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EFFECTIVENESS OF TENS, ULTRASOUND, CRYOTHERAPY V/S ULTRASOUND, CRYOTHERAPY, KINESIO-TAPING ON UPPER TRAPEZIUS TRIGGER POINT A COMPARTATIVE STUDY.

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ABSTRACT

BACKGROUND OF STUDY: Myofascial trigger points (MTrPs) are a major factor in causing mechanical neck pain, which can become a chronic problem. The purpose of this study is to find out the results of TENS, Ultrasound, Cryotherapy vs Kinesio-Taping on trigger points in the upper trapezius.

AIM: The purpose of this study is to find out which of the two treatment procedures is more effective in treatment of myofascial trigger points in upper trapezius region.

Methods: Study will be conducted on 30 patients following the inclusion and exclusion criteria with myofascial trigger. Patients will be divided into two groups randomly. Group A is treated with TENS, Cryotherapy and Ultrasound and Group B is treated with Cryotherapy and Ultrasound & Kinesio-Taping (X-shape)

Results: Kinesio Taping, combined with Ultrasound and Cryotherapy, significantly reduces neck pain more effectively than TENS, Ultrasound, and Cryotherapy. Higher mean differences and effect sizes in VAS and Northwick Park Neck Pain Questionnaire scores highlight the superior efficacy of Kinesio Taping for managing neck pain and associated symptoms in patients.

Conclusion: From the above findings we can conclude that Kinesio Taping is more effective than TENS in reducing neck pain and related symptoms across all questionnaires. The higher mean differences in the Kinesio Taping group suggest a greater improvement in the condition of the patients

Keywords: Cryotherapy, Kinesio-taping, Myofascial Trigger point, TENS, Ultrasound, Upper trapezius.

CHAPTER: 1

INTRODUCTION

1. INTRODUCTION

Myofascial Trigger Points (MTrPs):

The trapezius muscle, a key player in the cervical spine, comprises three segments: upper, middle, and lower. While the upper part primarily contributes to movements of the neck and shoulder region, the middle and lower portions also play roles in the thoracic spine. Among the muscles commonly afflicted by myofascial trigger points (MTrPs) in clinical settings, the trapezius stands out. Pain referred by MTrPs in the upper section typically radiates unilaterally upwards along the back and side of the neck, extending to the temple and the rear of the eye socket, resembling symptoms of tension-type headaches. [31]

Trigger points often manifest as a primary dysfunction and can arise independently of any underlying medical condition or tissue damage. [26] Therefore, trigger points can serve as origins of ongoing peripheral nociceptive input, irrespective of tissue damage. [9,14] They may also be linked with other conditions like whiplash injuries or osteoarthritis. [8,12] Trigger points located in the upper trapezius are often correlated with dysfunction in the cervical spine, particularly at the C3 and C4 segmental levels, although this association doesn't always imply a causal relationship. [5]

Trigger points have the potential to exacerbate the symptoms of other conditions and can endure even after the initial triggering condition has been addressed. They may also be linked with visceral conditions and dysfunctions, such as endometriosis, interstitial cystitis, irritable bowel syndrome, dysmenorrhea, and prostatitis. [1,2,3,10,24,33,]

Myofascial trigger points are sensitive areas in muscle fibres and are often accompanied by nodules found in tight bands. These elements are divided into two groups: active elements and latent elements. [21]

Active points can cause symptoms such as local or localized pain and tingling, while latent trigger points remain asymptomatic until they become stronger. Myofascial trigger points play an important role in myofascial pain syndrome by affecting movement, thought, and functional disorders. Effects of movement resulting from active and latent elements include muscle weakness, weakness due to inhibition, stiffness, and a limited range of motion. Both active and latent myofascial trigger points cause pain when used excessively. [21]

The compromised fibres experience decreased oxygen and blood glide, consequently impeding the elimination of metabolic waste products and the transport of essential nutrients to muscle fibres. A taut band in the skeletal muscle elicits tenderness and can be palpated for the duration of the bodily evaluation. Additionally, sufferers might also display a sore sign while stress is applied to this band. Furthermore, patients may additionally experience referred aches. [29]

Transcutaneous Electrical Nerve Stimulation (TENS):

Transcutaneous electrical nerve stimulation (TENS) includes various techniques, each personalized to specific therapeutic objectives. Conventional TENS, the most prevalent in clinical practice, involves applying high-frequency electrical currents ranging from 50 Hz to 130 Hz, characterized by low intensity (comfortable, not painful), and short pulse durations spanning from 50μs to 200μs. Patients undergoing long-term TENS treatment commonly report significant benefits from this approach, particularly noting relief when nonpainful currents are administered at the site of pain. [28]

Moreover, burst TENS combines low-frequency bursts (2 Hz to 4 Hz) with high-frequency pulses (100 Hz to 200 Hz), offering an alternative modality in pain management. [28]

Cryotherapy:

Cryotherapy refers to the application of cold as a therapeutic intervention. It is frequently employed to relieve chronic pain in targeted areas, either locally or more broadly. [17]

The Lewis hunting reaction refers to a process of alternating vasoconstriction and vasodilation in the extremities which exposed to cold. The term Lewis reaction is named after the scientist Thomas Lewis, who first described the effect of cold application in 1930. Vasoconstriction happens to reduce heat loss, but also results in greater cooling of the extremities where applied. After about five to ten minutes of cold exposure, the blood vessels in the extremities will suddenly go for vasodilation which itself may last 15 min before being replace by another episode of vasoconstriction. Alteration of constriction and dilation is called Lewis Hunting Reaction. This is possibly triggered by a sudden decrease in the release of neurotransmitters from the sympathetic nerves to the muscular coat of the arteriovenous anastomoses due to local application of cold. Vasodilation due to cold application increases blood flow to the area and subsequently the temperature of the part. A new cycle of vasoconstriction followed by the vasodilation, after which the process repeats itself. [45]

The mechanism of cryotherapy involves reducing nerve transmission velocity in pain fibres, which is believed to contribute to its analgesic effect and pain relief. Previous studies have demonstrated that cryotherapy significantly decreases both motor and sensory nerve conduction velocity. [17]

Ultrasound (US):

Ultrasound (US) has gained widespread popularity and recognition as a non-invasive treatment modality in clinical and physiotherapy settings. US devices utilize piezoelectric crystals to convert high-frequency alternating current into mechanical oscillation energy. These devices induce both thermal and non-thermal effects on tissues. The thermal effects transiently enhance the flexibility of tendons, ligaments, and joint capsules, resulting in decreased joint stiffness, alleviation of pain, reduction in muscle spasms, and temporary increase in blood flow. These combined effects make ultrasound a valuable tool in rehabilitation and pain management.[36]

Kinesio-Taping (KT):

The KT method was developed between 1973 and 1979 by Dr. Kenzo Kase with the intention of providing support for musculoskeletal structures without causing over immobilization or associated side effects. Dr. Kase commercially introduced KT tape in 1982, characterized by its elastic, cohesive, lightweight, and ventilating properties. Initially intended for oedema control, soft tissue support, joint protection, and alleviating heat associated with active inflammation, the tape's applications evolved to include extending the effects of therapy from clinic to home care and activities of daily living. [35]

The name "Kinesio" for this woven cotton and elastic tape is derived from the term "kinesiology," reflecting its application over and around muscles to facilitate movement control and achieve functional goals. This tape, featuring an elastic core wrapped within cotton and capable of stretching up to 140–150%, is equipped with a heat-sensitive acrylic adhesive to minimize the risk of latex allergies, making it suitable for use, especially in children. Despite lacking medicinal properties, the tape is water-resistant and can remain on the skin for a long time. Its special waved structure allows for alternating inputs of proprioception and somatosensorial. Additionally, this elastic tape can be easily applied or cut into special patterns to accommodate various alignments of the human body. [35]

CHAPTER: 2

ANATOMY

2. ANATOMY

The superior fibres of the trapezius originate from the medial third of the superior nuchal line and the median line of the ligamentum nuchae. Converging laterally and forward, they attach to the posterior edge of the lateral third of the clavicle. None of these higher fibres are positioned to exert a direct upward force on the clavicle or scapula.[31]

