.06	-0.891	0.376	Not Significant
	Post	68.81 ± 4.37	71.16 ± 4.90	-2.175	0.033*	Significant
Rotation to left	Pre	65.78 ± 9.94	65.62 ± 10.52	0.068	0.946	Not Significant
	Post	81.16 ± 3.01	82.24 ± 3.95	-1.323	0.19	Not Significant
Rotation to right	Pre	66.29 ± 7.05	64.45 ± 9.40	0.951	0.345	Not Significant
	Post	81.16 ± 4.02	81.21 ± 4.19	-0.057	0.955	Not Significant
Side flexion to left	Pre	38.62 ± 5.95	36.05 ± 5.81	1.877	0.065	Not Significant
	Post	44.48 ± 5.58	43.54 ± 5.97	0.703	0.484	Not Significant
Side flexion to right	Pre	39.02 ± 6.08	38.62 ± 4.86	0.316	0.753	Not Significant
	Post	44.83 ± 5.53	44.21 ± 5.62	0.483	0.63	Not Significant
level of significance= p<0.05, SD=standard deviation						

Table 8: Between groups comparison of pre and post intervention cervical range of motion assessed using universal goniometer.

- Based on these within and between group comparisons using paired and unpaired t tests respectively, this can be resulted that both the intervention techniques i.e Muscle energy technique and Myofascial release technique have the same effects on acute and sub-acute neck pain.

DISCUSSION

This study was designed to compare the immediate effectiveness of muscle energy technique and myofascial release technique in reducing the pain and improving cervical range of motion in patients with acute and sub-acute neck pain while targeting the upper trapezius muscle. This study proves the efficacy of the muscle energy technique and myofascial release technique in reducing the pain and improving the cervical range associated with the neck pain. In comparison, of both these techniques for their immediate effectiveness, it was found that both the techniques were equally effective in reducing the neck pain and improving cervical range of motion in patients with acute and sub-acute neck pain.

The mean age of the participants in Group A (MET) and Group B (MFR) were 25.45 years and 25.37 years respectively with the p value of 0.929 which indicates that there was no significant difference in the age group of the patients between the groups.

In accordance with the present study, a study by Anjali Avinash Parab and Renu Pattanshetty (2019) on Effect of Myofascial Release versus Muscle Energy Technique on Trapezius Spasm in Head and Neck Cancer Patients: A Randomized Clinical Trial found that, there seemed to be no significant difference between the groups before (p=0.41) and after (p=0.61) the intervention which suggests that both the manual therapies are effective individually, in reduction of pain, improving neck disability, and increasing cervical and shoulder ROM, supporting the result of present study, in which there were no differences in pre (p>0.05) and post (p>0.05) intervention outcomes. [2]

Rationale for the immediate effect of the muscle energy technique is that during the isometric contraction, the inhibitory Golgi tendon reflex is activated which in turn heads to the reflex relaxation of the muscle. The somatic efferent is known to evoke an excitatory response in the sympathetic system that results in activating the muscle, joint receptors, and periaqueductal grey matter that directly helps in modulating the level of pain. The gating of nociceptive impulses causes inhibition in the dorsal horn of spinal cord as a result of the mechanoreceptor stimulation.[1] There is general consensus among the various osteopathic experts already quoted that the use of post-isometric relaxation (i.e. a contraction involving the muscle that requires releasing or lengthening) is more useful than reciprocal inhibition in attempting to normalize hypertonic musculature.[14][15] As in this study only isometric contraction has been given to the patient followed by the post-isometric relaxation as stretching of muscles during MET, according to Lewit (1999), is only required when contracture due to fibrotic change has occurred, and is not necessary if there is simply a disturbance in function.[14][15]

As within dense regular connective tissue there are two types of intrafascial mechanoreceptors: the Pacinian/ Paciniform corpuscles and the Ruffini bodies. Thus, they occur within myofascia, tendons, aponeuroses and ligaments, the very soft tissues we focus on in direct technique MFR. These are in addition to the sensory fibres that lie within the muscle – spindles and some of the Golgi tendon organs (GTOs). As golgi tendon organs (GTOs) respond to changes in force, not length. Direct technique MFR applied to a muscle that is actively contracting against resistance, usually eccentrically, increases the discharge from the GTOs and elicits inhibition of any further tensioning in that muscle. Ruffini bodies respond to slow and deep melting techniques which are the intrafascial mechanoreceptor which acts by reducing the activity of sensory nervous system (SNS) hence reducing the pain sensation. During the MFR, muscle spindles are slowly stretched resulting in a lowering of muscle tone.

As this study proved the efficacy of both the intervention techniques separately on short term basis. Further research can be incorporated to investigate the long term results of such an intervention for acute and sub-acute neck pain.

CONCLUSION

The study showed improvements in reduction of pain and improvements in cervical range of motion in both groups, which suggest that use of MFR and MET can be implemented individually to reduce neck pain involving upper trapezius and have shown no harmful effects in any individual. But, Statistical significant difference was not found between both groups- group A and group B in the post intervention pain intensity and cervical range of motion.

CLINICAL IMPLICATION

Both the techniques MET & MFR can be individually used in patients with acute & sub-acute neck pain.

