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To Compare the Effectiveness of the Dry Needling Versus Instrumented Assisted Soft Tisse Mobilization Technique on Scapular Dyskinesia in College Students with Trapezitis – A Comparative Study

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ABSTRACT

Background: Scapular dyskinesis ('dys'—alteration of, 'kinesis'—movement) is a collective term that refers to movement of the scapula that is dysfunctional. The Upper Trapezius (UT) muscle has been found to be often affected by MTrPs. Common symptoms in individuals with MTrPs in the UT muscle include a taut and painful muscle, tension headache, neck pain, dizziness or vertigo, limited neck, and shoulder ROM. The former technique Dry needling is used to treat myofascial trigger points (MTrPs), which are described as localized hypersensitive spots in a palpable taut band of muscle, and the other is Instrument Assisted Soft Tissue Mobilization (IASTM) is a popular therapeutic approach for myofascial restrictions. As college students have to carry heavy bag pack, their scapular stabilizer muscle may become weaken due to continuous stress. Hence this study was undertaken to find out the effectiveness of either Dry needling or Instrumented assisted soft tissue manipulation in case of scapular dyskinesia with trapezitis among college students.

Purpose of the Study: Aim of the study is to evaluate the effectiveness of Dry Needling versus Instrumented Assisted Soft Tissue Mobilization on scapular dyskinesia in college students with trapezitis, and objective is to determine the effect of Dry Needling on Scapular Dyskinesia in college students with Trapezitis, and to determine the effect of Instrumented Assisted Soft Tissue Mobilization technique on scapular dyskinesia in college students with Trapezitis, and to compare the effectiveness of Dry Needling versus Instrumented Assisted Soft Tissue Mobilization technique on scapular dyskinesia in college students with Trapezitis.

Methods: A comparative study was conducted in M.B Gohil Institute of Medical Science and Research Center, College of Physiotherapy, Navsari (OPD) on 40 college students including both male and female of Navsari district based on inclusion and exclusion criteria. Outcome of the study that is Dynamic scapular motion test, Pressure pain threshold scale, Lateral scapular slide test and Numeric pain rating scale were assessed for each college students with prior inform consent form signed by the participant.

Comparison of the effectiveness of Dry needling and IASTM Tool was done statistically.

Outcome Measure: (1) NPRS (2) Pressure Pain Thresold Scale (3) Dynamic Scapular Motion Test (4) Lateral Scapular Slide Test.

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Statistical Analysis: Statistical Analysis was done by using SPSS 20 software.

Results: In Study, within group comparisons showed a significant improvement in NPRS, PPTS, LSST of group-a and group-b. p value (<0.005) whereas, in between group there was no significant difference found i.e., Dry needling and instrumented assisted soft tissue mobilization have similar effects on active mayo-facial trigger points of upper trapezius muscle.

Conclusion: This study suggests that Dry Needling and soft tissue mobilization with myorelease tool may have similar effects on active trigger points of the upper trapezius muscle, which include reducing the pain intensity, increasing the pressure pain threshold and improving LSST.

Keywords: DN; IASTM; Scapular Dyskinesia; Trapezitis; College students.

INTRODUCTION

Normal scapulohumeral rhythm, the coordinated movement of the scapula and humerus to achieve shoulder motion, is the key to efficient shoulder function. Scapular position and motion are closely integrated with arm motion to accomplish most shoulder functions. Scapular movement is a composite of three motions—upward/downward rotation around a horizontal axis perpendicular to the plane of the scapula, internal/external rotation around a vertical axis through the plane of the scapula and anterior/posterior tilt around a horizontal axis in the plane of the scapula.[1]

The clavicle acts as a strut for the shoulder complex, connecting the scapula to the central portion of the body. This allows two translations to occur—upward/downward translation on the thoracic wall and retraction/protraction around the rounded thorax. When the humerus moves into elevation, clavicular elevation, retraction and posterior axial rotation occur at the sternoclavicular joint, while scapular internal rotation, upward rotation and posterior tilting occur at the acromioclavicular joint. Both the acromioclavicular and sternoclavicular joints contribute to scapular upward rotation with up to 31° of clavicular posterior rotation occurring at the joint. The acromioclavicular joint is primarily responsible for the occurrence of scapular posterior tilting. Sternoclavicular joint retraction and acromioclavicular joint internal rotation are offsetting motions allowing scapular internal and external rotation to occur.[1]

The scapula plays several roles in normal shoulder function. Control of static position and control of the motions and translations allow the scapula to fulfil theseroles. In addition to upward rotation, the scapula must also posteriorly tilt and externally rotate to clear the acromion from the moving arm in forward elevation or abduction.

Also, the scapula must synchronously internally/ externally rotate and posteriorly tilt to maintain the glenoid as a congruent socket for the moving arm and maximize concavity compression and ball and socket kinematics. The scapula must be dynamically stabilized in a position of relative retraction during arm use to maximize activation of all the muscles that originate on the scapula. Finally, it is a link in the kinetic chain of integrated segment motions that starts from the ground and ends at the hand. Because of the important but minimal bony stabilization of the scapula by the clavicle, dynamic muscle function is the major method by which the scapula is stabilized and purposefully moved to accomplish its roles. Muscle activation is coordinated in task specific force couple patterns to allow stabilization of position and control of dynamic coupled motion.[1]

Scapular dyskinesis ('dys'—alteration of, 'kinesis'—movement) is a collective term that refers to movement of the scapula that is dysfunctional. Scapular dyskinesis has been identified by a group of experts as: (1) Abnormal static scapular position and/or dynamic scapular motion characterized by medial border prominence; or (2) Inferior angle prominence and/or early scapular elevation or shrugging on arm elevation; and/or (3) Rapid downward rotation during arm lowering. However, static position and dynamic motion are two separate entities, so when describing the static appearance of the scapula and if an asymmetry is observed, it should be referred to as 'altered scapular resting position' rather than 'scapular dyskinesis'. Scapular dyskinesis is a non-specificresponse to a painful condition in the shoulder rather than a specific response to certain glenohumeral pathology. Scapular dyskinesis has multiple causative factors,

both proximally (muscle weakness/ imbalance, nerve injury) and distally (acromioclavicular joint injury, superior labral tears, rotator cuff injury) based. This dyskinesis can alter the roles of the scapula in the scapula-humeral rhythm. It can be due to alterations in the bony stabilizers, alterations in muscle activation patterns or strength in the dynamic muscle stabilizers (Trapezius, Serratus Anterior, Rhomboids, Pectoralis Minor).[1]