Some thin fibres perpendicular to the line of the upper spine swing around the neck, almost passing horizontally, and attach to the clavicle. The transverse ligaments of this upper part of the trapezius arise from the lower half of the ligamentum nuchae and enter the lateral third of the clavicle. The larger ligaments of the upper trapezius fibres run almost horizontally and have the ability to pull the lateral end of the clavicle medially and upward, rotating it around the sternoclavicular joint. Rotation of the clavicle indirectly elevates the scapula through the acromioclavicular joint.[32]

The vertical fibres of the upper trapezius muscle can compress the greater occipital nerve. This nerve is the medial branch of the dorsal primary division of the second cervical nerve and gives off sensory branches over the scalp. It is visible under the posterior arch of the Atlas, curves around the lower edge of the oblique muscle, and rests on the upper part of the trapezius and trapezium near their attachment to the side of the occiput. [33]

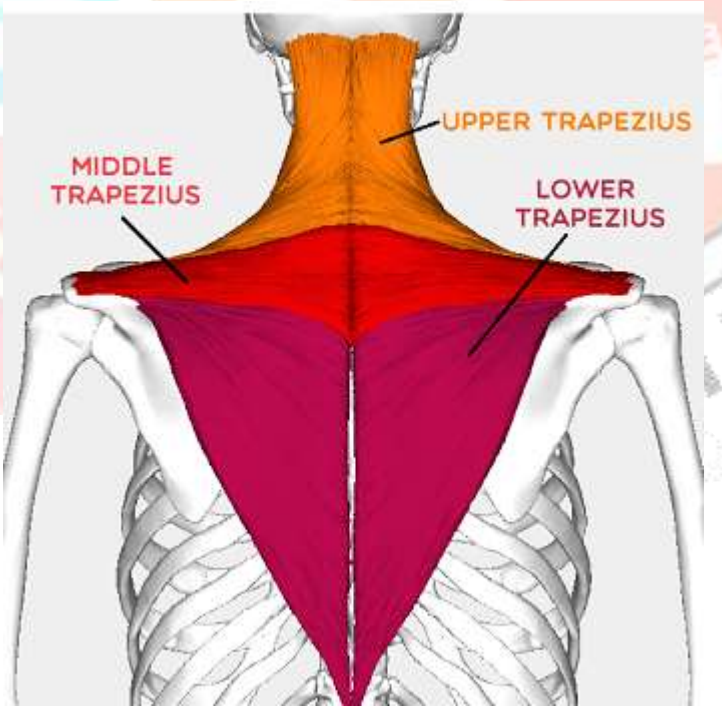


Fig.1: Fibers of Trapezius Muscle.

2.1 Innervation and Vascularization

The trapezius muscle receives its nerve supply from the spinal (external) branch of the accessory nerve (cranial nerve XI). This nerve originates from the spinal nucleus of the upper five to seven cervical segments. The fibres from these segments merge to form a trunk, which enters the posterior fossa of the cranium through the foramen magnum. Here, it briefly combines with the cranial (internal) root to create a single nerve trunk known as the accessory nerve. Exiting the jugular foramen, the accessory nerve branches into its cranial and spinal portions, with the spinal part typically passing laterally to the internal jugular vein. [11]

Although less common, it can also take a medial route or split around the internal jugular vein before descending obliquely, remaining medial to the styloid process and certain neck muscles. Often, it traverses through the sternocleidomastoid muscle or between its two heads, forming connections with fibres from C2 to C4. From there, it travels obliquely through the posterior triangle towards the trapezius muscle, situated in a fatty layer between the trapezius and levator scapulae muscles.[19]

While it was initially believed that the connections from C2 to C4 only carry sensory information, electromyographic and histochemical data indicate that these nerves have both sensory and motor functions, contributing to some extent to the contraction of the trapezius muscle. [18]

Vascular supply to the trapezius muscle; the upper portion is vascularized by a transverse muscular branch from the occipital artery. [6]

2.2 Function

Acting unilaterally, the upper portion of the trapezius muscle extends and laterally flexes the head and the neck toward the same side, aiding in the extreme rotation of the head so that the face turns to the opposite side. [26]

It can draw the clavicle bone (and indirectly the scapula) backward and raise them by rotating the clavicle at the sternoclavicular joint. It usually helps (but can be trained not to) carry the weight of the upper extremity (indirectly through the shoulder girdle) during standing or support the weight in the hand with the arm hanging. In conjunction with the levator scapulae muscle and upper digitations of the serratus anterior muscle, the upper trapezius muscle provides the upper component of the force couple necessary to rotate the glenoid fossa upward.

It showed that during both flexion and abduction of the arm, the electromyographic activity of the upper trapezius increased progressively and became vigorous. In another study, when the arm was actively maintained at 90° of abduction, all subjects showed significant electromyographic evidence of fatigue within 1 minute and, on average, in less than 30 seconds. [20]

CHAPTER: 3

REVIEW OF LITRATURE

3. REVIEW OF LITRATURE

1. **Ay S, Konak HE, Evcik D (2016).** Studied that the effectiveness of Kinesio Taping on pain and disability in cervical myofascial pain syndrome. This study showed that Kinesio Taping led to improvements in pain, pressure pain threshold, and cervical range of motion, but not disability in a short time. Therefore, Kinesio Taping could be used as an alternative therapy method in the treatment of patients with MPS. Procedure: This study was designed as a randomized, study. Sixty-one patients with MPS were randomly assigned into two groups. Group 1 (n=31) was treated with Kinesio Taping and group 2 (n=30) was treated sham taping five times by intervals of 3 days for 15 days. Additionally, all patients were given neck exercise program. Patients were evaluated according to pain, pressure pain threshold, cervical range of motion and disability. Pain was assessed by using Visual Analog Scale, pressure pain threshold was measured by using an algometer, and active cervical range of motion was measured by using goniometry. Disability was assessed with the neck pain disability index disability. Measurements were taken before and after the treatment.

2. **Carol Garcia. Jay Karri. (2020).** Studied that the role of local and non-local cryotherapy can be low-risk and easy treatment options to add in the management of chronic pain in carefully selected patients. However, long-term effects, a standardized approach, and careful study of other chronic pain syndromes should be considered in future research to further support the use of cryotherapy in the management of chronic pain. Procedure: A PubMed database search was performed to find human studies between the years 2000 and 2020 that included the application of cryotherapy in patients with chronic pain associated with chronic diseases. A review of the relevant references was also performed to gather more articles. Data was extracted, summarized into tables, and qualitatively analysed.

3. **Kwiecien SY, McHugh MP. (2021).** Studied that the role of cryotherapy in the treatment of injury and recovery from exercise. Cryotherapy methods like ice packs can help with pain and soreness after injuries or exercise, but their effectiveness varies. It's important to apply them promptly and keep muscles cool. Longer cooling times might be beneficial but can be impractical. Cryotherapy shouldn't be used regularly during training, and there's not enough evidence to support its impact on metabolism and inflammation.

4. **Wei-Ting et al (2015).** Studied that the Kinesio Taping Method for Myofascial Pain Control. The KT method is widely used in clinical practice for various conditions, including sports injuries and pain problems. Self-application of the tape can be challenging due to limited knowledge and

experience. Combining therapeutic exercises and postural adjustments may improve outcomes. Further research is needed to confirm the effectiveness of the KT method. Additionally, whole-body cryotherapy has been found effective as an analgesic treatment for myofascial pain syndrome in the trapezius muscle, according to a study conducted in Monterrey, Mexico.

5. **Noguera-Iturbe Y (2019).** Studied that Short-Term Effects of Kinesio Taping in the Treatment of Latent and Active Upper Trapezius Trigger Points: two Prospective, Randomized, Sham-Controlled Trials Overall the results did not provide any evidence for the usefulness of the space-correction KT technique in the treatment of patients with latent or active UT myofascial trigger points. Procedure: 97 volunteers with latent MTrPs were recruited from the University (trial A), and 37 with active MTrPs from clinics in Elche, Spain (trial B). Participants received Kinesio Tape application for 72 hours. The primary outcome was pressure pain threshold (PPT) measured using an algometer. The tape was applied by a certified physiotherapist. Participants were evaluated before, 15 minutes after, and 72 hours after tape application. Pressure algometry is a reliable tool for assessing pain sensitivity.

