

Impact of Cryotherapy Airflow on Neural Modulation, Pain Threshold, and Cervical Function in Upper Trapezius Myofascial Trigger Points

Osama M. Abdelraheem

Osama.abdelraheem@deraya.edu.eg

Deraya University

Wael G. Abdelnaeem

Deraya University

Lama Eid

Sphinx University

Fatema H. Hassan

Deraya University

Thoria H. Thabet

Sphinx University

Mahmoud Eid⁶

Assiut university

Research Article

Keywords: Cryotherapy, Upper trapezius, Pain, Neck function, Range of motion

Posted Date: October 11th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-11053866/v1>

License:   This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Additional Declarations: No competing interests reported.

Abstract

Background and purpose

Myofascial trigger points in the upper trapezius are a prevalent source of neck pain, reduced pressure pain threshold, and impaired cervical mobility. Emerging evidence suggests that cryotherapy airflow may influence peripheral nerve conduction, central pain modulation, and local circulation. However, its specific effects on neural modulation, pain sensitivity, and cervical function remain insufficiently clarified.

Methods

30 participants were recruited their ages ranged from 18 to 35 years and their body mass index (BMI) ranging from 18 to 25 kg/m². They were randomly assigned into two groups. Group A (n = 15) received cryo-air flow therapy in addition to therapeutic exercises muscle energy technique, and trigger point release techniques for two weeks, whereas Group B (n = 15) (control group) received only therapeutic exercises, muscle energy technique, and trigger point release techniques only for two weeks. Range of motion (ROM), pain intensity, and neck-related disability were assessed using universal goniometer, Visual Analogue Scale (VAS), and Neck Disability Index (NDI) respectively.

Results

The experimental group demonstrated statistically significant improvements compared with the control group in cervical flexion, extension, left lateral flexion, and bilateral rotation ($p < 0.05$). Significant reductions in pain intensity (VAS) and Neck Disability Index (NDI) scores were observed, along with a significant increase in pressure pain threshold ($p < 0.001$). No statistically significant difference was found in right lateral flexion ($p > 0.05$).

Conclusion

The addition of cryotherapy airflow to conventional therapeutic interventions resulted in statistically significant improvements in cervical range of motion (flexion, extension, left lateral flexion, and bilateral rotation), pain intensity, pressure pain threshold, and neck-related disability compared with exercise therapy alone. However, no significant difference was observed in right lateral flexion. These findings support the clinical value of cryotherapy airflow as an effective adjunct in managing upper trapezius myofascial trigger points.

Contribution of Paper

What is already known on this topic:

Upper trapezius myofascial trigger points are a common source of neck pain, reduced cervical range of motion, and functional disability.

Cryotherapy has documented analgesic effects through modulation of nerve conduction velocity and reduction of pain perception.

Evidence regarding the effects of non-contact cryotherapy airflow on pain threshold and cervical function remains limited.

What this study adds:

Cryotherapy airflow combined with conventional physiotherapy significantly improved pain intensity, pressure pain threshold, cervical range of motion, and neck disability compared with conventional treatment alone.

Participants receiving cryotherapy airflow demonstrated greater improvements in cervical flexion, extension, left lateral flexion, and bilateral rotation.

The findings support cryotherapy airflow as an effective adjunctive intervention for the management of upper trapezius myofascial trigger points and enhancement of rehabilitation outcomes

Background

Myofascial trigger points (MTrPs) in the upper trapezius muscle represent a common source of neck and shoulder pain, often leading to reduced cervical function and quality of life. Cryotherapy airflow, such as Cryoflow, offers a non-contact method to deliver cold air for therapeutic cooling, potentially modulating neural activity and pain perception in these conditions[1].

Myofascial trigger points are hyperirritable spots within taut bands of skeletal muscle that elicit referred pain upon compression. In the upper trapezius, these points frequently manifest as active or latent MTrPs, contributing to local tenderness, stiffness, and headaches. Latent MTrPs prevail in 20–23% of upper trapezius sites in asymptomatic individuals, rising significantly in chronic neck pain cohorts. Histologically, they involve muscle fiber atrophy, fibrofatty replacement, and microvascular inflammation without classic contraction knots [2].

The upper trapezius elevates and retracts the scapula, stabilizing the cervicothoracic junction during daily activities. Dysfunction from MTrPs impairs scapular kinematics, exacerbating cervical strain and forward head posture common in desk workers. Prevalence reaches 58% in neck pain patients, with active MTrPs more common in females and linked to poor ergonomics or stress [3].

