

EFFECTIVENESS OF MUSCLE ENERGY TECHNIQUE (MET) VS. TRANSVERSE OSCILLATORY PRESSURE (TOP) IN MECHANICAL NECK PAIN: A RANDOMIZED CLINICAL TRIAL

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ABSTRACT

Introduction: In the general community, mechanical neck pain is a rather prevalent issue. It continues to place a significant burden on patients in terms of pain, disability, and economic loss, as well as on society in terms of healthcare costs and lost productivity. There are several different therapy options for mechanical neck discomfort, but experts disagree on the best course of action.

Objectives: The aim of the study is to compare the clinical effectiveness of Muscle Energy Technique (MET) and Transverse Oscillatory Pressure (TOP) to determine the most beneficial approach for Mechanical Neck Pain (MNP).

Methodology: It was decided to conduct a randomized controlled trial. 30 people who had mechanical neck pain were randomly assigned to the TOP or MET groups. MET was given to the first group, and TOP to the second. Conventional treatment was given to both groups. For three weeks, there was one daily treatment and three weekly treatments. The neck disability index (NDI), a universal goniometer, and a visual analogue scale (VAS) were used to measure the severity of pain, range of motion (ROM), and functional disability, respectively. Immediately before

treatment and following the final session, the outcome measures VAS, NDI, and ROM were collected.

Result: Pre-post values for groups A and B were analysed using paired t-tests, while post-post data for comparison between groups A and B were analysed using unpaired t-tests. Pre-post values for VAS, NDI, and CROM revealed a significant improvement in both groups. The MET group, however, significantly improved in VAS, NDI, and CROM for post-post values as compared to the TOP group. In the study, post-treatment results demonstrate a significantly greater improvement in pain, range of motion, and functional impairment with Muscle Energy Technique than with Transverse Oscillatory Pressure technique in patients with mechanical neck discomfort.

Keywords - Muscle Energy Technique (MET), Transverse Oscillatory Pressure (TOP), Mechanical Neck Pain, VAS, ROM, NDI.

INTRODUCTION

In the technological age, neck pain is a prevalent musculoskeletal problem. It is a widespread issue that is a significant contributor to disability. Neck pain is described as 'pain perceived as arising from anywhere within the region bounded superiorly by superior nuchal line, inferiorly by an unnaturally transverse line through the tip of first thoracic spinous process, and laterally by sagittal plane tangential to the lateral border of neck' by the **International Association for the Study of Pain (IASP)**.¹ Age-related increases in neck discomfort prevalence are particularly prevalent in women.

Despite the fact that the definition of mechanical neck pain (MNP) varies across the literature, it can be summed up as neck discomfort that is made worse by cervical motion, prolonged postures, and/or probing of the cervical musculature. When joint and muscle issues lead to neck pain, healthcare practitioners refer to it as "mechanical neck pain".

Hypertonic posterior cervical muscles that develop as a result of persistent partial neck flexion while reading, writing, using a computer terminal for extended periods of time, sewing, adopting a stooped posture, or from severe trauma can cause mechanical neck discomfort. Poor posture, melancholy, anxiety, neck strain, and physical or occupational activity are a few of the factors that might contribute to mechanical neck pain, which has an unclear aetiology and is frequently complex. According to some researchers, mechanical neck discomfort can be caused by any circumstance or ailment that alters the structure or function of the muscles or the joint mechanics (e.g., poor posture, ageing, acute injury, congenital or developmental problems).

MET (Muscle Energy Technique) is a sort of manual treatment that was developed by osteopathic doctor Dr. Fred L. Mitchell Sr. MET "involves the voluntary contraction of the patient's muscle in a precisely controlled direction, at varying levels of intensity, against a clearly executed counterforce applied by the operator," according to Greenman.

Post Isometric Relaxation (PIR) and Reciprocal Inhibition (RI) are the two types of MET.

After a brief amount of time during which an isometric contraction is conducted, a muscle or group of muscles may experience post isometric relaxation. It is recommended for soft tissue (fascia, muscle) that needs stretching, restriction, fibrosis, and contraction.

Without using force or bounce, the hypertonic muscle is extended to a length just short of pain or to the point where movement resistance is first noticed. For between 5 and 10 seconds, the patient gently pushes the affected hypertonic muscle away from the barrier (i.e., an agonist is used), while the effort is met with an exact equal counterforce. Lewit frequently instructs the patient to breathe in during these actions. This resistance calls for the user to retain the muscle that is contracting in a manner that will stretch it in the absence of resistance.

The amount of work required by Lewit's method is modest. In order to prevent the manoeuvre from turning into a struggle for dominance between the patient and the operator, the patient may be advised to consider using only 10% or 20% of his total strength.

One of the manipulative techniques advised for unilaterally dispersed symptoms of cervical origin, whether localised to the neck or referred to the upper limb, is Transverse Oscillatory Pressure (TOP). Nguwa is where TOP first appeared. According to research, spinal area TOP has both neurological and mechanical impacts. It has been asserted to be successful in reducing pain intensity, particularly radiating pain in the lumbar, cervical, and thoracic regions. In the area of the spine that experienced mechanical discomfort, the spinous processes of the vertebrae are mobilised.