The Upper Trapezius (UT) muscle has been found to be often affected by MTrPs. Common symptoms in individuals with MTrPs in the UT muscle include a taut and painful muscle, tension headache, neck pain, dizziness or vertigo, limited neck, and shoulder ROM. Considering the role of synergistic function of the UT muscle in scapulohumeral rhythm during shoulder movement, it is not surprising that MTrPs in UT muscle can result in shoulder dysfunction and disability.[2,3]

Dry needling is a technique in which a fine needle is used to penetrate the skin, subcutaneous tissues, and muscle, with the intent to mechanically disrupt tissue without the use of an anesthetic. Dry needling is often used to treat myofascial trigger points (MTrPs), which are described as localized hypersensitive spots in a palpable taut band of muscle. These hyperirritable spots can be classified as active MTrPs when they produce spontaneous pain and, when palpated, reproduce a patient's familiar pain.

Latent MTrPs do not produce spontaneous pain and are only painful uponpalpation. Myofascial trigger points are commonly found in patients with musculoskeletal pain.[4,5]

The physiological mechanism underpinning the effects of Dry Needling remains to be elucidated. However, it has been suggested that Dry Needling may produce both local and central nervous responses to restore homeostasis at the site of the MTrPs, resulting in a reduction of both peripheral and central sensitization to pain. Tsai et al demonstrated that needling of distal trigger points causes a reduced sensitivity of proximal trigger points. Centrally, Dry Needling may activate descending control mechanisms in the brain or spinal cord. Dry needling has been shown to immediately increase pressure pain threshold (PPT) and range of motion, decrease muscle tone, and decrease pain in patients with musculoskeletal conditions.[5]

DN can stimulate the A-delta nerve fibers (group III), which in turn, may activate the enkephalinergic inhibitory dorsal horn interneurons, resulting in opioidmediated pain suppression (pain relief). Some studies have also demonstrated that the increased levels of bradykinin, CGRP, substance P and other chemicals at MTrPs are directly corrected by eliciting LTR following DN. It has been suggested that DN may influence the microcirculation in muscle. Several investigators have demonstrated that needle insertion in the muscles may influence the microcirculation and enhance blood flow in the stimulated region.[2]

Previous studies have assessed the effect of DN on MTrPs in UT. However, with the use of varying study designs, samples and testing procedures, different results have been reported regarding the effect of DN on MTrPs in the UT.[2] Instrument Assisted Soft Tissue Mobilization (IASTM) is a popular therapeutic approach for myofascial restrictions. IASTM is based on the rationale introduced by previous studies, but instead of cross friction massage with fingers, it involves using specially designed steel instruments to create controlled micro trauma in the soft tissue (e.g., scar tissue, myofascial adhesion) with the purpose of reducing pain and improving the range of motion (ROM) and function. The growing interest in this technique as a treatment approach for myofascial pain syndrome can partly be attributed to its remarkable effects on muscle tissues and surrounding fascia. There is evidence suggesting that a controlled microtrauma created during soft tissue mobilization enhances the tissue repair process by stimulating the proliferation of fibroblasts.[3]

The IASTM treatment is thought to stimulate connective tissue remodeling through resorption of excessive fibrosis, along with inducing repair and regeneration of collagen secondary to fibroblast recruitment. In turn, this will result in the release and breakdown of scar tissue, adhesions, and fascial restrictions. In laboratory studies using a rat model, the use of instruments resulted in increased fibroblast proliferation and collagen repair (e.g., synthesis, alignment, and maturation) in cases of enzyme-induced tendinitis. Many of these benefits were also found in a laboratory study on ligament healing using the rat model which further provided supporting evidence that instrument massage produces a significant short-term (e.g., 4 weeks) increase in ligament strength and stiffness compared to the contralateral control limb. While these findings provide initial support for IASTM stimulating connective tissue remodeling, these physiological changes are still being studied and have not been confirmed in human trials.[3,4,5]

METHODOLOGY

❖ **STUDY SETTING**

M.B. Gohil Institute of Medical Science and Research Centre, College of physiotherapy, Navsari

❖ **STUDY DESIGN**

Comparative study

❖ **STUDY SAMPLE SIZE**

40 college students depending upon availability

❖ **STUDY SAMPLE DESIGN**

Convenient Sampling

❖ **STUDY POPULATION**

College students

❖ **STUDY DURATION**

6 months

❖ **MATERIALS USED**

- Dry Needle
- IASTM Tool
- Petroleum jelly
- Padded plinth
- Towel
- Pillow
- Cotton and sterilizer
- Gloves
- Ball pen
- Paper
- Measure tape

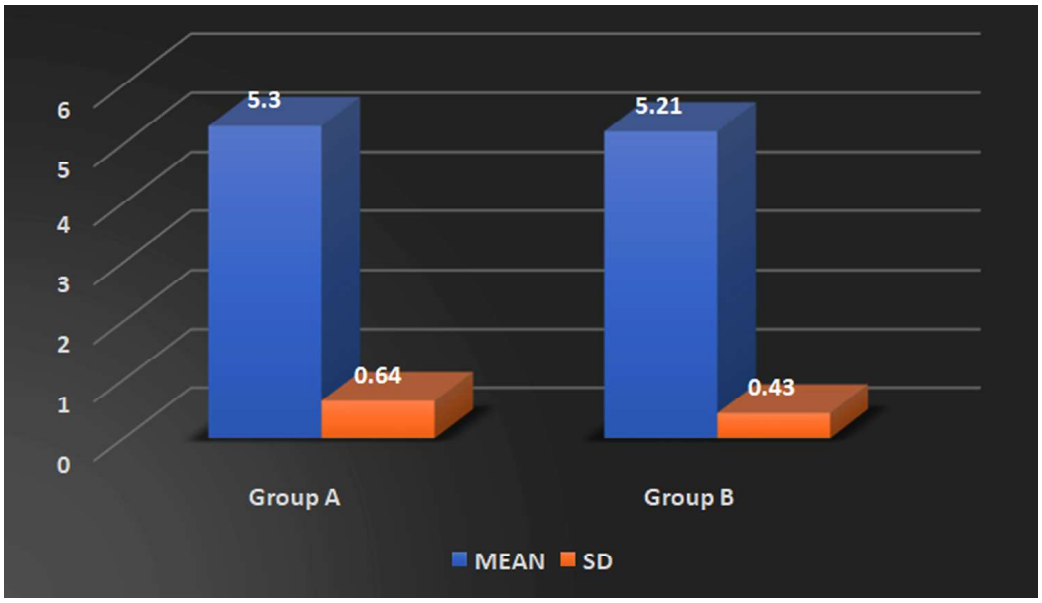
RESULT

General Characteristics of Participants:

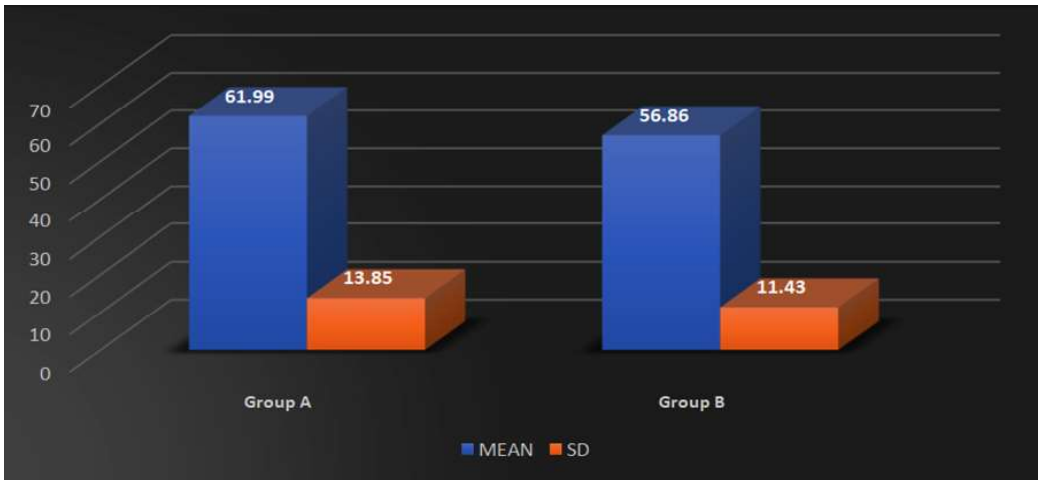
Table 1: Mean of height, weight and BMI among the participants

Variable	Group A	Group B
Height	5.30±0.64	5.21±0.43
Weight	61.99±13.85	56.86±11.43
BMI	23.53±5.26	23.51±6.38

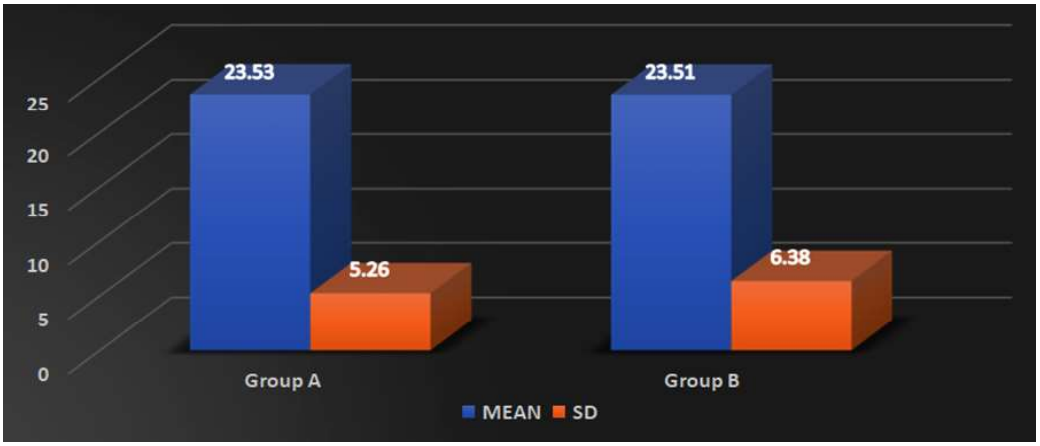
Table 1 shows mean height, weight, BMI of participants.



Graph 1.1: Shows the average height of subjects



Graph 1.2: Shows the average weight of subjects



Graph 1.3: Shows the average BMI of subjects

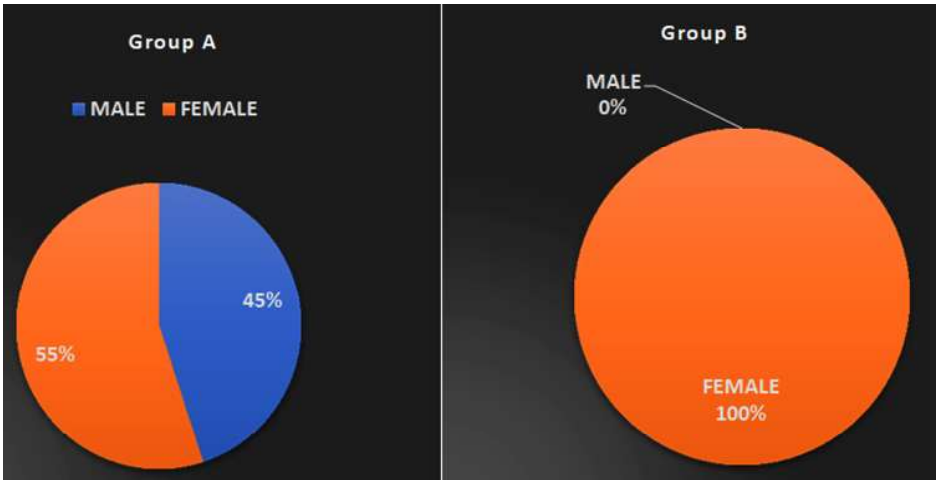
GENDER DISTRIBUTION:

Table 2: The gender distribution of participants

-	Female	Male
Group-A	11	9
Group- B	20	0

Table 2 shows gender distribution of both groups. Group A shows 11 females (55%) with 9(45%) male and group B shows 20 females (100%).

