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ORIGINAL RESEARCH

Immediate Effects of Instrument-Assisted Soft Tissue Mobilization Combined with Self-Stretching on Pain, Cervical Range of Motion, and Pressure Pain Threshold in Individuals with Upper Trapezius Myofascial Trigger Points: A Single-Group Pilot Study

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ABSTRACT

Background: Myofascial trigger points (MTrPs) in the upper trapezius are commonly associated with neck and shoulder pain, restricted cervical mobility, and local mechanical hypersensitivity. Instrument-assisted soft tissue mobilization (IASTM) is used clinically for soft-tissue pain and mobility restriction; however, evidence regarding the immediate response of upper trapezius MTrPs to a single treatment session remains limited.

Objective: To examine immediate changes in pain intensity, active cervical range of motion (CROM), and pressure pain threshold (PPT) after a single session of IASTM combined with upper trapezius self-stretching.

Methods: This single-group pre-post pilot study included 13 participants with clinically active upper trapezius MTrPs. Pain intensity was assessed using a 0-10 visual analogue scale (VAS), CROM using a universal goniometer, and PPT using a handheld mechanical algometer. Participants received standardized IASTM to the upper trapezius followed by self-stretching. Outcomes were recorded immediately before and after the intervention. Following assessment of normality with the Shapiro-Wilk test, paired t tests were used to compare pre- and post-intervention values; statistical significance was set at $p < 0.05$.

Results: Mean VAS pain decreased from 6.15 ± 0.99 to 2.69 ± 0.95 (mean change, -3.46 points; $p < 0.0001$). Active CROM increased in all six measured directions, with mean gains ranging from 5.54° to 8.23° (all $p \leq 0.0002$). In contrast, PPT decreased bilaterally: right upper trapezius, 41.08 ± 8.72 to 31.77 ± 7.04 N (mean change, -9.31 N); left upper trapezius, 40.46 ± 6.96 to 30.69 ± 6.58 N (mean change, -9.77 N); both $p < 0.0001$. The lower PPT indicates greater immediate mechanical sensitivity.

Conclusion: A single combined session of IASTM and self-stretching was followed by lower pain ratings and greater cervical mobility, but also by a bilateral reduction in PPT. Because the study was uncontrolled and self-stretching was administered as a co-intervention, these within-participant changes cannot be attributed specifically to IASTM. Larger controlled studies with standardized PPT measurement and follow-up beyond the immediate post-treatment period are warranted.

Keywords: Cervical range of motion; Instrument-assisted soft tissue mobilization; Myofascial trigger points; Neck pain; Pressure pain threshold; Upper trapezius

Introduction

Neck pain is a major contributor to global musculoskeletal disability and affects adults across a wide range of ages and occupational settings [1]. Myofascial trigger points (MTrPs) are frequently identified in people with neck and shoulder disorders, although reported prevalence varies substantially because of differences in diagnostic methods and study quality [2]. Clinically, an MTrP is typically identified as a hypersensitive nodule within a palpable taut band of skeletal muscle; reproduction of familiar pain on compression is commonly used to distinguish an active trigger point from a latent one [3].

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The upper trapezius is among the muscles most often examined in patients with cervical myofascial pain because local tenderness and altered muscle function may contribute to pain, movement restriction, and activity limitation.

Instrument-assisted soft tissue mobilization (IASTM) uses rigid instruments to apply controlled mechanical loading to soft tissues. Proposed effects include changes in tissue compliance, sensory input, and pain modulation, but the biological mechanisms underlying clinical responses remain incompletely established. Recent systematic reviews and meta-analyses suggest that IASTM may reduce pain and improve range of motion in selected musculoskeletal conditions, particularly when used as part of a broader rehabilitation programme; however, the certainty of evidence varies and substantial heterogeneity remains across patient populations, treatment protocols, comparators, and outcome measures [4-6].

Evidence specific to upper trapezius MTrPs is also mixed. In a randomized trial, El-Hafez et al. reported improvements in pain and function after repeated IASTM combined with stretching, although outcomes were not superior to stripping massage [7]. Earlier work by Gulick found no clear between-group effect in an initial controlled study [8], whereas a later study reported increased PPT after six IASTM sessions over three weeks [9]. Manual trigger-point interventions have likewise produced short-term changes in cervical mobility and pressure pain sensitivity [10]. These findings support further study of acute responses, but they do not establish that a single IASTM session consistently produces hypoalgesia or clinically important changes in mobility.