The fundamental goal of muscular energy techniques (MET), a direct, non-invasive manual therapy, is to relax hypertonic muscles. It is used to normalise muscle length and promote range of motion. Only a small number of research have used MET as a useful tool, and it is yet unknown what the long-term advantages of this method will be. Contrarily, Transverse Oscillatory Pressure (TOP), a non-invasive manual therapy, involves mobilising the vertebra's spinous process in the area of the spine where mechanical discomfort is present. It is said to be helpful when there is unilateral pain, whether it originates in the neck or refers to an upper limb. This approach has been shown to be beneficial in a small number of studies for mechanical neck pain as well as cases of cervical radiculopathy.

The study compares the clinical efficacy of two manual therapies to decide which the most effective treatment for Mechanical Neck Pain.

METHODOLOGY:

The study used simple random sampling technique, the patients coming to the outpatients were allotted in two groups A & B and sample size was 30. The technique was described and a formal consent was obtained. The patients with below criteria's were included or excluded.

INCLUSION CRITERIA:

- People who have had mechanical neck pain for three months or longer.
- Age between 18 to 45 years
- Both male and female were included
- Neck pain without radiation
- Non-significant radiological finding

- VAS (5-9)

EXCLUSION CRITERIA:

- Signs of serious pathology (e.g. , malignancy, inflammatory disorder, infection) □
- History of trauma or fractures in cervical spine
- Radiculopathies of upper limb.
- Osteoporosis
- Whiplash associated disorders
- Previous cervical spine surgeries
- Vertebrobasilar insufficiency
- Diagnosed pregnancy
- Any deformity (e.g. Torticollis, Sprengel's deformity, scoliosis)
- Un-cooperative patient.
- Spurling test positive

PROTOCOL:

With 15 participants (N=15), Group A received MET in addition to standard care (neck isometric exercise and ultrasonography therapy). With 15 participants (N=15), Group B received TOP in addition to standard care (ultrasound therapy and neck isometric exercise). Both groups received standard treatments. Prior to the start of the trial, all outcome measurements were made. Intervention was then conducted for three weeks, once a day on three different days of the week. After the final post-intervention session, the outcome measurements were once again collected. Then, measurements from before and after the intervention were compared. The Group A received neck isometric exercises, ultrasound therapy, and MET. The procedure of the exercise consists of the various steps. The subject was instructed to lie face down. The upper trapezius and levator scapulae muscles were subjected to a post-isometric relaxation approach for five repetitions utilising 20% of the maximum isometric contraction. For 20 seconds, the stretch was maintained beyond the resistance barrier. Following the 5-7 second mild contraction, these muscles underwent post isometric relaxation. The neck was then moved to its new barrier, and the process was repeated three times.

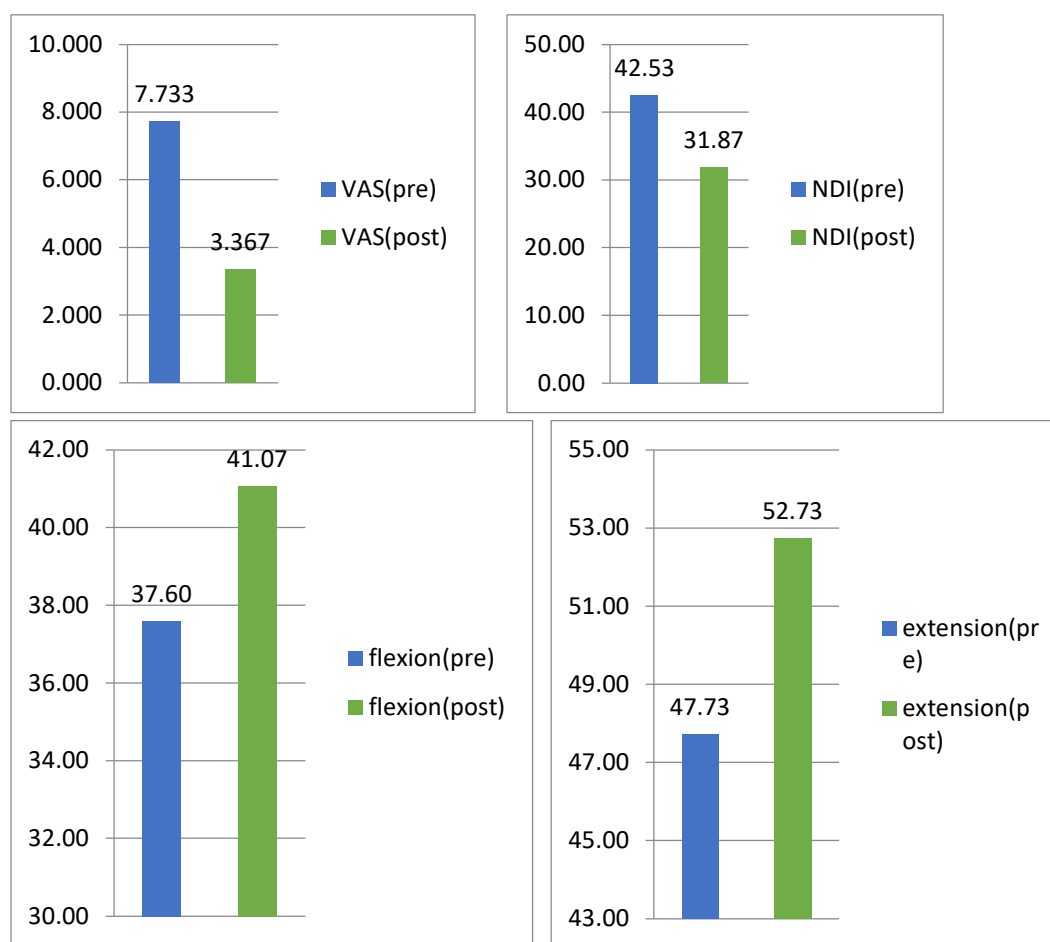
Transverse Oscillatory Pressure (TOP), ultrasound treatment, and neck isometric exercise were given to Group B. On the couch, the subjects were instructed to lie face down with their foreheads resting on their fingers. The therapist (myself) stood by the patient's side and pressed the thumb pads against the left (or right, depending on where the discomfort was) spinous process of the vertebrae that needed to be shifted. Then the therapists applied finger pressure to the neck and