Graph 2.1: CAPTION NOT PROVIDED **Graph 2.2:** CAPTION NOT PROVIDED



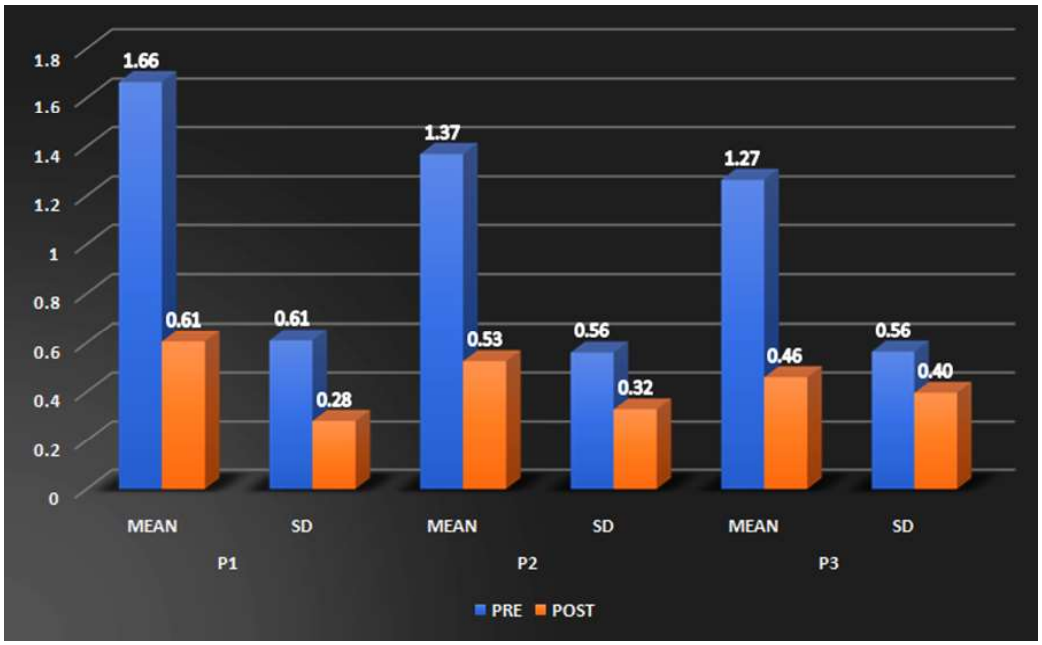
Graph 2.1 Shows Gender distribution of Group-A & Graph 2.2 Shows Gender distribution of Group-B.

WITHIN GROUP COMPARISONS

Table 3.1: Intra group comparison of Lateral Scapular Slide Test (Group-A)

Variables	Data	Mean±SD	p-value	t value	df
Lsst-P1	Pre	1.66±0.60	0.000	9.365	19
	Post	0.60±0.28			
Lsst-P2	Pre	1.37±0.56	0.000	7.122	19
	Post	0.52±0.32			
Lsst-P3	Pre	1.26±0.56	0.000	9.232	19
	Post	0.46±0.39			

Table 3.1: shows Intra group comparison of Lateral Scapular Slide Test (LSST) for the pre- test and after 4 weeks of intervention. Pre-test mean of LSST P1-1.66, LSST P2-1.37, LSST P3-1.26 with the SD1- 0.60, SD2- 0.52, SD3- 0.46 when it was compared with the mean of LSST P1-0.60, LSST P2-0.52, LSST P3-0.46 after 4 weeks of intervention with the SD1-0.28, SD2-0.32, SD3-0.39; obtained "P" value was 0.000. This finding had showed that there was significant difference in LSST in pre and post-test. (p<0.005)

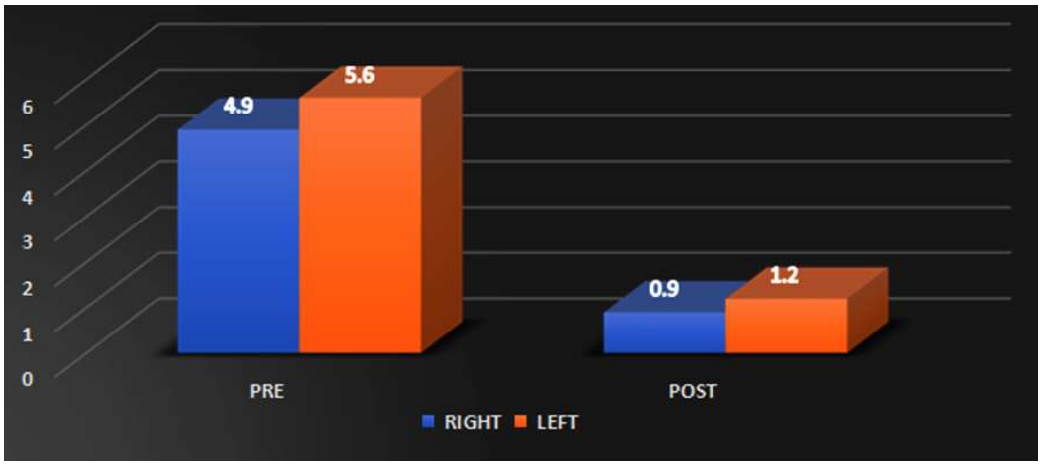


Graph 3.1: Graphical presentation of intra group comparison of LSST

Table 3.2: Intra group comparison for Numeric Pain Rating scale (Group A)

Variables	Data	Mean±SD	P value	t value	df
NPRS (Right)	Pre	4.9±1.41	0.000	13.784	19
	Post	0.9±0.55			
(Left)	Pre	5.6±1.81	0.000	11.186	19
	Post	1.2±0.89			

TABLE 3.2 Shows the intra group comparison of Numeric Pain Rating Scale (NPRS) for pre-test and after 4 weeks of intervention. For right side Pre-test mean of NPRS :4.9 with SD:1.41, compared with mean of NPRS :0.9 with the SD:0.55; obtained "P" value was 0.000. This showed that there is significant difference in NPRS pre and post-test. (P<0.005). For left side pre-test mean of NPRS :5.6 with the SD: 1.81, when it was compared with mean of NPRS (left):1.2 with the SD:0.89; obtained "P" value was 0.000. This finding had showed that there was significant difference in NPRS Pre and Post-test. (P<0.005)