6. **Parab M, Bedekar N, Shyam A (2020).** Studied that Immediate effects of myofascial release and cryo-stretching in management of upper trapezius trigger points – A comparative study. The study found that both MFR and cryo-stretching were effective in management of upper trapezius trigger point. Procedure: In a study at Sancheti Institute of Joint Replacement Centre, Pune, 54 participants (age range: 20-40 years) were randomly assigned to two groups. They received either myofascial release or cryo-stretching treatment for neck pain. Measurements of cervical range of motion and pressure threshold were taken before and after treatment. Myofascial release involved direct pressure without sliding, while cryo-stretching included ice application followed by stretching and isometric contractions. Post-treatment, participants performed active neck exercises.

7. **Doraisamy MA (2011).** The majority of MTrPs research focuses on pain concerns. When the maximum strength of the upper trapezius was compared in this study between individuals with and without latent MTrPs, no statistically significant difference was found. On the other hand, a gross-motor exercise in which the subject shrugged their shoulder against resistance was used to measure strength. If the participant had been given a task involving a specific combination of movements, like lifting boxes, where the pace of the task would have depended on the synergists' activation patterns and the firing rate of the muscles moving the shoulder complex, the results might have been different. Future research should examine how individuals with and without latent MTrPs perform on functional repetitive tasks.

8. **Michal Elboim Gabyzon (2021).** The current results support the potential application of US-KHz therapy as an effective treatment modality for MTrPs, by affecting elasticity and muscle flexibility (represented in this study by ROM) and improving muscle performance of the muscle. If this efficacy will be confirmed in a further full-scale clinical trial, US-KHz can be a therapeutic alternative to invasive treatments such as dry needling in MTrPs conditions and can be added to the physical therapist's toolbox. US KHz is a relatively new modality and only a few studies have examined its effect, therefore, high-quality, especially randomized controlled trials, are essential to establish its efficacy and treatment protocols.

9. **Jay P. Shah, MD, (2015). The pathogenesis and** pathophysiology of myofascial trigger points (MTrPs) and their role in myofascial pain syndrome (MPS) remain unclear. MPS involves muscle and fascia, with MTrPs central to diagnosis and treatment. New imaging methods show various objective findings in active MTrPs. MTrPs are linked to high symptom burden and reduced function. Dry needling provides symptom relief, but its mechanism is unknown. Key questions include MPS etiology, MTrPs role, pain mechanisms, and biochemical milieu. Future research must identify and target perpetuating factors for effective treatment.

10. **MANUEL SAAVEDRA-HERNÁNDEZ (2012).** Patients with mechanical neck pain who received cervical thrust manipulation or Kinesio Taping exhibited similar reductions in neck pain intensity and disability and similar changes inactive cervical range of motion, except for rotation. Changes in neck pain surpassed the minimal clinically important difference, whereas changes in dis-ability did not. Changes in cervical range of motion were small and not clinically meaningful. Because we did not include a control or placebo group in this study, we cannot rule out a placebo effect or natural changes over time as potential reasons for the improvements measured in both groups.

11. **Mirsad Muftic, Ksenija Miladinovic (2013).** Results of the study indicate a significant reduction of pain in degenerative musculoskeletal system after continuous treatment with ultra sound. On VAS with numeration 0-10, average score for reduction of pain in the first group was M=4.74, in the second group was M=3.97. Varying intensity and duration of ultrasound application showed no significant effect on the degree of pain reduction. Body mass index showed significant negative correlation with the degree of pain reduction in the group of patients who have been treated with in tensity 04W/cm2 for 8 minutes, and the patient age, gender and location of pain showed no significant correlation in either group of patients.

12. TomaszHalski (2015). The application of all three types of tapes does not influence the resting bioelectrical activity of UT muscle and may not lead to a reduction in muscle tone in the case of MTrPs. However, in comparison to CT and sham, the KT application reduces the subjective pain sensation, what confirms the scientific reports about its analgesic influence. Authors suggest further verification of CT and KT application methods to compare their therapeutic effect and also to compare them with different methods used in the therapy of MTrPs. therefore, it is appropriate to continue measurements of KT and CT influence on bioelectrical activity of muscles with MTrPs, pain, and cervical ROM. Further experimental research should include a larger number of participants and more objective assessment tools.

CHAPTER: 4

METHODOLOGY

4. METHODOLOGY

4.1 RESEARCH DESIGN

Comparative Study.

4.2 SAMPLING DESIGN

Simple Random Sampling**.**

4.3 STUDY POPULATION

Individual with upper trapezius trigger point**.**

4.4 SAMPLE SIZE

30 Subjects

Group- A: - 15 (Kinesio-Taping, Ultrasound, Cryotherapy)

Group- B: - 15 (TENS, Ultrasound, Cryotherapy**)**

4.5 MATERIAL USED

i. Ultrasound.
ii. Cold pack.
iii. Kinesiology-Tape.
iv. Scissor.
v. Aqua sonic gel.
vi. Cotton.
vii. TENS.

viii. Micropore tape

4.6 VARIABLE

Independent Variable- Pain

4.7 STUDY DURATION -6 Days

4.8 STUDY SETTING

Physiotherapy OPD, School of Physiotherapy, Abhilashi University**.**

4.9 SUBJECT SELECTION CRITERIA:

INCLUSION CRITERIA

i. Age-
   a) 20-30 years
   b) 30-40 years

ii. Gender: - Both male and females.

iii. Patient with unilateral trigger point on upper trapezius.

EXCLUSION CRITERIA

i. Cervical disc prolapses, migraine.

ii. Patient on medication.

iii. Cervical fracture and cervical fixation.

4.10 OUTCOME MEASURES

i. ROM- Goniometer**.**

4.11 MEASUREMENT TOOLS

i. Visual analogue scale (VAS)

ii. Northwick Park Neck Pain Questionnaire.

iii. Neck Bournemouth Questionnaire**.**

4.12 PROCEDURE

Based on selection criteria 30 subjects were selected randomly and allotted in two groups A & B. A screening test was done for both the groups, where a careful medical history and physical examination was done

Eligible patients were informed about the study objectives and procedures and those who agreed to participate informed consent was taken. Pre-test for myofascial trigger points (MTrPs) of upper trapezius muscle was assessed by Visual analogue scale (VAS), Northwick Park Neck Pain Questionnaire, Neck Bournemouth Questionnaire and ROM with Goniometer.

30 patients with Myofascial trigger point in upper trapezius were divided into two groups randomly intervened with TENS, Cryotherapy and Ultrasound (Group A) and Kinesio- taping, Ultrasound and Cryotherapy in (group B) in upper trapezius trigger point.

Group A: - Kinesio-Taping, Cryotherapy and Ultrasound.

Group B: -TENS, Cryotherapy and Ultrasound.

On the first day and the end of the week, patients in both groups were evaluated for pain and ROM.

4.13 TREARTMENT PROTOCOL

Group A:

Kinesio-Taping: myofascial pain syndrome (MPS) [36]

Frequency: Once a day in X shape.

No of days: 6 days.

Procedure for X shape taping:

1. The initial pain level on the VAS was recorded before the treatment.

2. The patient was positioned in a sitting position.

3. The skin was cleaned & dried out around the neck area (upper trapezius)

4. The strip of kinesiology tape was cut in the shape of the letter "X". The note was taken, that the base of the X should be long enough to cover the anchor point (above the nodule) and the arm of the X should be long enough to extend along the path of the neck.

5. The base of the X strip is applied on the anchor point just above the trapezius.

6. The patient was instructed to wear the tape for a day following proper care and removal instructions.

7.Retaping was done for a day as the same as the previous day of application.

Post intervention measures were recorded & data was analysed for the results.

Fig.2: Application of X- Shape taping in Upper Trapezius Region

Cryotherapy: Chronic Pain. [17]

Time: 10 min

Frequency: once a day

No of Days: 6 days

Fig.3: Application of Cryotherapy in Upper Trapezius Region.

Ultrasound: Myofascial Pain Syndrome. [38]

Time: 8min

Frequency: 1MHz

No of days: 6 Days

Type: Continuous

Pattern: Concentric circles

Fig.4: Application of Ultrasound in Upper Trapezius Region.

Group B:

TENS: latent myofascial trigger point. [31]

Time: 10 min

Mode: burst

Frequency: 100Hz

No of days: 6 days

Fig.5: Application of TENS in Upper Trapezius Region.

Cryotherapy: Chronic Pain. [17]

Time: 10 min

Frequency: Once a day

No of Days: 6 days

Fig.6: Application of Cryotherapy in Upper Trapezius Region.