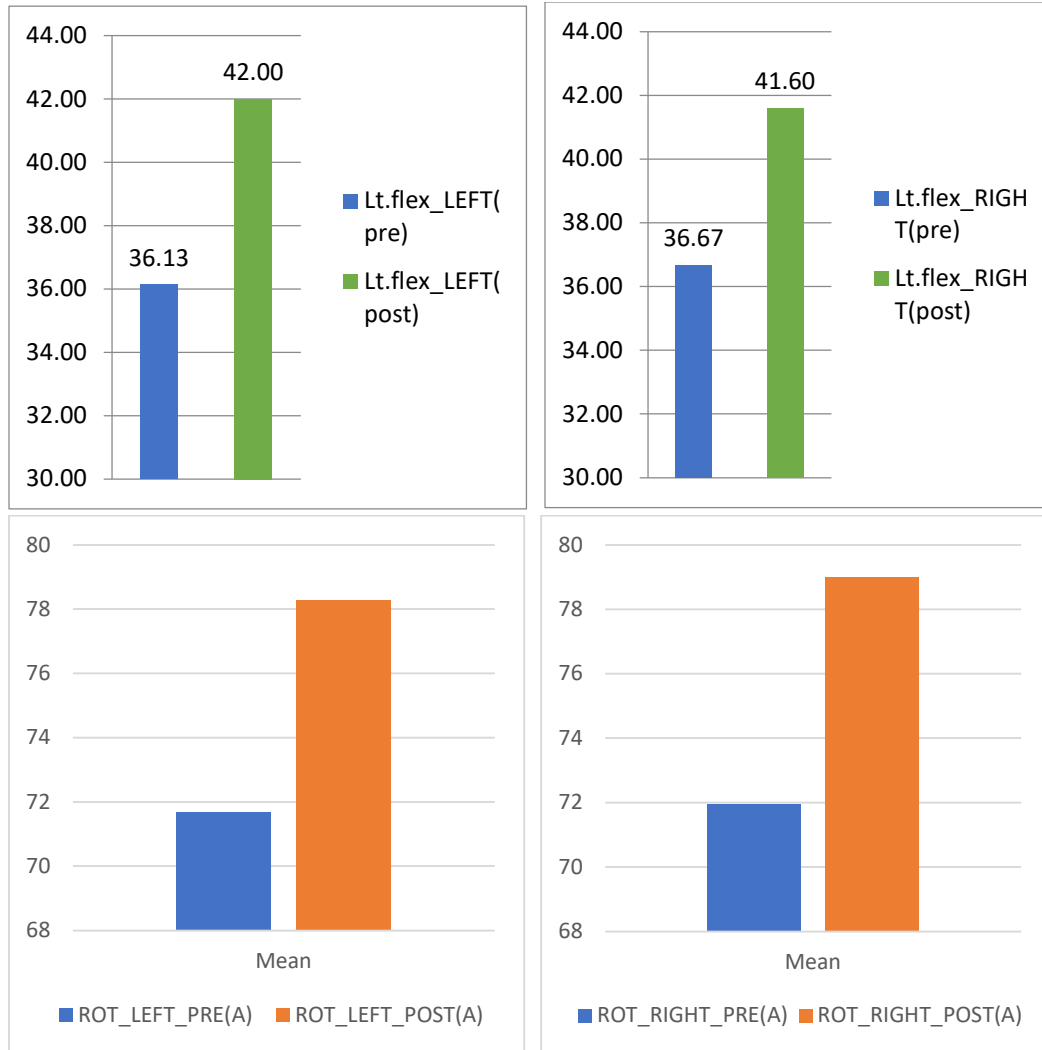
upper thoracic area. Thumbs were used to apply pressure to the side of the spinous process in a horizontal direction. A pressure-relaxed sequence on the spinous process was used to carry it out. On the side of the cervical vertebrae where there was pain, transverse pressure was applied. For 20 seconds, the oscillation was performed rhythmically.