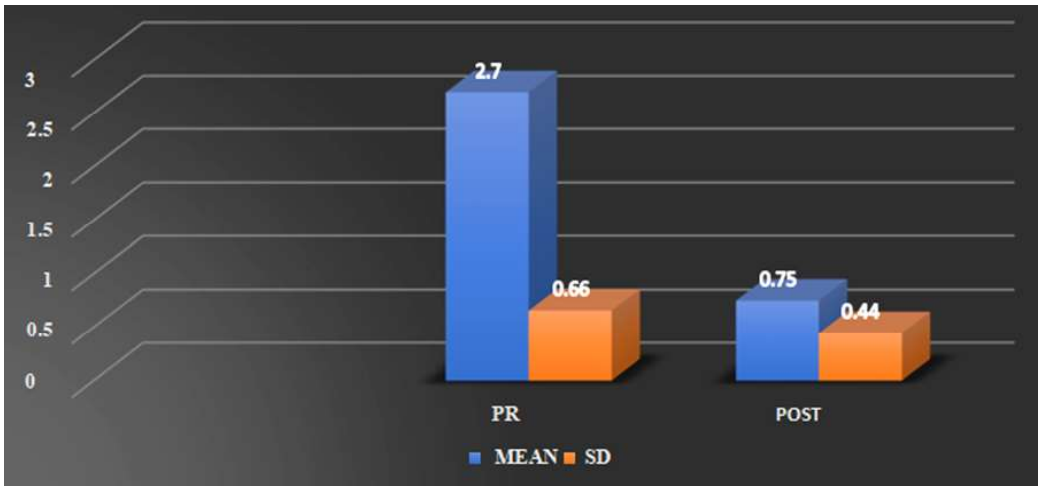


Graph 3.2: Graphical presentation of the intra group comparison of NPRS

Table 3.3: Intra group comparison for Pressure Pain Thresold scale (Group-A)

Variable	Data	Mean±SD	P value	T value	df
PPTS	Pre	2.7±0.65	0.000	14.41	19
	Post	0.75±0.44			

Table 3.3: shows the intra group comparison of Pressure Pain Thresold Scale (PPTS) for pre test and after 4 weeks of intervention. Pre-test mean of PPTS 2.7 with the SD 0.65, when it was compared with the mean of 0.75 after 4 weeks of intervention with the SD 0.44; obtained "p" value was 0.000. This finding had showed that there was significant difference in NPRS in pre and post test.($p<0.005$)

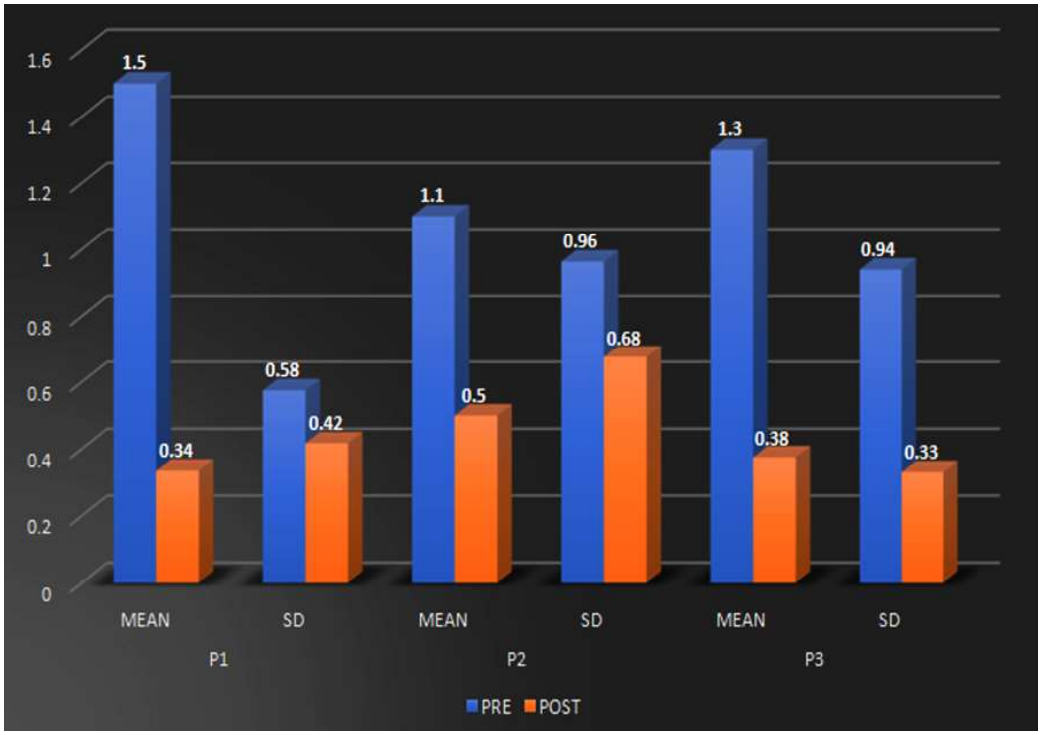


Graph 3.3: Graphical presentation of inter group comparison for PPTS

Table 4.1: Intra group comparison for Lateral Scapular Slide Test (Group-B)

Variable	Level	Mean±SD	P value	t value	df
LSST-P1	Pre	1.505±0.57	0.000	9.435	20
	Post	0.33±0.41			
LSST-P2	Pre	1.14±0.96	0.661	0.435	20
	Post	0.5±0.67			
LSST-P3	Pre	1.325±0.93	0.000	4.972	20
	Post	0.37±0.33			

Table 4.1: shows the intra group comparison of Lateral Scapular Slide Test (LSST) for pre-test and after 4 weeks of intervention. Pre-test mean of LSST P1-1.505, LSST P2 1.14, LSST P3 1.32 with the SD1-0.57, SD2- 0.96, SD- 0.93, when it was compared with the mean of LSST P1 0.33, LSST P2 0.5, LSST P3 0.37 after 4 weeks of intervention with the SD1: 0.41, SD2: 0.67, SD3: 0.33; obtained "P" value was LSST P1-0.000, LSST P2-0.661, LSST P3-0.000. This finding showed that there was significant difference in LSST pre and post-test for LSST P1 AND LSST P 3 (P<0.005); but for LSST P2 there were no significant difference in LSST pre-test and post- test.(p >0.005)