Ultrasound: Myofascial Pain Syndrome. [38]

Time: 8min

Frequency: 1MHz

No of days: 6 Days

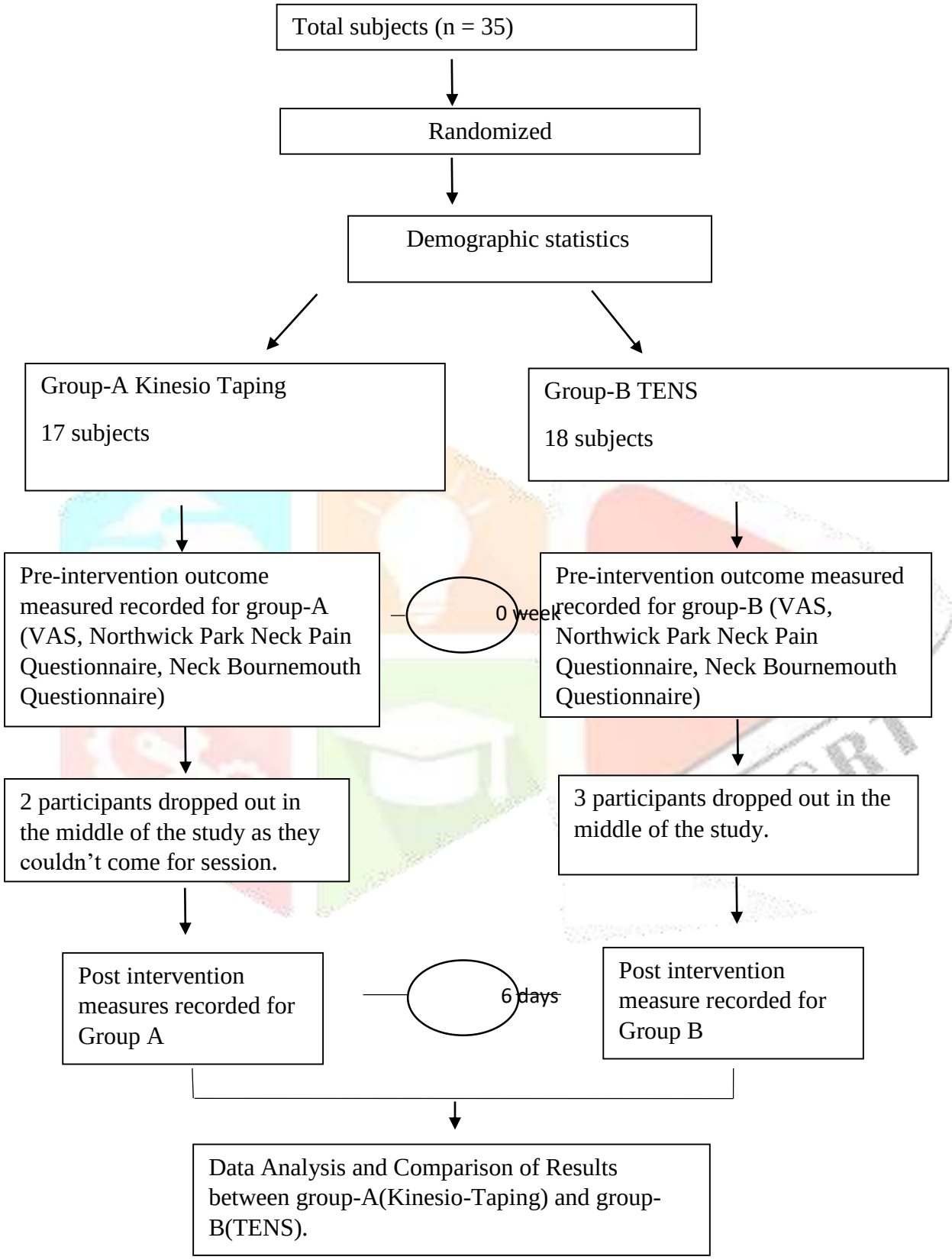
Type: Continuous

Pattern: Concentric circles

Fig.7: Application of Ultrasound in Upper Trapezius Region.

STUDY PROTOCOL:

- 40 patients underwent screening for MTrPs.
- 35 patients were identified with MTrPs on Upper Trapazius.



Data Analysis

All data were analysed using SPSS (v 29.0.2.0). All the data for normality were tested by using the Shapiro-Wilk test.

For determining the difference before and after for both groups, paired t test was used. To compare the difference between two groups. A level of significance of $p < 0.001$ was accepted.

The coefficient of variation (CV) is used as measure of relative variability, calculated by dividing the standard deviation by the mean and expressing it as a percentage. The CV values in the table reveal that treatments like Taping and TENS effectively reduce average pain scores (shown by lower mean values). However, they also show higher variability in outcomes after treatment (indicated by increased CV values). This suggests that while these treatments generally work, individual responses vary widely, indicating that their effects are not consistent for everyone.

RESULT

Result:

A total of 35 patients were taken in the study out of which 5 dropped out. 30 patients were included in the study and randomly divided into 2 groups: Group- A(Kinesio-Taping) and Group- B(TENS), both included 15 subjects each.

Table 1. DEMOGRAPHIC CHARACTERISTICS

CHARACTERISTICS	GROUP-A(Kinesio-Taping)	GROUP-B(TENS)
AGE GROUP 20-30 30-40	 6 9	 8 7
GENDER MALE FEMALE	 5 10	 3 12
MEAN	7.5	7.5

The above given table represents the demographic characteristics of the experiment. In the group-A (Kinesio-Taping), there were 6 participants aged between 20-30 and 9 participants aged between 30-40. The group consist of 5 males and 10 females. In Group-B (TENS), there were 8 participants aged between 20-30 and 7 participants aged between 30-40. The group consist of 3 males and 12 females.

Table 2. Comparison of Pre- and Post-Treatment Outcomes

VARIABLE	TAPING					TENS				
	MEAN		SD	CV		MEAN		SD	CV	
Northwick Park Neck Pain Questionnaire	PRE	POST	24.077	PRE	POST	PRE	POST	10.524	PRE	POST
	76.067	9.933		0.162	0.785	76.200	26.533		0.145	0.377
Visual Analogue Scale	7.867	1.333	0.983	0.126	0.732	8.267	3.267	0.706	0.097	0.182
Neck Bournemouth Questionnaire	56.333	8.533	35.512	0.115	0.410	56.200	20.267	28.724	0.102	0.185

This table evaluates the effects of Taping and TENS treatments on neck pain using three outcome measures: the Northwick Park Neck Pain Questionnaire, Visual Analogue Scale, and Neck Bournemouth Questionnaire. For Taping, the mean scores pre- and post-treatment for the Northwick Park Neck Pain Questionnaire are 76.067 and 9.933, respectively, with a standard deviation (SD) of 24.077 and a coefficient of variation (CV) changing from 0.162 pre-treatment to 0.785 post-treatment. For TENS, the mean scores pre- and post-treatment are 76.200 and 26.533, with an SD of 10.524 and a CV from 0.145 to 0.377.

The Visual Analogue Scale for Taping shows a mean reduction from 7.867 to 1.333, with an SD of 0.983 and CVs of 0.126 and 0.732, respectively. TENS treatment shows a reduction from 8.267 to 3.267, with an SD of 0.706 and CVs of 0.097 and 0.182. For the Neck Bournemouth Questionnaire, Taping shows a decrease in mean scores from 56.333 to 8.533, with an SD of 35.512 and CVs of 0.115 and 0.410. TENS shows a reduction from 56.200 to 20.267, with an SD of 28.724 and CVs of 0.102 and 0.185. These values indicate that both treatments significantly improve neck pain and discomfort, with Taping showing a higher degree of variation in outcomes.