Accordingly, the present pilot study evaluated the immediate effects of a single session of upper trapezius IASTM followed by self-stretching on pain intensity, active CROM, and PPT in individuals with active upper trapezius MTrPs. The primary purpose was exploratory: to characterize the direction and magnitude of immediate pre-post changes and to identify issues requiring attention in a future controlled trial.

Materials and Method

Study design and participants

A single-group pre-post pilot design was used. Thirteen participants with clinically active MTrPs in the upper trapezius were recruited. Eligibility required a palpable taut band containing a tender nodule that reproduced the participant's familiar pain on compression, consistent with commonly used clinical criteria for MTrP identification [3]. Exclusion criteria were known cervical spine pathology, systemic pain disorders, and physiotherapy or medical treatment to the cervical region within the preceding month. All participants provided written informed consent before study procedures.

Because the study was exploratory, no efficacy-based sample-size calculation was reported. The sample of 13 participants is consistent with a commonly cited pilot-study rule of thumb, although such heuristics do not replace precision-based sample-size planning for a definitive study [11].

Ethics

The source manuscript states that the Institutional Ethics Committee approved the study before recruitment.

Outcome measures

Pain intensity. Pain was measured on a 0-10 visual analogue scale (VAS), anchored by no pain and worst imaginable pain. The VAS is widely used for quantifying pain intensity in clinical and research settings [12].

Cervical range of motion. Active cervical flexion, extension, right and left rotation, and right and left lateral flexion were measured with a universal goniometer while the participant was seated in a standardized position. Three measurements were obtained for each direction and the mean was recorded. Universal goniometry has demonstrated acceptable to excellent reliability for active cervical ROM when standardized procedures are used [13].

Pressure pain threshold. PPT was measured at the identified upper trapezius MTrP using a handheld mechanical algometer. Pressure was increased gradually until the participant first reported that the sensation had become painful. The device shown in Figure 1 has a maximum force scale of 200 N; therefore, the numerical PPT values in this manuscript are

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reported in newtons (N). Algometry over the upper trapezius has demonstrated acceptable repeatability when performed by trained examiners [14].



Figure 1. *Handheld mechanical algometer used for pressure pain threshold assessment. The instrument displays a 0-200 N force scale.*

Intervention

Participants were positioned prone for IASTM. A curved stainless-steel M2T instrument was applied over the proximal two-thirds of the upper trapezius using moderate scanning strokes parallel and perpendicular to the muscle fibres. After the symptomatic region and trigger point were identified, sustained moderate pressure was applied for approximately 30 seconds, followed by multidirectional scraping strokes at approximately 1-2 strokes per second. The procedure concluded with lighter clearance strokes. The source protocol described approximately 2 minutes of instrument application over the treated region. This sequence was based on clinical IASTM protocols used in previous studies of upper trapezius MTrPs [7,9]. Mild transient erythema was accepted as an expected local response to mechanical stimulation.

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Figure 2. *Instrument-assisted soft tissue mobilization applied to the upper trapezius.*

Immediately after IASTM, participants performed a standardized upper trapezius self-stretch in sitting. The hand on the side being stretched was stabilized at the edge of the plinth to limit shoulder elevation, and the neck was gently moved into contralateral lateral flexion until a comfortable stretch was perceived. Each stretch was held for 30 seconds and repeated three times per side, with 15-20 seconds of rest between repetitions. Participants were instructed to avoid bouncing or stretching into pain.

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Figure 3. *Standardized upper trapezius self-stretch performed after IASTM.*

Procedure

At baseline, the examiner identified the upper trapezius MTrP and recorded VAS pain, active CROM, and bilateral PPT. The combined IASTM and self-stretching intervention was then administered. The same outcomes were reassessed immediately after the intervention using the same procedures. No delayed follow-up measurement was reported.

Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, version 26.0 (IBM Corp., Armonk, NY, USA). Data are presented as mean ± standard deviation (SD). Normality was assessed using the Shapiro-Wilk test. Paired Student t tests were used to compare pre- and post-intervention values for VAS, each CROM direction, and bilateral PPT. Statistical significance was set at $p < 0.05$. Because this was an exploratory pilot analysis, the p values should be interpreted cautiously; no adjustment for multiple comparisons was reported.

Results

All 13 participants included in the study were analysed. The source manuscript did not provide participant age, sex distribution, symptom duration, or baseline functional-disability data; these descriptive characteristics should be added to the final submission if available.

Pain intensity

Pain intensity decreased immediately after the intervention. Mean VAS fell from 6.154 ± 0.987 to 2.692 ± 0.947, corresponding to a mean reduction of 3.462 points ($p < 0.0001$; Table 1).

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Table 1. Table 1. Immediate change in pain intensity. Negative change indicates lower post-intervention pain.

Outcome	Pre-intervention, mean ± SD	Post-intervention, mean ± SD	Mean change	p value
VAS pain (0-10)	6.154 ± 0.987	2.692 ± 0.947	-3.462	<0.0001

Cervical range of motion

Table. Immediate change in pain intensity. Negative change indicates lower post-intervention pain.

Active CROM increased in every measured direction (Table 2). Mean increases ranged from 5.539° for extension to 8.231° for left rotation. All comparisons were statistically significant ($p \leq 0.0002$).

Table 2. . Immediate changes in active cervical range of motion. Positive change indicates greater post-intervention ROM.

Outcome	Pre-intervention, mean ± SD	Post-intervention, mean ± SD	Mean change	p value
Flexion (°)	33.154 ± 6.530	39.538 ± 5.925	+6.384	0.0002
Extension (°)	34.846 ± 9.063	40.385 ± 9.152	+5.539	<0.0001
Right rotation (°)	61.615 ± 7.523	68.000 ± 6.285	+6.385	<0.0001
Left rotation (°)	61.846 ± 7.437	70.077 ± 4.991	+8.231	<0.0001
Right lateral flexion (°)	35.615 ± 11.659	43.385 ± 12.087	+7.770	0.0002
Left lateral flexion (°)	35.231 ± 8.288	42.231 ± 9.784	+7.000	<0.0001

Pressure pain threshold

Table. Immediate changes in active cervical range of motion. Positive change indicates greater post-intervention ROM.

PPT decreased significantly on both sides (Table 3). On the right, PPT decreased by 9.308 N; on the left, it decreased by 9.770 N. Because a lower PPT represents pain elicited at a lower applied force, these findings indicate increased immediate mechanical sensitivity rather than hypoalgesia.

Table 3. Immediate changes in upper trapezius pressure pain threshold. Negative change indicates greater mechanical sensitivity

Outcome	Pre-intervention, mean ± SD	Post-intervention, mean ± SD	Mean change	p value
Right upper trapezius PPT (N)	41.077 ± 8.722	31.769 ± 7.037	-9.308	<0.0001
Left upper trapezius PPT (N)	40.462 ± 6.960	30.692 ± 6.575	-9.770	<0.0001

Discussion

Table. Immediate changes in upper trapezius pressure pain threshold. Negative change indicates greater mechanical sensitivity.

This pilot study examined immediate within-participant changes after a single combined session of IASTM and upper trapezius self-stretching in individuals with active MTrPs. Three findings were notable. First, pain intensity decreased by an average of 3.46 points on the 0-10 VAS. Second, active cervical motion increased in all six directions, with mean gains of approximately 5.5° to 8.2°. Third, and in the opposite direction to the pain and ROM findings, PPT decreased by approximately 9-10 N bilaterally, indicating greater pressure sensitivity immediately after treatment.

The reductions in self-reported pain and increases in cervical mobility are broadly consistent with studies in which IASTM was incorporated into rehabilitation for neck or upper trapezius symptoms [7]. They are also directionally compatible with recent systematic reviews and meta-analyses that report short-term improvements in pain and ROM in some musculoskeletal populations [4,5]. Nevertheless, the broader literature remains heterogeneous, and earlier syntheses have found that adding IASTM to other care does not consistently produce clinically important benefits over comparison interventions [6]. The present study therefore adds preliminary information about immediate response but should not be interpreted as evidence that IASTM is superior to stretching, sham treatment, no treatment, or another manual intervention.