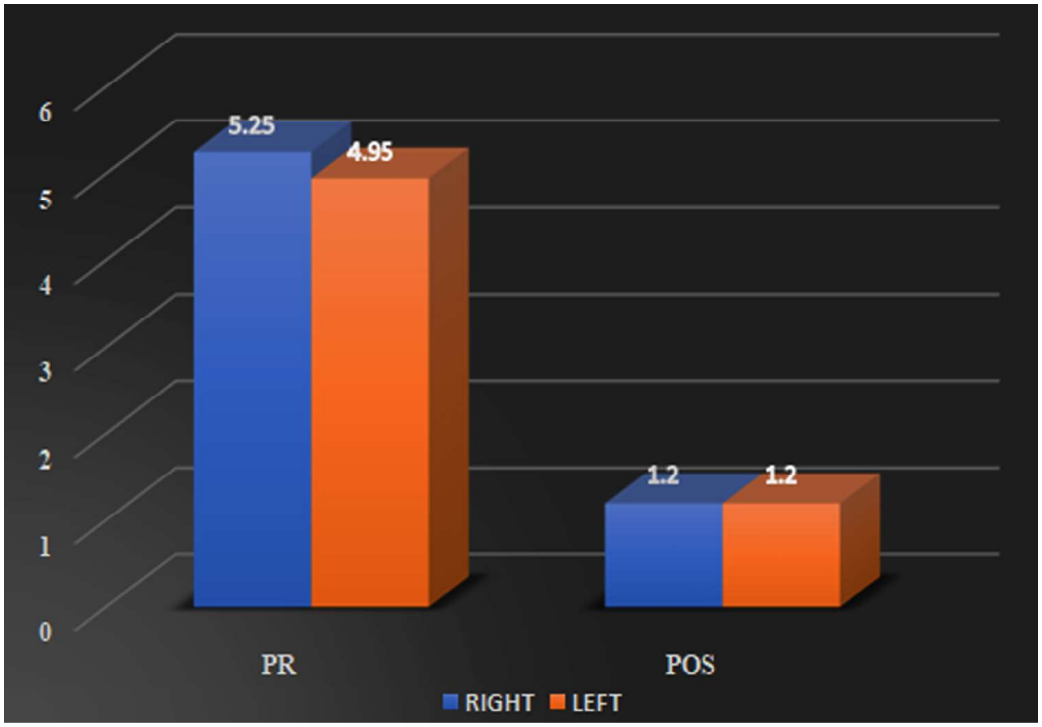


Graph 4.1: Graphical presentation of intra group comparison of LSST(Group-B)

Table 4.2: Intra group comparison for Numeric pain Rating Scale (Group-B)

Variable	Level	Mean±Sd	P value	t value	df
NPRS (Right)	Pre	5.25±1.74	0.000	12.090	20
	Post	1.2±0.89			
NPRS (Left)	Pre	4.95±2.48	0.000	8.047	20
	Post	1.2±0.95			

Table 4.2: shows the Intra group comparison of Numeric Pain Rating Scale (NPRS) for pre and after 4 weeks of intervention. For right side Pre-test mean of NPRS -5.25 with the SD-1.74, when it was compared with the mean of NPRS -1.2 with the SD-0.89 after 4 weeks of intervention; obtained "P" value was 0.000. This finding showed that there was significant difference in NPRS in pre and post-test. (P<0.005). For left side Pre-test mean of NPRS -4.95 with the SD-2.48, when it was compared with the mean of NPRS -1.2 with the SD-0.95; obtained "P" value was 0.000. This finding showed that there is significant difference in NPRS in pre and post-test. (P<0.005)

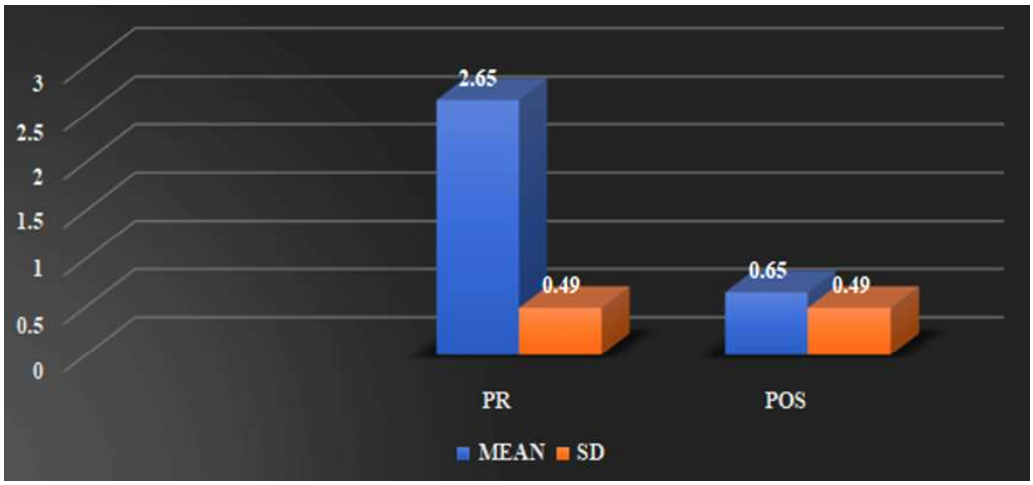


Graph 4.2: Graphical presentation of intra group comparison of NPRS

Table 4.3: Intra group comparison of Pressure Pain Threshold Scale (GroupB)

Variable	Level	Mean ± SD	P value	t value	df
PPTS	Pre	2.65±0.48	0.000	17.980	20
	Post	0.65±0.48			

Table 4.3 shows the intra group comparison of pressure pain threshold scale (PPTS) for pre-test and after 4 weeks of intervention. Pre-test mean of NPRS 2.65 with the SD 0.48, when it was compared with the mean of 0.65 after 4 weeks of intervention with SD 0.48; obtained "P" value was 0.000; this finding had showed that there was significant difference in NPRS in pre and posttest. ($p<0.005$)