Table 3. Outcome Measure of Kinesio-Tape and TENS

OUT COME MEASURE	TENS		KINESIO TAPING	
	t VALUE	p VALUE	t VALUE	p VALUE
Northwick Park Neck Pain Questionnaire	12.115	0.001	23.538	0.001
Visual Analogue Scale	20.917	0.001	22.483	0.001
Neck Bournemouth Questionnaire	19.640	0.001	26.793	0.001

The table presents the effectiveness of TENS and Kinesio Taping treatments for neck pain, using three outcome measures: the Northwick Park Neck Pain Questionnaire, Visual Analogue Scale, and Neck Bournemouth Questionnaire. For the Northwick Park Neck Pain Questionnaire, TENS shows a t-value of 12.115 and a p-value of 0.001, while Kinesio Taping has a t-value of 23.538 and a p-value of 0.001. The Visual Analogue Scale shows t-values of 20.917 and 22.483 for TENS and Kinesio Taping, respectively, both with p-values of 0.001. The Neck Bournemouth Questionnaire reports t-values of 19.640 for TENS and 26.793 for Kinesio Taping, with p-values of 0.001 for both. These consistently low p-values indicate that the improvements in neck pain and discomfort for both treatment groups are statistically significant, demonstrating their reliability and effectiveness in clinical settings.

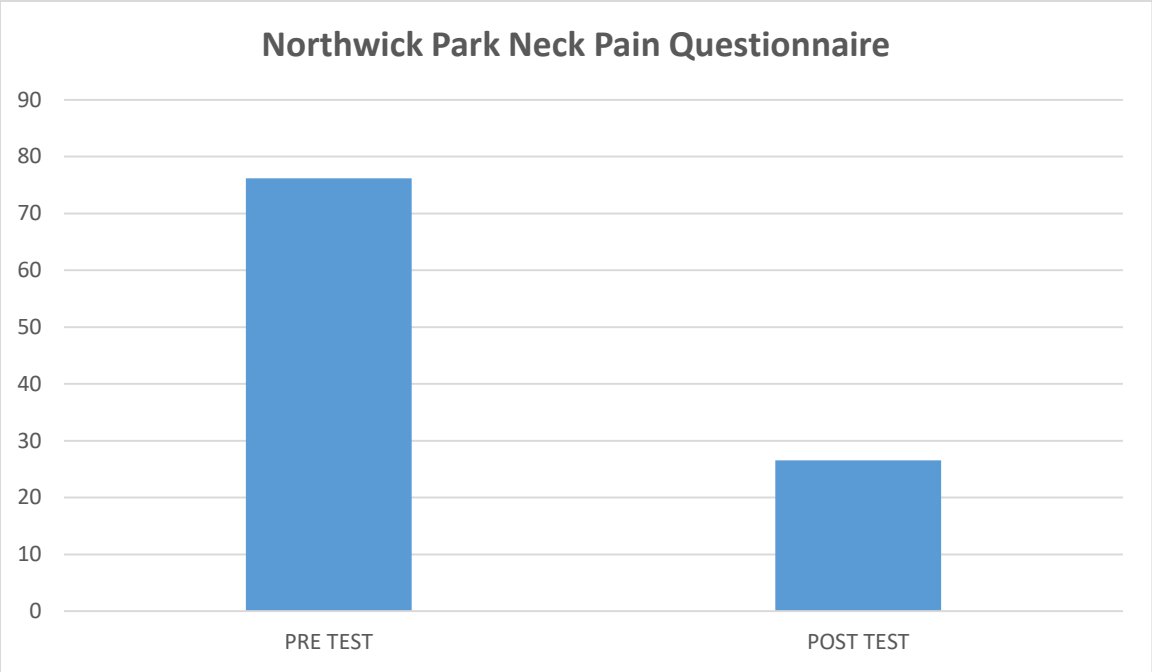
Table 4. Comparison of Mean Difference

Mean Differences	TENS Mean Difference	Kinesio Taping Mean Difference
Northwick Park Neck Pain Questionnaire	49.67	66.127
Visual Analogue Scale	5.00	6.53
Neck Bournemouth Questionnaire	35.94	47.80

The table compares the mean differences in outcomes from the Northwick Park Neck Pain Questionnaire, the Visual Analogue Scale, and the Neck Bournemouth Questionnaire between two treatment methods: TENS (Transcutaneous Electrical Nerve Stimulation) and Kinesio Taping. For the Northwick Park Neck

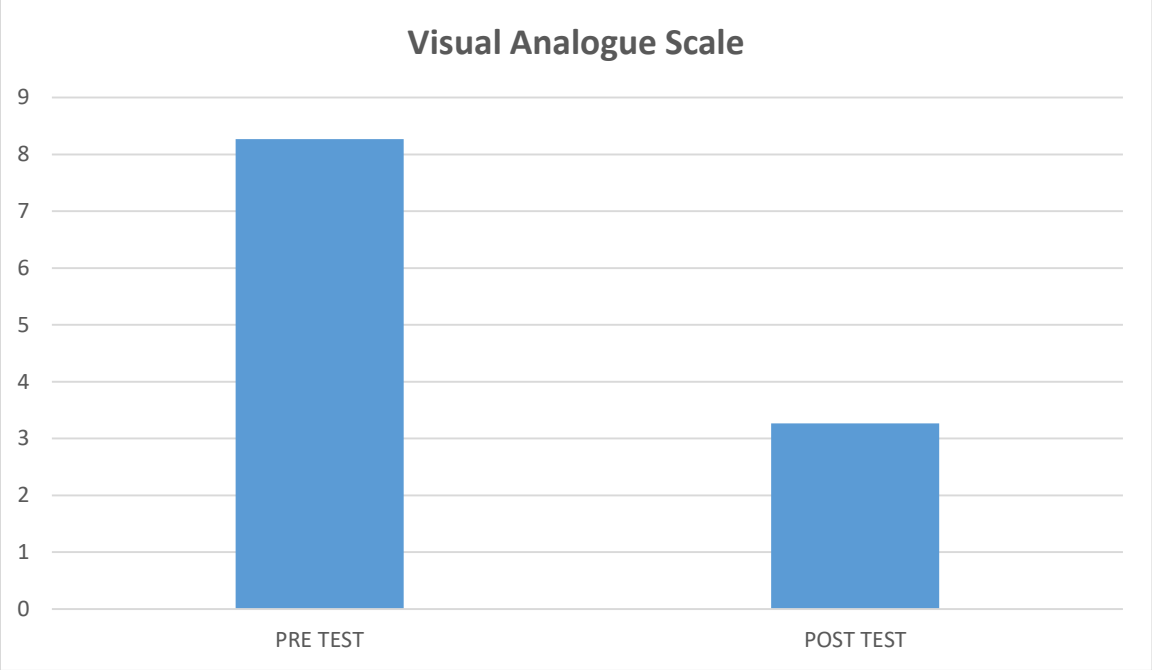
Pain Questionnaire, the mean difference is 49.67 for TENS and 66.127 for Kinesio Taping. For the Visual Analogue Scale, the mean difference is 5.00 for TENS and 6.53 for Kinesio Taping. For the Neck Bournemouth Questionnaire, the mean difference is 35.94 for TENS and 47.80 for Kinesio Taping. This suggests that Kinesio Taping generally shows higher mean differences across these measures compared to TENS.

Fig no. 8: t-test for TENS (Northwick Park Neck Pain Questionnaire)



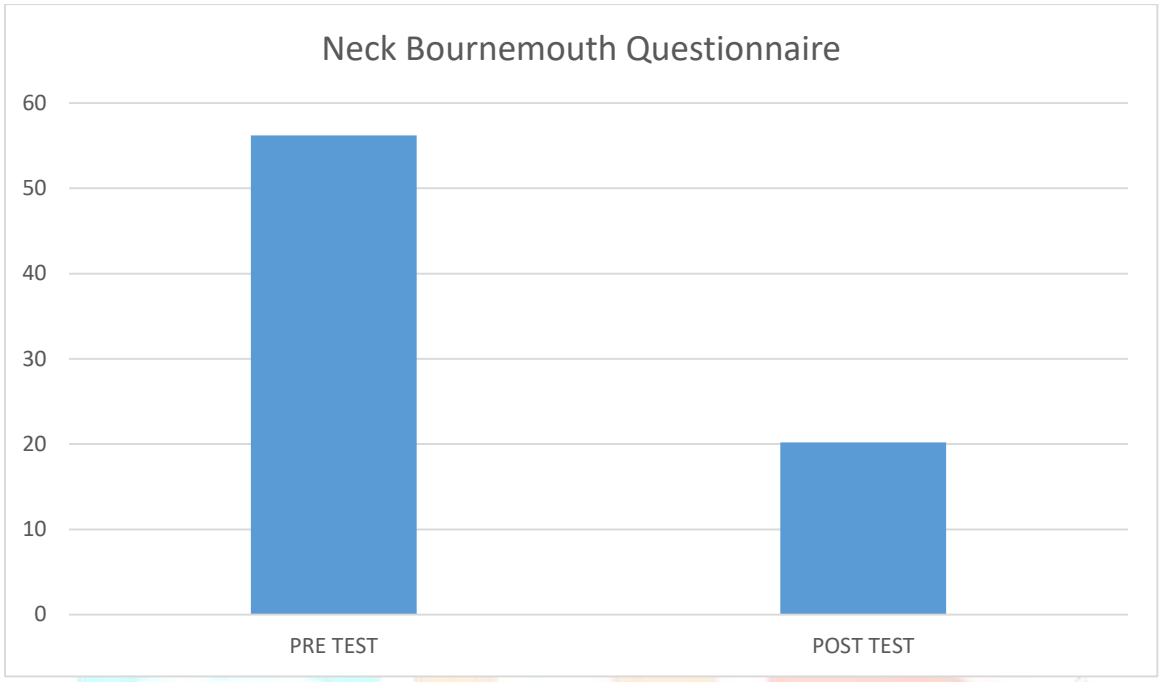
This graph displays the results of a pre-test and post-test conducted to evaluate the effectiveness of TENS on MTrPs by Northwick Park Neck Pain Questionnaire.