DATA ANALYSIS AND RESULTS

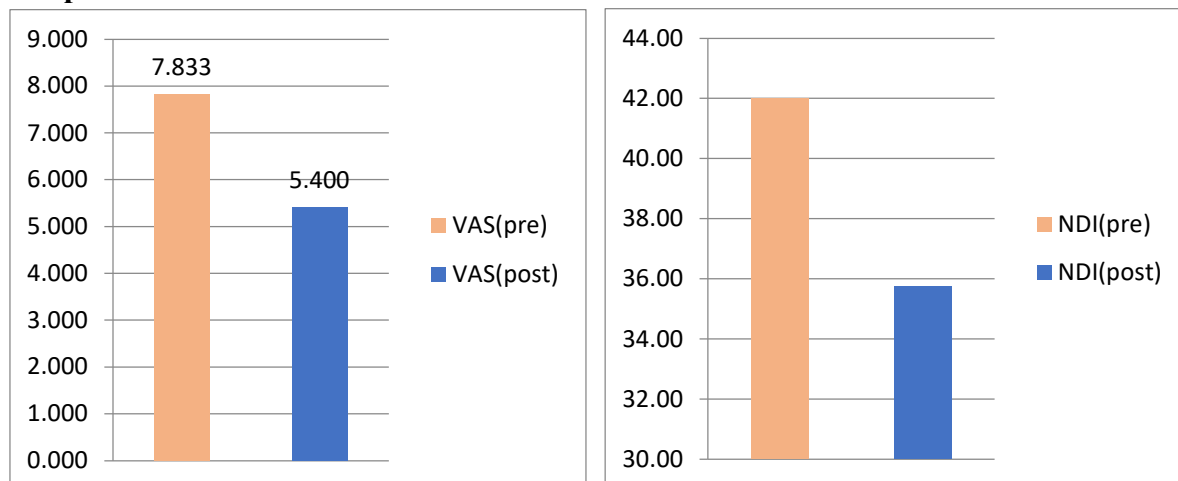
SPSS Software Version 20.0 was used for the statistical analysis. To determine the effectiveness of MET and TOP in enhancing VAS, ROM, and NDI, a paired t-test was conducted for pre-post values in both groups (A and B). To identify the significant difference between the groups, a post-post comparison was performed using an unpaired t test.

Graph 1 : GRAPHS FOR PRE-POST MEAN OF THE PARAMETERS IN GROUP A





Graph 2: GRAPHS FOR PRE POST MEAN OF THE PARAMETERS IN GROUP B



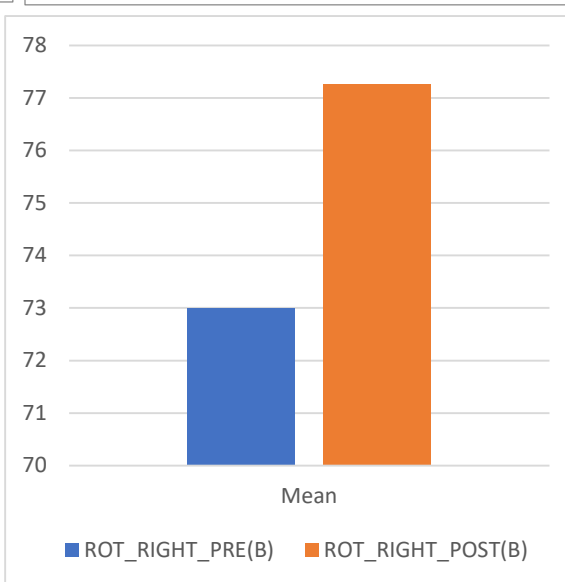
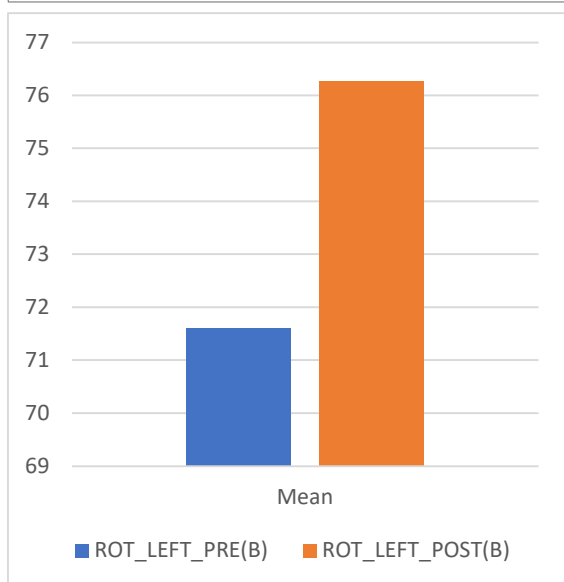
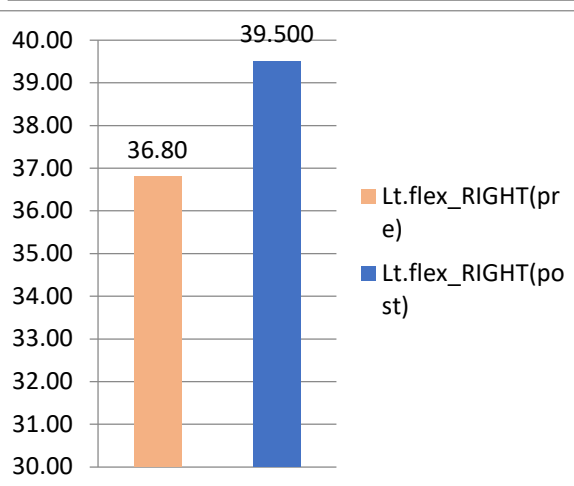
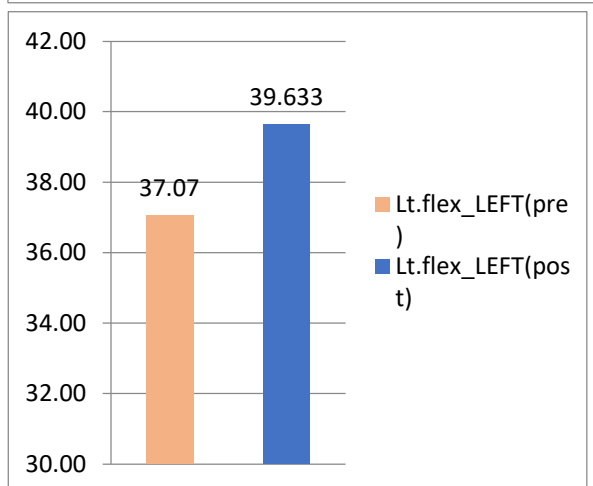
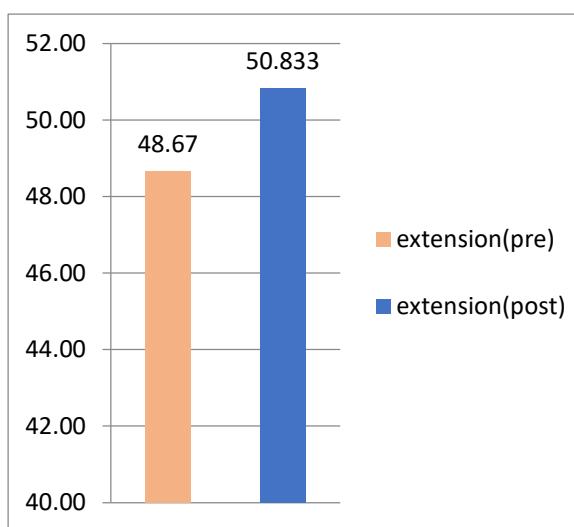
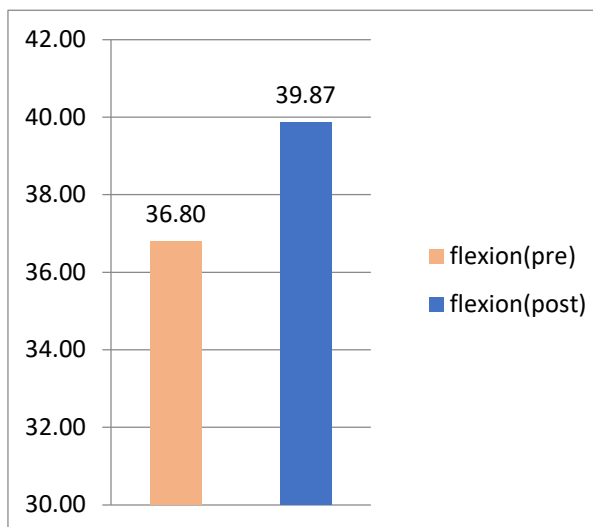