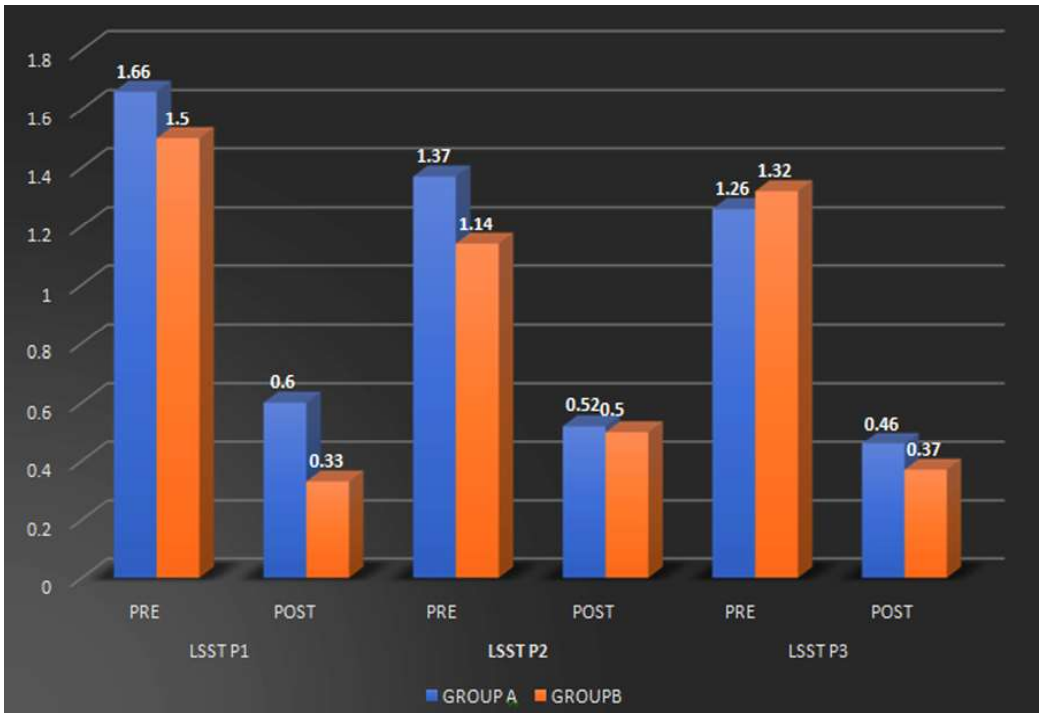
Graph 4.3: Graphical presentation of intra group comparison of PPTS

BETWEEN GROUP COMPARISION

Table 5.1: Inter group comparison of parameters for Lateral Scapular Slide Test

Variable	Group A	Group B	P value
Lsst-P1	0.60±0.28	0.33±0.41	0.21
Lsst- P2	0.52±0.32	0.5±0.67	0.883
Lsst-P3	0.46±0.39	0.37±0.33	0.466

Table 5.1: Shows Inter group comparison of LSST of Group-A and Group-B. Group-A mean of LSST P1=0.60, LSST P2=0.52, LSST P3=0.46 with the SD 1=0.28, SD 2=0.32, SD 3=0.39, when it was compared with the Group B mean of LSST P1=0.33, LSST P2=0.5, LSST P3=0.37 with the SD 1=0.41, SD 2=0.67, SD 3 =0.33; Obtained "P" value for LSST P 1, LSST P2, LSST P3 was 0.21, 0.883, 0.446. This finding showed that there was no significant difference in LSST in GroupA and Group-B. (P>0.005)

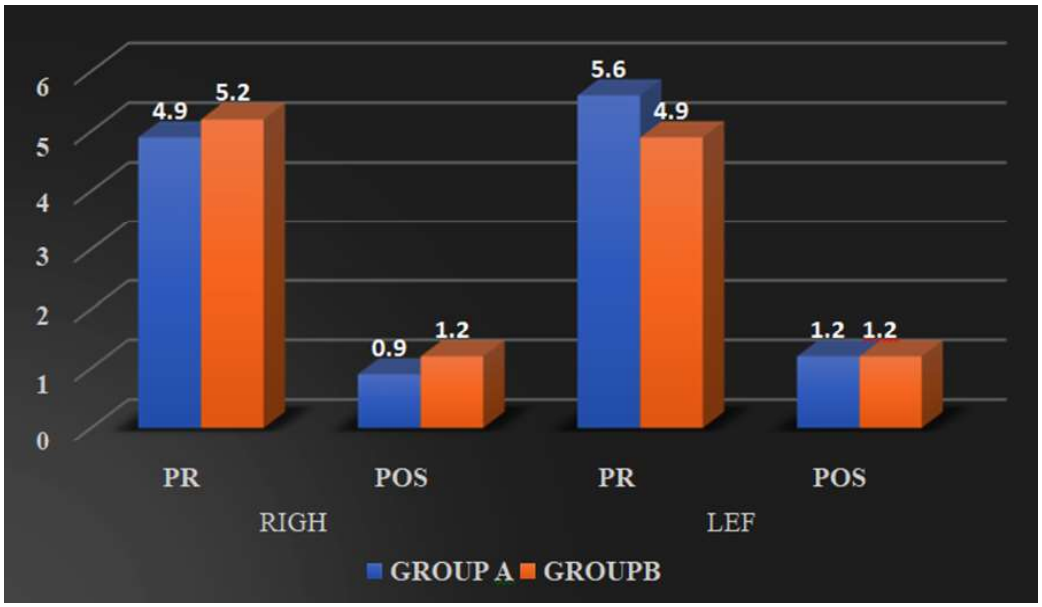


Graph 5.1: Graphical presentation of inter-group comparison of LSST

Table 5.2: Inter group comparison of parameters for Numeric pain Rating Scale

Variable	Group A	Group B	P value
NPRS (Right)	0.9±0.55	1.2±0.89	0.210
NPRS (Left)	1.2±0.89	1.2±0.95	1.000

Table 5.2 shows the Inter-group comparison of Numeric Pain Rating Scale (NPRS) of Group-A and Group-B. For right side Group-A mean of NPRS-0.9 with the SD-0.55 and for left side Group-A mean of NPRS-1.2 with the SD- 0.89, when it was compared with the right-side Group-B mean of NPRS-1.2 with SD-0.89 and for left side mean of NPRS-1.2 with the SD-0.95; obtained "P" value of NPRS for right side and NPRS for left side was 0.210 and 1.000. This finding showed that there was no significant difference in NPRS in Group-A and Group-B. (P>0.005)