Fig no. 9: t-test for TENS (Visual Analogue Scale)



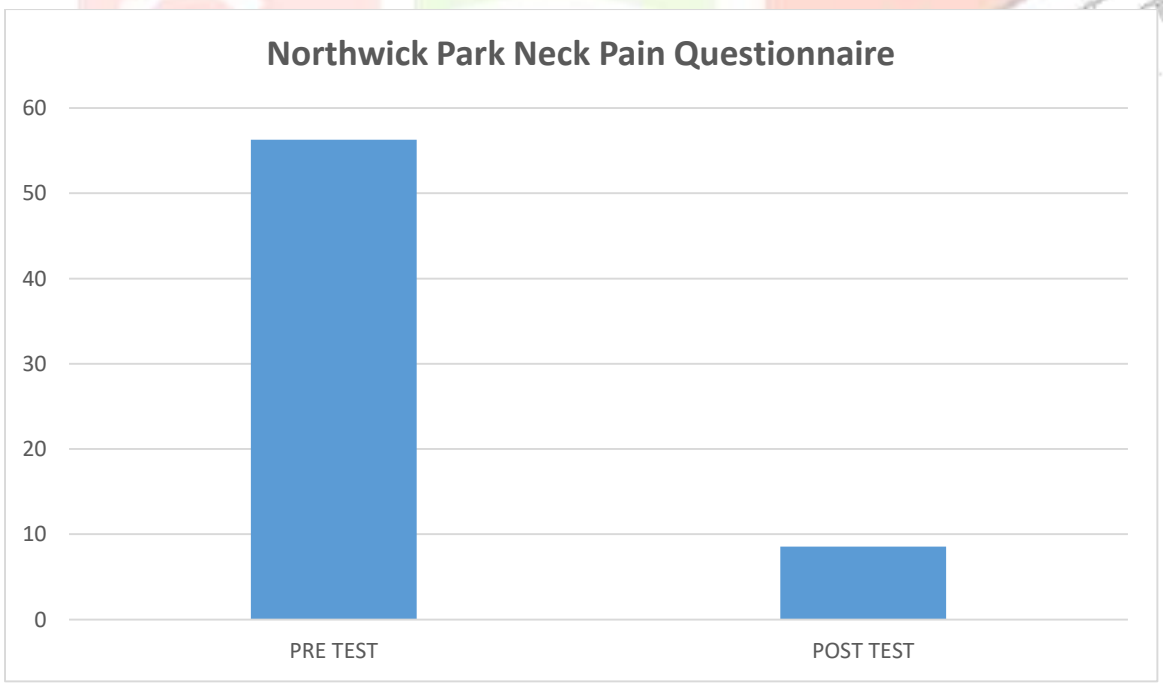
The graph shows the results of a pre-test and post-test evaluating the effectiveness of TENS therapy on pain levels by VAS on MTrPs.

Fig no. 10: t-test for TENS (Neck Bournemouth Questionnaire)



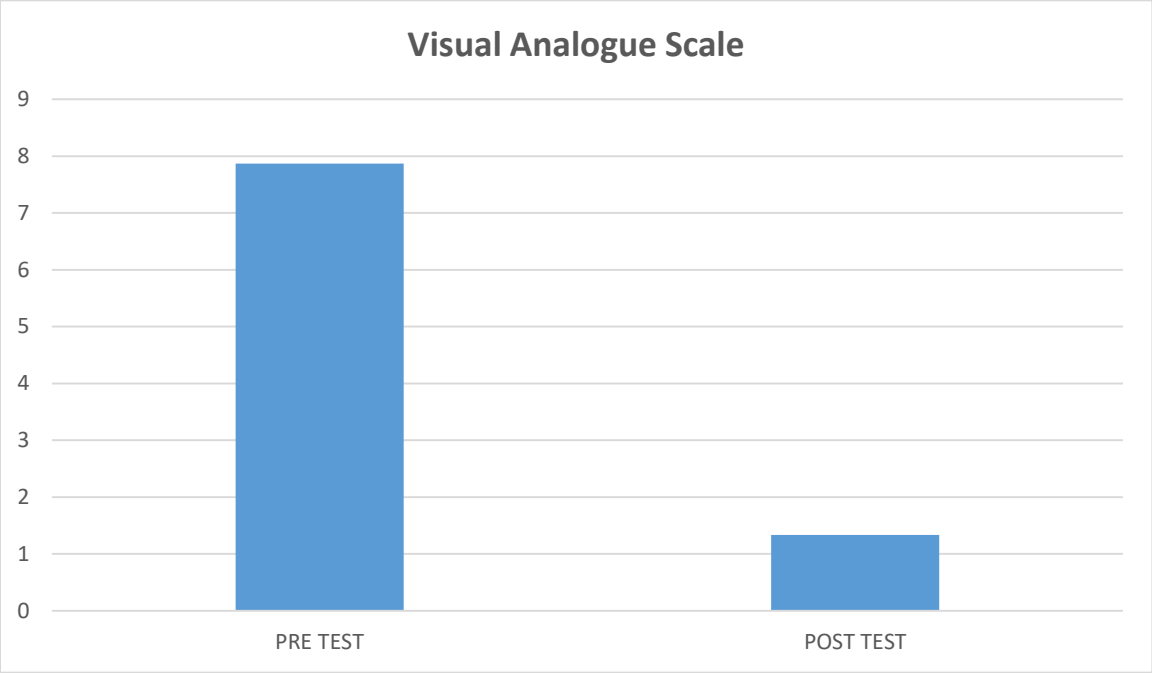
The graph presents the pre-test and post-test results assessing the impact of TENS on MTrPs using Neck Bournemouth Questionnaire.

Fig no. 11: t-test for KINESIO TAPING GROUP (Northwick Park Neck Pain Questionnaire)