TABLE 3: : TEST OF NORMALITY

	Shapiro-Wilk			REMARK
	Statistic	df	Sig.	
VAS(pre)	0.891	15	0.070	NS
flexion(pre)	0.923	15	0.212	NS
extension(pre)	0.898	15	0.088	NS
Lt.flex_LEFT(pre)	0.861	15	0.055	NS
Lt.flex_RIGHT(pre)	0.850	15	0.068	NS
Rotation_LEFT(pre)	0.934	15	0.312	NS
Rotation_RIGHT(pre)	0.983	15	0.987	NS
NDI(pre)	0.891	15	0.068	NS
VAS(pre)	0.956	15	0.626	NS
flexion(pre)	0.920	15	0.192	NS
extension(pre)	0.934	15	0.310	NS
Lt.flex_LEFT(pre)	0.936	15	0.332	NS
Lt.flex_RIGHT(pre)	0.930	15	0.270	NS
Rotation_LEFT(pre)	0.898	15	0.088	NS
Rotation_RIGHT(pre)	0.843	15	0.074	NS
NDI(pre)	0.899	15	0.092	NS

TABLE 4: PARAMETRIC PAIRED T-TEST FOR RELATED PRE POST TEST IN GROUP A

		Paired Differences			t	One-Sided p	
		Mean	Std. Deviation	Std. Error Mean			
VAS(pre)	-	4.3667	0.5815	0.1501	29.085	<0.001	Highly Significant
VAS(post)							
flexion(pre)	-	-3.467	1.598	0.413	-8.404	<0.001	Highly Significant
flexion(post)							
extension(pre)	-	-5.000	1.195	0.309	-16.202	<0.001	Highly Significant
extension(post)							
Lt.flex_LEFT(pre)	-	-5.867	0.990	0.256	-22.941	<0.001	Highly Significant
Lt.flex_LEFT(post)							
Lt.flex_RIGHT(pre)	-	-4.933	1.280	0.330	-14.929	<0.001	Highly Significant
Lt.flex_RIGHT(post)							
Rotation_LEFT(pre)	-	-6.6	1.9148	0.4944	-12.6021	<0.001	Highly Significant
Rotation_LEFT(post)							
Rotation_RIGHT(pre)	-	6.06666	2.1865	0.5645	30.9704	<0.001	Highly Significant
Rotation_RIGHT(post)							
NDI(pre)	-	10.667	2.582	0.667	16.000	<0.001	Highly Significant
NDI(post)							