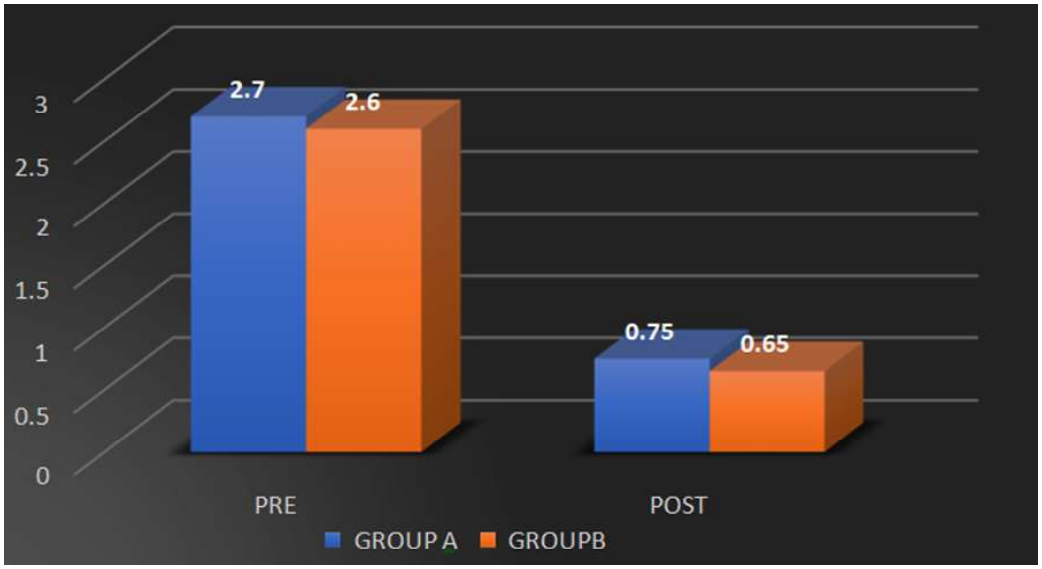


Graph 5.2: Graphical presentation of inter-group comparison of NPRS

Table 5.3: Inter group comparison of parameters for Pressure Pain Threshold Scale

Variable	Group A	Group B	p value
PPTS	0.75±0.44	0.65±0.48	0.399

Table 5.3 shows the inter group comparison of Pressure Pain Threshold Scale (PPTS) of Group-A and Group-B. Group-A mean of PPTS-0.75 with the SD-0.44, when it was compared with the Group-B mean of PPTS-0.65 with the SD-0.48; obtained "P" value was 0.399. This finding had showed that there was no significant difference in PPTS in Group-a and Group-B. (P>0.005)



Graph 5.3: Graphical Presentation of Inter Group Comparison of PPTS

DISCUSSION

The results of the study are discussed in context of statistical analysis of present data and also compared with the previous studies. The possible explanations for the results are also discussed below according to supporting literature.

The study attempted to find out the effectiveness of Dry Needling and IASTM in college students

having Scapular Dyskinesia with Trapezitis. 40 subjects having scapular dyskinesia with Trapezitis were randomly assigned into two groups, Group A (DN) and Group B (IASTM) groups. Dry Needling can cautiously be recommended for pain relief in myofascial trigger points in the neck and shoulder (short and medium-term effects). Although dry needling has shown acceptable efficacy in reducing pain in trigger points, its mechanism of effect is still unclear. It has been suggested that this mechanism could be hyperstimulation analgesia through the descending inhibitory system.[3]

A study by Chen JT et al, on Inhibitory Effect of Dry Needling on the Spontaneous Electrical Activity Recorded from Myofascial Trigger spots of rabbit skeletal muscle, had found that this treatment works by reducing the spontaneous electrical activity of trigger points.[12]

A study by HYUK GA et al, on Dry Needling of Trigger Points with and Without Paraspinal Needling in Myofascial Pain Syndromes in Elderly Patients, had found that TrP and paraspinal dry needling resulted in more continuous subjective pain reduction than TrP dry needling only, when we compared the present study with this study there is significant pain reduction in trigger point dry needling.[13]

A study by Jennalyn Lew et al, on Comparison of dry needling and trigger point manual therapy in patients with neck and upper back myofascial pain syndrome: a systematic review and meta-analysis (2021), had found that the effectiveness of DN and TPMT in improving pain and function in the short to medium term for patients with myofascial pain syndrome in the neck and upper back. Neither intervention appeared to be superior than the other.[14]

A study by Fahimeh Kamali et al, on Comparison of Upper Trapezius and Infraspinatus Myofascial Trigger Point Therapy by Dry Needling in Overhead Athletes with Unilateral Shoulder Impingement Syndrome, had found that applying DN for active MTrPs in the ISP can be as effective as direct DN of active MTrPs in the UT, with respect to improving pain and disability in athletes with shoulder pain.[15]

On Contrary to our findings, A study by Juan Rodríguez-Mansilla et al (2016), on Effectiveness of dry needling on reducing pain intensity in patients with myofascial pain syndrome: a Meta-analysis, had found that DN was less effective on decreasing pain comparing to the placebo group. Other treatments were more effective than DN on reducing pain after 3-4 weeks.[16]

In present study there is significant change in NPRS, PPTS AND LSST after 4 weeks of intervention, when it was compared with pre-treatment scores in Group-A (DN).

A study by Dawn T. Gulick et al, on Instrument-assisted soft tissue mobilization increases myofascial trigger point pain threshold, had showed, a 5-min interventionusing three well defined IASTM techniques can effectively reduce the PPT of a MTrP in six treatments over a three-week period of time. When we compared the present study with above mentioned studies it also had showed reduce the PPT of a MTrPs in UT, LT Pectoralis Major and Serratus Anterior 8 treatment sessions over 4-week period of time.

In Present Study, within group comparisons showed a significant improvement in NPRS, PPTS, LSST of group-a and group-b. p value (<0.005) A study by Zeinab Ahmadpour Emshi et al, Comparison of the effects of instrument assisted soft tissue mobilization and dry needling on active myofascial trigger points of upper trapezius muscle (2018), had found that dry needling and soft tissue mobilization with myo-release tool may have similar effects on active trigger points of the upper trapezius muscle, which include reducing the pain intensity (as measured with NPS), increasing the pressure pain threshold, increasing the ROM of cervical contralateral flexion, and decreasing the neck disability index.

In the present study, in between group there was no significant difference found i.e dry needling and instrumented assisted soft tissue mobilization have similar effects on active mayo-facial trigger points of upper trapezius muscle.

CONCLUSION

Findings of the present study suggest that Dry Needling and soft tissue mobilization with myorelease tool may have similar effects on active trigger points of the upper trapezius muscle, which include reducing the pain intensity, increasing the pressure pain threshold and improving LSST.

After reviewing the previous reports in the relevant literature, these findings were found to be consistent with the existing evidence regarding the subject under the study.

In addition, the results of measurements in both treatment groups were significantly different from those in the control group, but were not significantly different from each other in terms of any variable.

The present study had a 1- month follow-up period, the results of which demonstrated the long-term effects of both treatments on the studied variables.

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