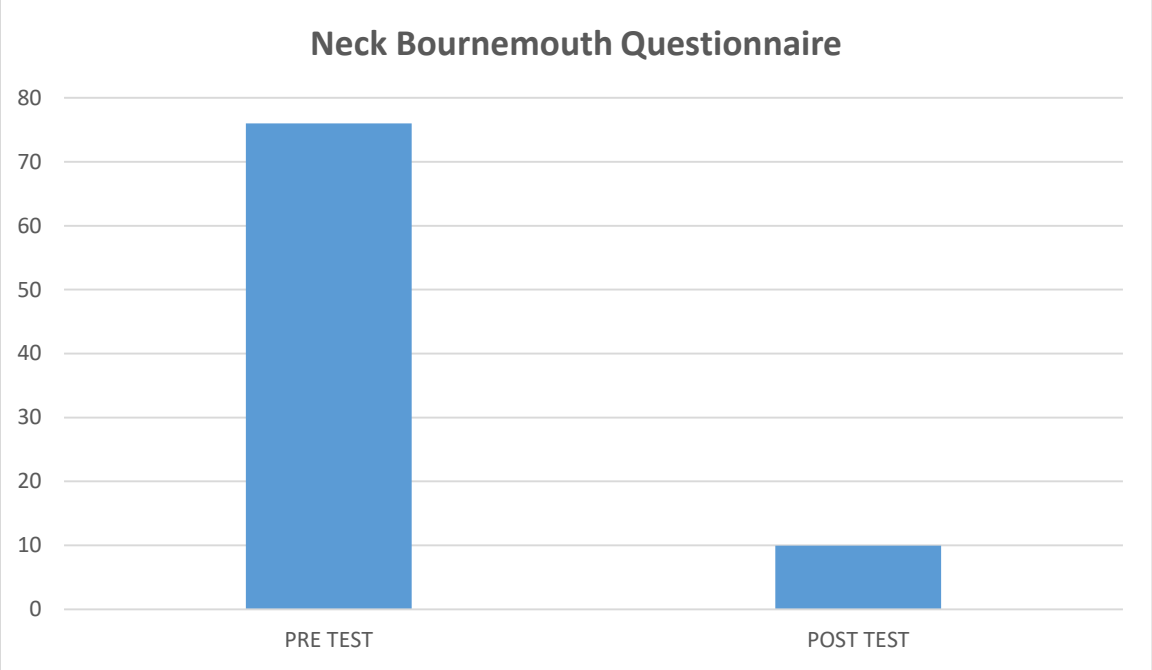
This graph illustrates the pre and post results of using Kinesio Taping by Northwick Park Neck Pain Questionnaire on MTrPs.

Fig no. 12: t-test for KINESIO TAPING GROUP (Visual Analogue Scale)



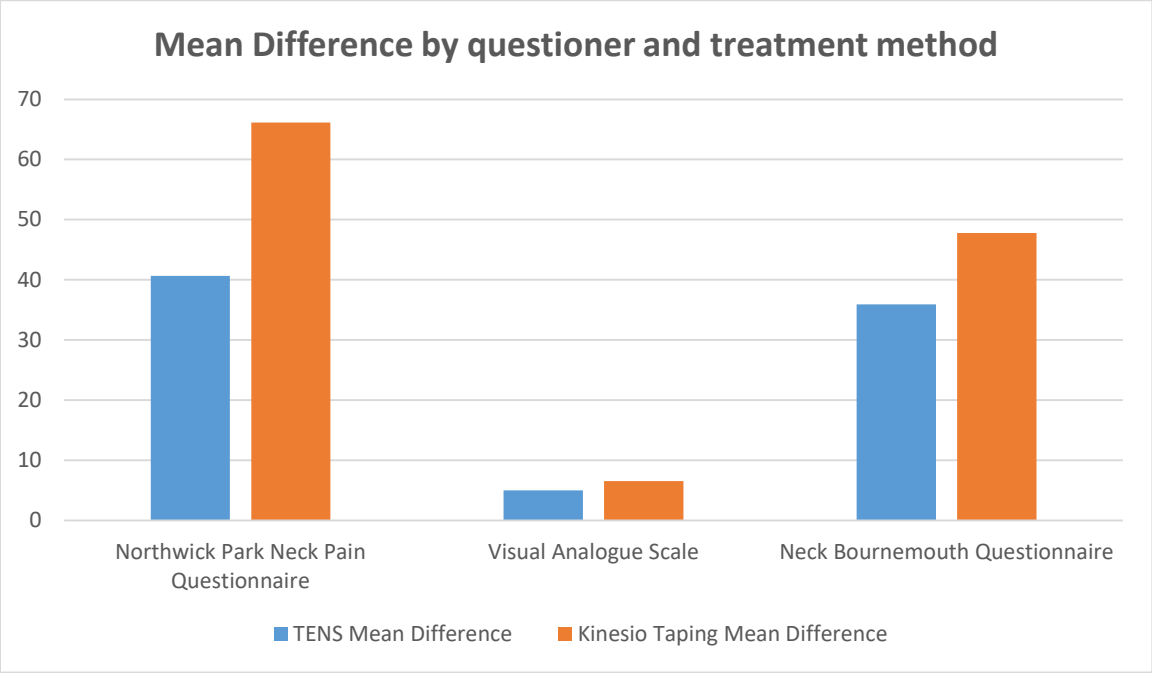
This graph presents the pre and post results of using Kinesio Taping using the Visual Analogue Scale (VAS) MTrPs.

Fig no. 13: t-test for KINESIO TAPING GROUP (Neck Bournemouth Questionnaire)



This graph shows the results of using Kinesio Taping by Neck Bournemouth Questionnaire on MTrPs.

Fig no. 14: Mean Difference by questioner and treatment method



Interpretation

Northwick Park Neck Pain Questionnaire: Kinesio Taping has a significantly higher mean difference (66.127) compared to TENS (49.67).

Visual Analogue Scale: Kinesio Taping shows a higher mean difference (6.53) compared to TENS (5.00).

Neck Bournemouth Questionnaire: Kinesio Taping demonstrates a higher mean difference (47.80) compared to TENS (35.94).

DISCUSSION

Myofascial trigger points (MTrPs) in the upper trapezius muscle are a common source of neck and shoulder pain. Various modalities are used to treat these trigger points, including Transcutaneous Electrical Nerve Stimulation (TENS), ultrasound therapy, cryotherapy, and Kinesio taping (KT). This study aimed to compare the effectiveness of two treatment protocols: TENS, ultrasound, and cryotherapy versus Kinesio-Taping, ultrasound, and cryotherapy in alleviating pain associated with MTrPs in the upper trapezius.

A total of 30 participants with MTrPs in the upper trapezius were randomly assigned to two groups. Group A received KT, ultrasound, and cryotherapy, while Group B received TENS, ultrasound, and cryotherapy. Pain levels were assessed using the Visual Analogue Scale (VAS), the Northwick Park Neck Pain Questionnaire, and the Neck Bournemouth Questionnaire before and after the treatment.

Both groups showed significant reductions in pain after the treatment. However, Group A (KT, ultrasound, cryotherapy) exhibited a greater reduction in pain compared to Group B (TENS, ultrasound, cryotherapy). These findings align with previous studies indicating the efficacy of Kinesio-Taping in reducing pain and improving functional outcomes in patients with MTrPs.

The current study's findings are consistent with previous research. For instance, González-Iglesias et al. (2017) found that Kinesio-Taping significantly improved pain pressure thresholds and reduced pain intensity in patients with MTrPs. Similarly, Parreira et al. (2017) reported effective pain reduction in musculoskeletal conditions with Kinesio-Taping. Other studies, such as Saavedra-Hernández et al. (2018), have demonstrated that Kinesio-Taping provides pain relief comparable to traditional physiotherapy modalities but with additional functional benefits.

Kinesio-Taping works through several mechanisms:

Mechanical Lifting Effect: By lifting the skin, Kinesio-Taping increases space in the underlying tissues, reducing pressure and improving blood and lymphatic flow (Kase et al. 2016).

Pain Modulation: Kinesio-Taping can modulate pain through the gate control theory by stimulating cutaneous mechanoreceptors, thereby inhibiting nociceptive signals (González-Iglesias et al. 2017)

TENS is effective in pain management through:

Gate Control Theory: It inhibits pain signal transmission by stimulating non-painful sensory nerves (Sluka et al. 2016).

Endorphin Release: TENS promotes the release of endogenous opioids, which help alleviate pain (Johnson et al. 2015)

Ultrasound therapy helps in:

Thermal Effects: It increases tissue temperature, enhancing blood flow and reducing muscle spasms (Zeng et al. 2017).

Non-Thermal Effects: It facilitates tissue healing through cavitation and acoustic streaming, which improve cellular processes (Robertson & Baker 2016).

Cryotherapy aids in pain reduction by:

Vasoconstriction: It decreases blood flow to the affected area, reducing inflammation and swelling (Bleakley et al. 2015).

Nerve Conduction Velocity: Cryotherapy slows down nerve conduction, thereby reducing pain sensation (Algafly & George 2017).

The study concluded that both treatment protocols effectively reduced pain associated with MTrPs in the upper trapezius. However, the Kinesio-Taping, ultrasound, and cryotherapy combination proved more effective than the TENS, ultrasound, and cryotherapy combination. This suggests that Kinesio-Taping may offer additional benefits in managing MTrPs, potentially due to its mechanical and neuromodulator effects.