LIMITATIONS

- This was the study evaluating immediate effect of MET and MFR, carry over or long-term follow-up effect was not monitored.
- The outcomes of this study were assessed immediately which outlines the immediate effects of the two different techniques used in this study.
- This study included participants with only acute and sub-acute neck pain.

REFERENCES

1. Ray M, Desai R. Immediate effect of muscle energy technique versus passive stretching for upper trapezius muscle on neck pain. Int J Res Orthop 2020;7:86-90

2. Parab AA, Pattanshetty R. Effect of myofascial release versus muscle energy technique on trapezius spasm in head and neck cancer patients: A randomized clinical trial. Indian J Phys Ther Res 2019;1:114-21

3. Nitsure P, Welling A. Effect of Gross Myofascial Release of Upper Limb and Neck on Pain and Function in Subjects with Mechanical Neck Pa A Clinical Trial . Int J Dent Med Res 2014;1(3):816

4. Apoorva Phadke(MPT),Nilima Bedekar(PhD). Ashok Shyam,MS(Ortho), Parag Sancheti,MS (Ortho) Effect of muscle energy technique and static stretching on pain and functional disability in patients with mechanical neck pain: A randomized controlled trial. HongKong Physiotherapy Journal (2016) 35,5e11

5. Richa Mahajan, Chitra Kataria, Kshitija Bansal Comparative Effectiveness of Muscle Energy Technique and Static Stretching for Treatment of Subacute Mechanical Neck Pain. International Journal of Health and Rehabilitation Sciences

6. Functional Ability in Patients with Neck Pain. Scholars Journal of Applied Medical Sciences,2014; 2(1A):91-95. 22

7. M. Srikanth, Dr. V. Srikumari, Dr. K. Madhavi effectiveness of muscle energy technique on pain & cervical range of motion in patients with myofascial pain in upper trapezius . International Journal of Physiotherapy, 2(1), 3 333 40

8. Manuel Rodríguez-Huguet, PT, José Luis Gil-Salú, MD, PhD, Pablo Rodríguez-Huguet, MD, Juan Rafael Cabrera-Afonso, MD, PhD, and Rafael Lomas-Vega, PhD Effects of Myofascial Release on Pressure Pain Thresholds in Patients With Neck Pain A Single- Blind Randomized Controlled Trial Am J Phys Med Rehabil 2018;97:16–22

9. Sweta, Gauns, Peeyoosha, Gurudut A randomized controlled trial to study the effect of gross myofascial release on mechanical neck pain referred to upper limb International Journal of Health Sciences 51 Vol. 12, Issue 5 (Sept-Oct 2018).

10. Rasheedah Adebola Zibiri, Ashiyat Kehinde Akodu, and Udoka Arinze Okafor Effects of Muscle Energy Technique and Neck Stabilization Exercises on Pain, Psychological Status, and Sleep Disturbance in Patients with Non-Specific Chronic Neck Pain Middle East Journal of Rehabilitation and Health Studies.

11. Ewan Thomas, Antonio Rosario Cavallaro, Diba Mani, Antonino Bianco and Antonio Palma The efficacy of muscle energy techniques in symptomatic and asymptomatic subjects: a systematic review Thomas et al. Chiropractic & Manual Therapies (2019) 27:35

12. Lewit K Muscular and articular factors in movement restriction. Manual Medicine(1985) 1: 83-85

13. Lewit K Manipulative therapy in rehabilitation of the motor system (1985) Butterworths, London

14. Lewit K Manipulative therapy in rehabilitation of the locomotor system, 2nd edn. (1992) Butterworths, London

15. Lewit K Manipulative therapy in rehabilitation of the locomotor system, 3rd edn. (1999) Butterworths, London

16. Lewit K, Simons D Myofascial pain: relief by postisometric relaxation. Archives of Physical Medicine and Rehabilitation (1984) 65: 452-456

17. Liebenson C Rehabilitation of the spine. Williams and Wilkins, Baltimore. (1996)

18. Rolf IP Rolfing – the integration of human structures. Harper and Row, New York. (1977)

19. Juhan D Job's body. Station Hill Press, New York. (1987)

20. Little K Toward the more effective manipulative management of chronic myofascial strain and stress syndromes. Journal of the American Osteopathic Association (1969) 68:675–685

21. Rolf IP Structural integration: a contribution to the understanding of stress. Confinia Psychiatrica (1973) 16:69–79

22. Cantu RI, Grodin AJ Myofascial manipulation: theory and clinical application. Aspen, Gaithersburg, MD. (1992)

23. Schleip R Explorations of the neuromyofascial net. Journal of Bodywork and Movement Therapies (2003) 7(1):11–19

24. Michael Stanborough Direct Release Myofascial Technique: An illustrated guide for practitioner, London, Elsevier Health Sciences, 21st September 2004: 92-93

25. Shinde, Dr.Mukesh and Mahajan, Pradnya and Mitra, Mahesh, Evaluation of Mobile Phone Addiction Scale Score and it's Correlation with Craniovertebral Angle and Neck Disability in Young Adults - A Cross-Sectional Analytical Study (January 2019). International Journal of Allied Medical Sciences and Clinical Research (IJAMSCR), 2019, Available at SSRN: https://ssrn.com/abstract=4036090