TABLE 5: PARAMETRIC PAIRED T TEST FOR RELATED PRE POST TEST IN GROUP B

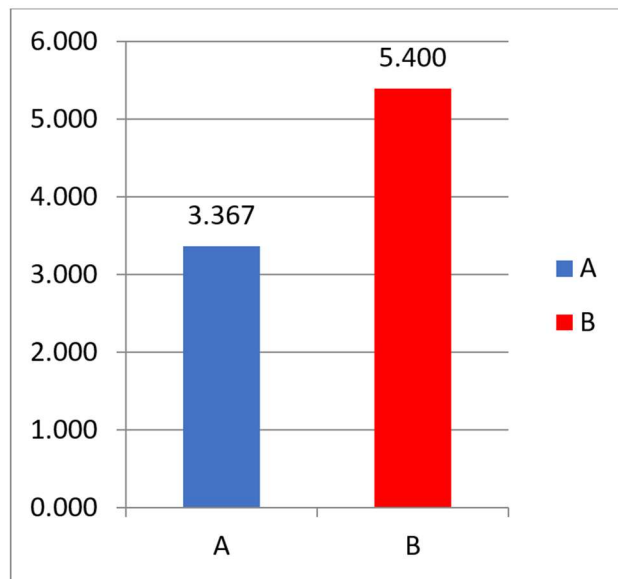
	Paired Differences			t	One-Sided p	
	Mean	Std. Deviation	Std. Error Mean			
VAS(pre) - VAS(post)	2.4333	0.4952	0.1279	19.031	<0.001	Highly Significant
flexion(pre) - flexion(post)	-3.067	0.594	0.153	-20.008	<0.001	Highly Significant
extension(pre) - extension(post)	-2.1667	0.6726	0.1737	-12.476	<0.001	Highly Significant
Lt.flex_LEFT(pre) - Lt.flex_LEFT(post)	-2.5667	0.8209	0.2119	-12.110	<0.001	Highly Significant
Lt.flex_RIGHT(pre) - Lt.flex_RIGHT(post)	-2.7000	0.6492	0.1676	-16.108	<0.001	Highly Significant
Rotation_LEFT(pre) - Rotation_LEFT(post)	-4.2666	2.2296	0.33	10.7829	<0.001	Highly Significant
Rotation_RIGHT(pre) - Rotation_RIGHT(post)	-4.6666	1.8516	0.478	13.5139	<0.001	Highly Significant
NDI(pre) - NDI(post)	6.267	1.033	0.267	23.500	<0.001	Highly Significant

TABLE 6: COMPARATIVE UNPAIRED T-TEST POST VALUES ACROSS THE GROUPS

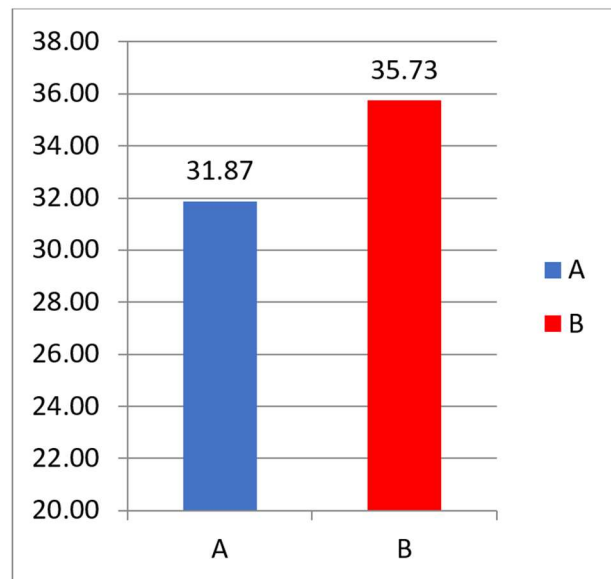
Parameters	t	One-Sided p	Mean Difference	Std. Error Difference	REMARK
VAS(post)	-6.166	<0.001	-2.0333	0.3297	Highly Significant

flexion(post)	2.396	0.012	1.200	0.501	Significant
extension(post)	2.034	0.026	1.9000	0.9342	Significant
Lt.flex_LEFT(post)	3.829	<0.001	2.3667	0.6181	Significant
Lt.flex_RIGHT(post)	4.100	<0.001	2.1000	0.5122	Highly Significant
Rotation_LEFT(post)	2.06909	<0.024	2	0.6863	Significant
Rotation_RIGHT(post)	1.7968	<0.029	1.7333	0.6473	Significant
NDI(post)	-1.958	0.030	-3.867	1.974	Significant

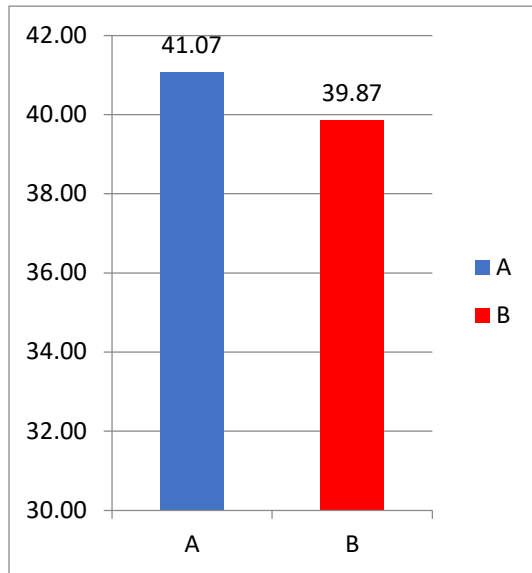
Graph 3: GRAPHS FOR POST-POST VALUES ACROSS GROUPS
VAS **NDI**