The data presents the mean ± SD values for two interventions, Taping and TENS, assessed using the Northwick Park Neck Pain Questionnaire, the Visual Analogue Scale, and the Neck Bournemouth Questionnaire. For Taping, the Northwick Park Neck Pain Questionnaire shows a reduction from 76.067 ± 24.077 (PRE) to 9.933 ± 24.077 (POST), the Visual Analogue Scale from 7.867 ± 0.983 to 1.333 ± 0.983, and the Neck Bournemouth Questionnaire from 56.333 ± 35.512 to 8.533 ± 35.512. For TENS, the Northwick Park Neck Pain Questionnaire changes from 76.200 ± 10.524 (PRE) to 26.533 ± 10.524 (POST), the Visual Analogue Scale from 8.267 ± 0.706 to 3.267 ± 0.706, and the Neck Bournemouth Questionnaire from 56.200 ± 28.724 to 20.267 ± 28.724. The coefficient of variation (CV) values indicates the relative variability of the data, with Taping showing more variability post-intervention compared to TENS. Overall, both interventions resulted in significant improvements in neck pain and related symptoms.

Limitations

- Sample size was small.

Future of study

In the future of my study, I will utilize advanced modalities and techniques with these protocol to enhance their effectiveness on patients. Patients will be called for follow-up appointments regularly. Follow up assessment is needed to find the effectiveness of pain and functional outcomes.

Conclusion

From the above findings we can conclude that Kinesio Taping is more effective than TENS in reducing neck pain and related symptoms across all questionnaires. The higher mean differences in the Kinesio Taping group suggest a greater improvement in the condition of the patients.

Clinical significance

The study on physiotherapeutic interventions for upper trapezius myofascial trigger points (MTrPs) holds significant clinical implications. By evaluating treatments like Kinesio-Taping, TENS, Cryotherapy, and Ultrasound therapy, it aims to enhance evidence-based practice in managing such conditions. The findings will guide physiotherapists in selecting the most effective treatment combinations, thereby improving pain management and functional outcomes for patients.

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APPENDICES

CONSENT FORM

I ……., agree to receive treatment for myofascial trigger point. I understand the potential benefits and purpose of this treatment. I have no objection and given my consent to proceed with TENS, cryotherapy and ultrasound.

Patient's signature: .....

Date: ……

CONSENT FORM

I ……., agree to receive taping treatment for myofascial trigger point. I understand the potential benefits and purpose of this treatment. I have no objection and given my consent to proceed with taping therapy with cryotherapy and ultrasound.

Patient's signature: .....

Date: ……

THE VISUAL ANALOGUE SCALE (VAS):

NECK BOURNEMOUTH QUESTIONNAIRE

Patient Name _____ Date _____

Instructions: The following scales have been designed to find out about your neck pain and how it is affecting you. Please answer ALL the scales, and mark the ONE number on EACH scale that best describes how you feel.

1. Over the past week, on average, how would you rate your neck pain?

No pain Worst pain possible

0 1 2 3 4 5 6 7 8 9 10

2. Over the past week, how much has your neck pain interfered with your daily activities (housework, washing, dressing, lifting, reading, driving)?

No interference Unable to carry out activity

0 1 2 3 4 5 6 7 8 9 10

3. Over the past week, how much has your neck pain interfered with your ability to take part in recreational, social, and family activities?

No interference Unable to carry out activity

0 1 2 3 4 5 6 7 8 9 10

4. Over the past week, how anxious (tense, uptight, irritable, difficulty in concentrating/relaxing) have you been feeling?

Not at all anxious Extremely anxious

0 1 2 3 4 5 6 7 8 9 10

5. Over the past week, how depressed (down-in-the-dumps, sad, in low spirits, pessimistic, unhappy) have you been feeling?

Not at all depressed Extremely depressed

0 1 2 3 4 5 6 7 8 9 10

6. Over the past week, how have you felt your work (both inside and outside the home) has affected (or would affect) your neck pain?

Have made it no worse Have made it much worse

0 1 2 3 4 5 6 7 8 9 10

7. Over the past week, how much have you been able to control (reduce/help) your neck pain on your own?

Completely control it No control whatsoever

0 1 2 3 4 5 6 7 8 9 10

_____
Examiner

OTHER COMMENTS: _____

With Permission from: Bolton JE, Humphreys BK: The Bournemouth Questionnaire: A Short-form Comprehensive Outcome Measure. II. Psychometric Properties in Neck Pain Patients. *JMPT* 2002; 25 (3): 141-148.

Optimal Performance Physical Therapy

Northwick Park Neck Pain Questionnaire

Name: _____ **Signature:** _____ **Date:** _____

Please Read: This questionnaire has been designed to give us information as to how Neck Pain has affected your ability to manage in everyday life. Please answer every section and mark in each section ONLY The ONE BOX which applies to you. We realize you may consider that two of the statements in any one section relate to you, BUT PLEASE MARK THE ONE BOX THAT MOST CLOSELY DESCRIBES YOUR PROBLEM.

Section 1 - Pain Intensity:

- ☐ A. I have no pain at the moment.
- ☐ B. My pain is very mild at the moment.
- ☐ C. My pain is moderate at the moment.
- ☐ D. My pain is fairly severe at the moment.
- ☐ E. My pain is very severe at the moment.

Section 2 - Pain and Sleeping

- ☐ A. My sleep is never disturbed by pain.
- ☐ B. My sleep is occasionally disturbed by pain.
- ☐ C. My sleep is regularly disturbed by pain.
- ☐ D. Because of pain I have less than 5 hours sleep in total.
- ☐ E. Because of pain I have less than 2 hours sleep in total.

Section 3 - Pins, Needles or Numbness in Arms at Night

- ☐ A. I have no pins and needles or numbness at night.
- ☐ B. I have occasional pins and needles or numbness at night.
- ☐ C. My sleep is regularly disturbed by pins and needles or numbness.
- ☐ D. Because of pins and needles or numbness I have less than 5 hours sleep in total.
- ☐ E. Because of pins and needles or numbness I have less than 2 hours sleep in total.

Section 4 - Duration of Symptoms

- ☐ A. My neck and arms feel normal all day.
- ☐ B. I have symptoms in my neck or arms on walking, which last less than one hour.
- ☐ C. Symptoms are present on & off for a total period of 1-4 hrs.
- ☐ D. Symptoms are present on & off for a total of more than 4 hrs.
- ☐ E. Symptoms are present continuously all day.

Section 5 -Carrying

- ☐ A. I can carry heavy objects without extra pain.
- ☐ B. I can carry heavy objects, but they give me extra pain.
- ☐ C. Pain prevents me from carrying heavy objects, but I can manage medium weight objects.
- ☐ D. I can only lift light weight objects.
- ☐ E. I cannot lift anything at all.

Section 6 - Reading and Watching TV

- ☐ A. I can do this as long as I wish with no problems.
- ☐ B. I can do this as long as I wish, if I'm in a suitable position.
- ☐ C. I can do this as long as I wish, but it causes extra pain.
- ☐ D. Pain causes me to stop doing this sooner than I would like.
- ☐ E. Pain prevents me from doing this at all.

Section 7 - Working/Housework, Etc.

- ☐ A. I can do my usual work without extra pain.
- ☐ B. I can do my usual work, but it gives me extra pain.
- ☐ C. Pain prevents me from doing my usual work for more than half the usual time.
- ☐ D. Pain prevents me from doing my usual work for more than a quarter of the usual time.
- ☐ E. Pain prevents me from working at all.

Section 8 - Social Activities

- ☐ A. My social life is normal and causes me no extra pain.
- ☐ B. My social life is normal but increases the degree of pain.
- ☐ C. Pain has restricted my social life, but I am still able to go out.
- ☐ D. Pain has restricted my social life to the home.
- ☐ E. I have no social life because of pain.

Section 9 - Driving (if applicable)

- ☐ A. I can drive whenever necessary without discomfort.
- ☐ B. I can drive whenever necessary, but with discomfort.
- ☐ C. Neck pain or stiffness limits my driving occasionally.
- ☐ D. Neck pain or stiffness limits my driving frequently.
- ☐ E. I can not drive at all due to neck symptoms.

Section 10 - Compared with the last time you answered this question, is your neck pain:

- ☐ A. Much better.
- ☐ B. Slightly better.
- ☐ C. The same.
- ☐ D. Slightly worse.
- ☐ E. Much worse