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The PPT response deserves particular attention. Gulick reported an increase in PPT after six IASTM sessions delivered over three weeks [9], and manual trigger-point techniques have also been associated with short-term increases in PPT [10]. In the present study, however, PPT decreased immediately after one combined treatment session. This result indicates that participants tolerated less mechanical force at the trigger point despite reporting less overall pain. Several explanations are plausible, including transient local mechanosensitivity after instrument contact, repeated-test effects, variation in algometer application, or random sampling variability. The current design cannot distinguish among these explanations because there was no control group, no blinded outcome assessor, and no delayed post-treatment PPT measurement.

The apparent divergence between VAS and PPT also highlights that these measures capture different aspects of the pain experience. VAS reflects the participant's subjective overall pain intensity, whereas PPT quantifies the force at which a localized mechanical stimulus first becomes painful. Improvement in one outcome therefore does not require improvement in the other. The finding reinforces the value of reporting both patient-reported and stimulus-evoked measures rather than describing all statistically significant changes as therapeutic improvement.

The CROM findings should likewise be interpreted with caution. Although statistically significant, the observed increases were modest in absolute magnitude, and the study did not prespecify a minimal clinically important difference. In addition, measurement error associated with universal goniometry may contribute to small pre-post differences even when standardized procedures are used [13]. A future trial should prespecify the primary ROM outcome, use blinded assessment where feasible, and report confidence intervals and measurement error alongside p values.

A further methodological consideration is that the intervention consisted of IASTM followed by upper trapezius self-stretching. Consequently, the immediate changes cannot be attributed to IASTM alone. Stretching itself can alter perceived muscle tension and cervical mobility, and an interaction between the two components is also possible. A definitive study should include appropriate comparison groups, such as IASTM alone, stretching alone, sham or minimal intervention, and a combined-treatment group, depending on the research question.

Limitations

The sample was small (n = 13) and participant demographic and clinical characteristics were incompletely reported, limiting generalizability. The absence of a control group prevents separation of treatment-specific effects from regression to the mean, expectation, repeated measurement, spontaneous variation, or the effect of stretching. Outcomes were measured only immediately after treatment, so the duration of any change is unknown. The assessor was not reported to be blinded. MTrP diagnosis relied on clinical palpation without reported inter-rater confirmation. Multiple outcomes were tested without adjustment for multiplicity. No disability or functional-performance measure was included. Finally, although the algometer photograph shows a 0-200 N scale and the reported values are compatible with force readings in newtons, the exact recording convention and contact-tip area should be confirmed and stated explicitly in the final protocol and manuscript.

Clinical implications

The present findings suggest that a single combined IASTM and self-stretching session may be followed by short-term reductions in perceived pain and small increases in cervical mobility in individuals with upper trapezius MTrPs. However, the simultaneous decrease in PPT indicates that local mechanical sensitivity may transiently increase. Clinicians should therefore avoid assuming that immediate subjective pain relief necessarily reflects reduced local mechanosensitivity. These observations are exploratory and do not establish the efficacy of IASTM as a stand-alone intervention.

Conclusion

In this single-group pilot study, immediate assessment after one session of upper trapezius IASTM combined with self-stretching showed lower VAS pain scores and greater active cervical ROM, while PPT decreased bilaterally. The reduced PPT indicates increased immediate mechanical sensitivity and contrasts with the direction of change in pain intensity and mobility. Because of the small sample, uncontrolled design, combined intervention, and absence of follow-up, the findings

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should be interpreted as preliminary within-participant changes rather than evidence of treatment efficacy. Larger controlled studies with standardized algometry, prespecified primary outcomes, blinded assessment, functional measures, and short- and longer-term follow-up are required.

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Conflicts of Interest

The authors declared no conflict of interest related to this study.