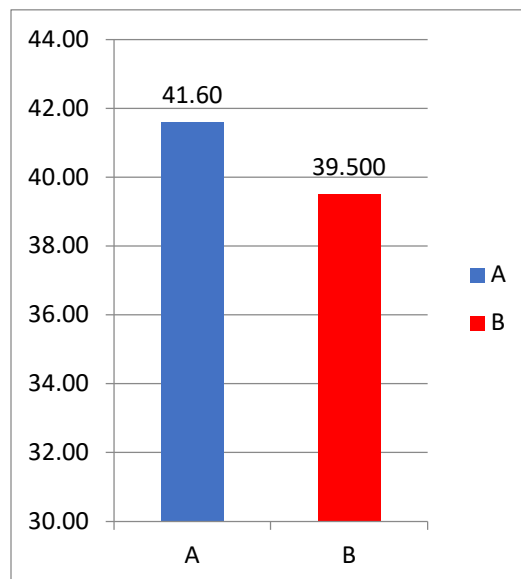
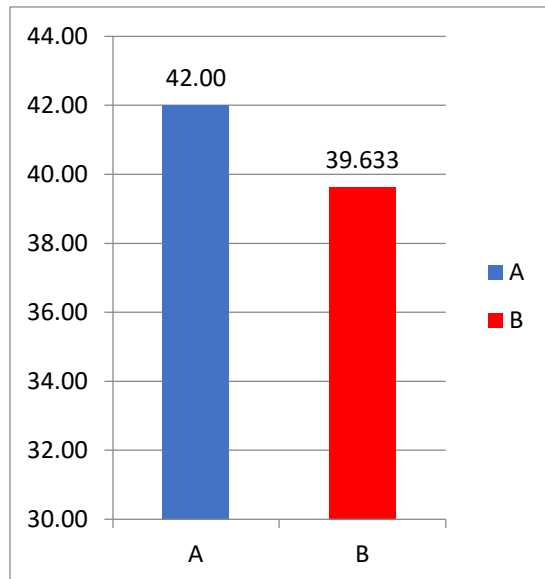
FLEXION



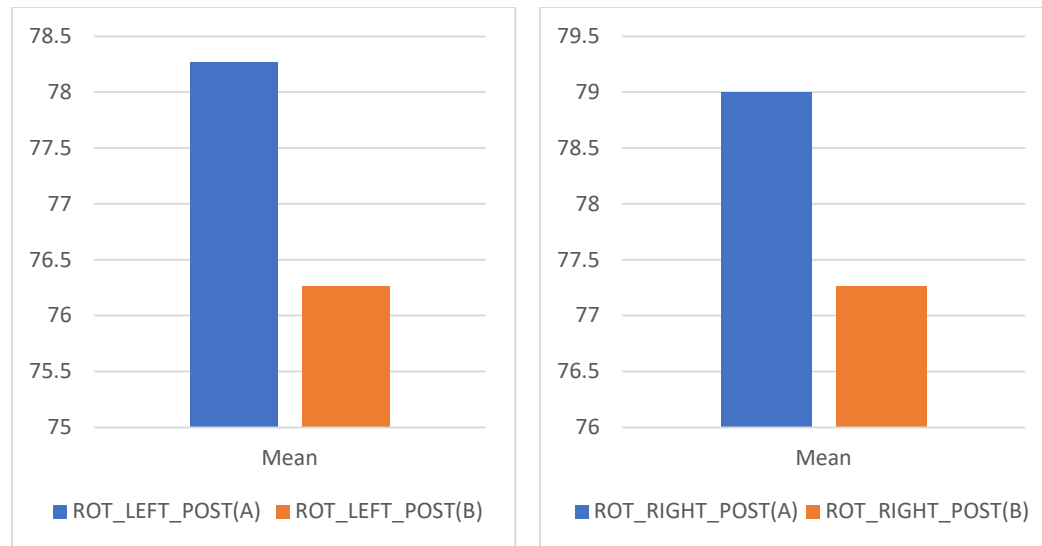
EXTENSION



LATERAL FLEXION LEFT AND RIGHT



ROTATION LEFT AND RIGHT



RESULTS

To determine the efficacy of MET in reducing pain, CROM, and functional impairment, a paired t test for pre-post test in group A was conducted. The statistical results for the VAS are extremely significant according to the $t=29.085$ ($p<0.001$). For CROM flexion and extension, left and right rotation, left lateral flexion, and right lateral flexion all exhibit strong significance ($p<0.01$).

The statistical results for the VAS are extremely significant according to the $t=-6.166$ ($p<0.001$). For CROM flexion($t=2.396$; $p<0.012$) and extension($t=2.034$; $p<0.026$), left($t=3.945$; $p<0.001$)($t=4.012$; $p<0.001$) and right rotation, left lateral flexion($t=3.829$; $p<0.001$), and right lateral flexion($t=4.100$; $p<0.001$) all exhibit strong significance. It may be inferred that Group A, which had MET and conventional treatment, significantly outperformed Group B, which received TOP, in terms of pain, range of motion, and functional impairment; for this reason, we are embracing an alternative hypothesis.

DISCUSSION:

The main conclusions of this study were that Transverse Oscillatory Pressure (TOP) and Muscle Energy Technique (MET) both significantly reduced pain, increased range of motion, and improved the Neck Disability Index score (NDI).

Comparing Group A, or the Muscle Energy Technique (MET) group, to Group B, or the Transverse Oscillatory Pressure (TOP) group, revealed better outcomes for Group A.

According to certain research, when applied to the spine or muscles, MET and associated post-isometric treatments lessen pain and suffering. It involves both central and peripheral modulatory processes. For instance, it may activate mechanoreceptors in the muscles and joints through centrally mediated channels like the PAG in the midbrain or non-opioid serotonergic and nor-adrenergic descending inhibitory pathways. Therefore, MET has a significant impact on pain and impairment. The results of the current study are consistent with those of Viswas Rajadurai's (2011)

study, which found that MET helps patients with temporomandibular dysfunction by reducing jaw muscular tension, which in turn lessens discomfort and improves maximal mouth opening (MMO). The TOP approach involves applying oscillatory pressure directly to the area that is in discomfort. When pressure is given to the spinous process towards the painful side, the vertebral body should rotate away from the painful side. This is the purpose of transverse pressure towards the painful side. This will mobilise the articular surfaces on the affected side and restore joint motion. This may change the segmental biomechanics by releasing meniscoids that have been imprisoned, removing adhesions, or by lessening intervertebral disc distortion and restoring joint motion, all of which increase the segment's mobility right away. Additionally, it is believed that particular motion segments have the capacity to buckle, causing rather substantial vertebral motions to reach a new equilibrium position. Reduced mechanical stress or strain on the soft and hard spinal tissues is achieved by restoring a buckled section to a reduced energy level with the help of the manipulative impulse.

So both methods have been shown to be successful in easing pain and disability as well as in enhancing range of motion in people with mechanical neck discomfort. The fact that MET involves muscle activation as the muscle is continuously stretched, contracted, and relaxed, as well as the fact that it involves both passive and active participation from the subject and the therapist, may be two reasons why it outperforms TOP in terms of reducing pain, increasing CROM, and improving NDI. Throughout the course of treatment, the therapist exclusively uses passive manipulation with the TOP technique, which solely entails the passive mobility of the cervical vertebrae.

Neck Isometric By improving motor unit activation synchronisation and/or firing rate within a specific muscle, exercises improve intramuscular coordination. More tension is produced by a static contraction than a concentric one. Muscle strength will increase as a result, and mobility will be improved.

The hypoalgesic effect of isometric exercise was confirmed to be multisegmental and not limited to the contracting muscle in studies that looked at how it affected the contracting body part as well as the contralateral and a remote body part to the contracting one.

High threshold skeletal muscle mechanoreceptors responded to stretch stimulation, according to Mense et al. Increased ROM was the result of how ultrasound impacted the sensitivity of sensory receptors in skeletal muscle, including the muscle spindle and high threshold mechanoreceptors. Individual impacts of the well-established MET and TOP approaches have been demonstrated in prior studies. However, the findings of the current study indicate that when comparing the two therapies, MET is superior to TOP for reducing pain, CROM, and disability in mechanical neck pain.

There are many study limitations, among others. There are only 30 participants in the study, making it a tiny sample size. Only the upper trapezius and levator scapulae muscles underwent MET in the current investigation.

There was no follow-up to ascertain the therapies' long-term effects. In the future, greater sample size studies will be done.

To ascertain the long-term effects of the therapies, a longer study should be done with follow-up a month later.

Since additional muscles may be involved in some circumstances and may provide a more positive outcome, it is possible to conduct research on MET for other neck muscles.

CONCLUSION:

Based on this study, we may conclude that both treatments were successful because we can see significant reductions in pain, range of motion, and functional impairment in both groups. However, in the inter-group comparison, the benefits were more pronounced in Group A than Group B, leading us to draw the conclusion that MET was more effective than TOP in reducing pain, CROM, and functional impairment in participants with mechanical neck discomfort.

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FIGURES –



Figure 1 - PIR UPPER TRAPEZIUS



Figure 2 - PIR LEVATOR SCAPULAE

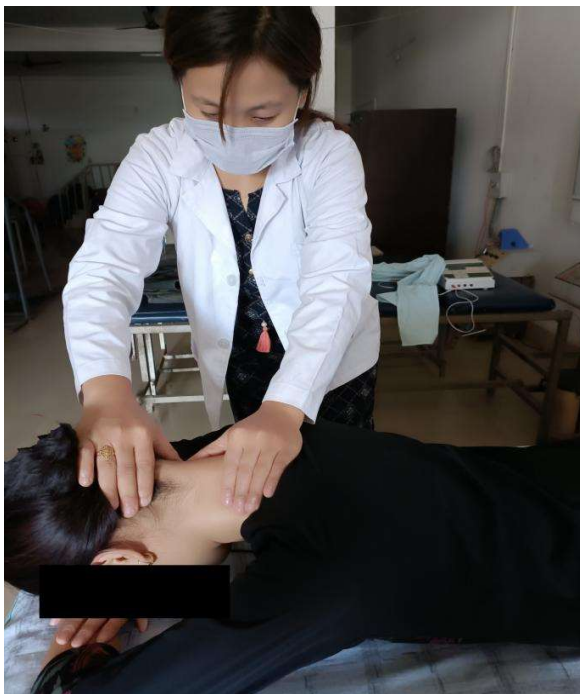


Figure 3 - TRANSVERSE OSCILLATORY PRESSURE TECHNIQUE