References

1. Safiri S, Kolahi AA, Hoy D, Buchbinder R, Mansournia MA, Bettampadi D, et al. Global, regional, and national burden of neck pain in the general population, 1990-2017: systematic analysis of the Global Burden of Disease Study 2017. BMJ. 2020;368:m791. https://doi.org/10.1136/bmj.m791
2. Ribeiro DC, Belgrave A, Naden A, Fang H, Matthews P, Parshottam S. The prevalence of myofascial trigger points in neck and shoulder-related disorders: a systematic review of the literature. BMC Musculoskelet Disord. 2018;19:252. https://doi.org/10.1186/s12891-018-2157-9
3. Grieve R, Barnett S, Coghill N, Cramp F. The prevalence of latent myofascial trigger points and diagnostic criteria of the triceps surae and upper trapezius: a cross-sectional study. Physiotherapy. 2013;99(4):278-284. https://doi.org/10.1016/j.physio.2013.04.002
4. Liu Y, Yu Y, Liu P, Yan J, Cheng Z. Instrument-assisted soft tissue mobilization for musculoskeletal disorders: a systematic review and meta-analysis of its effects on pain, function, and range of motion. Eur J Med Res. 2026;31(1):289. https://doi.org/10.1186/s40001-025-03752-4
5. Tang S, Sheng L, Wei X, Liang M, Xia J, Chen J. The effectiveness of instrument-assisted soft tissue mobilization on pain and function in patients with musculoskeletal disorders: a systematic review and meta-analysis. BMC Musculoskelet Disord. 2025;26(1):257. https://doi.org/10.1186/s12891-025-08492-4
6. Nazari G, Bobos P, Lu SZ, Reischl S, Sharma S, Le CY, et al. Effectiveness of instrument-assisted soft tissue mobilization for the management of upper body, lower body, and spinal conditions: an updated systematic review with meta-analyses. Disabil Rehabil. 2023;45(10):1608-1618. https://doi.org/10.1080/09638288.2022.2070288
7. El-Hafez HM, Hamdy HA, Takla MK, Ahmed SEB, Genedy AF, Abd El-Azeim ASS. Instrument-assisted soft tissue mobilisation versus stripping massage for upper trapezius myofascial trigger points. J Taibah Univ Med Sci. 2020;15(2):87-93. https://doi.org/10.1016/j.jtumed.2020.01.006
8. Gulick DT. Influence of instrument assisted soft tissue treatment techniques on myofascial trigger points. J Bodyw Mov Ther. 2014;18(4):602-607. https://doi.org/10.1016/j.jbmt.2014.02.004
9. Gulick DT. Instrument-assisted soft tissue mobilization increases myofascial trigger point pain threshold. J Bodyw Mov Ther. 2018;22(2):341-345. https://doi.org/10.1016/j.jbmt.2017.10.012
10. Oliveira-Campelo NM, de Melo CA, Alburquerque-Sendín F, Machado JP. Short- and medium-term effects of manual therapy on cervical active range of motion and pressure pain sensitivity in latent myofascial pain of the upper trapezius muscle: a randomized controlled trial. J Manipulative Physiol Ther. 2013;36(5):300-309. https://doi.org/10.1016/j.jmpt.2013.04.008
11. Julious SA. Sample size of 12 per group rule of thumb for a pilot study. Pharm Stat. 2005;4(4):287-291. https://doi.org/10.1002/pst.185
12. Hawker GA, Mian S, Kendzerska T, French M. Measures of adult pain: Visual Analog Scale for Pain, Numeric Rating Scale for Pain, McGill Pain Questionnaire, Short-Form McGill Pain Questionnaire, Chronic Pain Grade Scale, Short Form-36 Bodily Pain Scale, and Measure of Intermittent and Constant Osteoarthritis Pain. Arthritis Care Res (Hoboken). 2011;63 Suppl 11:S240-S252. https://doi.org/10.1002/acr.20543
13. Farooq MN, Mohseni Bandpei MA, Ali M, Khan GA. Reliability of the universal goniometer for assessing active cervical range of motion in asymptomatic healthy persons. Pak J Med Sci. 2016;32(2):457-461. https://doi.org/10.12669/pjms.322.8747
14. Takala EP. Pressure pain threshold on upper trapezius and levator scapulae muscles: repeatability and relation to subjective symptoms in a working population. Scand J Rehabil Med. 1990;22(2):63-68.

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