Patients experience acute pain onset, spasm, heaviness, and paresthesia, often radiating to the occiput. Chronic cases associate with central sensitization, lowering pain thresholds beyond the local site [4].

Cervical function declines, with reduced range of motion (ROM) measured via goniometry and elevated Neck Disability Index scores [5].

MTrPs lower pressure pain thresholds through nociceptor sensitization and sustained contractions causing local ischemia. Referred pain follows dermatomal patterns, amplifying disability. Therapy spreads thermal changes temporally and spatially, correlating inversely with pain intensity [6].

Neural modulation via cryotherapy slows nerve conduction velocity (NCV) by 2-2.5 m/s per 1°C drop, delaying sodium channel kinetics. This reduces axonal excitability in A-delta and C-fibers. Traditional cryotherapy elevates pain threshold by 71–89% and tolerance by 56–76% at 10°C skin temperature, even at distal sites. It decreases metabolic activity and spasm without central endorphin reliance [7].

Cryoflow delivers – 10°C air via nozzle, reducing forearm skin from 33°C to 17°C in 10 minutes without contact risks. It matches ice packs in cooling efficiency for analgesia and anti-inflammation. Motor NCV drops 8–10 m/s (median/ulnar), sensory 5–8 m/s, with prolonged latencies[1] Upper trapezius MTrPs restrict flexion/extension via guarding, confirmed by goniometric deficits. Cryotherapy restores ROM post-session, akin to myofascial release [8].

Despite the established analgesic effects of conventional cryotherapy, contact-based modalities present limitations such as uneven cooling, discomfort, hygiene concerns, and risk of cold injury, particularly in the cervical region where hypersensitivity and superficial neurovascular structures are prevalent [9]. Non-contact cryotherapy airflow systems provide control, uniform cooling without mechanical pressure, improving patient tolerance and safety. Cryotherapy airflow may enhance neural modulation by rapidly reducing skin temperature while minimizing cutaneous stimulation, thereby decreasing nociceptive input without provoking reflex muscle guarding. This characteristic is particularly advantageous in active upper trapezius MTrPs, where pressure-based interventions may exacerbate pain and perpetuate central sensitization [10].

Localized cooling has been shown to modulate spinal and supraspinal nociceptive processing by attenuating afferent signaling from sensitized trigger points. This segmental inhibition may explain improvements in pain perception and cervical function extending beyond the immediate treatment site [11]. However, evidence specific to airflow cryotherapy remains limited, particularly regarding its effects on pressure pain threshold and functional cervical outcomes.

Moreover, existing literature predominantly emphasizes short-term pain relief, with insufficient integration of objective functional measures such as cervical range of motion and validated disability indices. Consequently, the relationship between neural modulation, pain threshold alteration, and cervical function following cryotherapy airflow remains inadequately explored [12]. Therefore, evaluating the impact of cryotherapy airflow on neural modulation, pain threshold, and cervical function in upper trapezius myofascial trigger points is clinically and scientifically warranted.

The present study was conducted in response to the high prevalence of neck pain, particularly among students, many of whom experience persistent discomfort that often requires pharmacological management. This observation highlighted the need for exploring non-pharmacological interventions that could effectively alleviate pain and improve cervical function. Consequently, the research aimed to investigate the efficacy of Cryotherapy Airflow on upper trapezius myofascial trigger points, assessing whether this novel modality can reduce pain intensity, modulate neural activity, and improve cervical mobility.

To achieve this, a randomized comparative design was employed, involving two groups: one receiving Cryotherapy Airflow and the other undergoing conventional, widely accepted trigger point management techniques. This approach allows for a direct comparison of the novel intervention against standard care, providing evidence regarding the clinical effectiveness and potential advantages of Cryotherapy Airflow in managing persistent neck pain associated with myofascial trigger points.

Methods

2.1 | Patients / Sample Size/ Randomization

Thirty participants (both female and male) were recruited from the physical therapy outpatient clinics of Deraya University, Minya, Egypt, in accordance with the predefined inclusion and exclusion criteria. Participants' ages ranged from 18 to 35 years.

Participants were included if they were diagnosed with non-specific neck pain associated with active myofascial trigger points in the upper trapezius muscle with a symptom duration of less than three months. Diagnosis of active trigger points was based on the presence of the following criteria: a palpable taut band, a hypersensitive tender spot within the taut band, a local twitch response, referred pain pattern, and a body mass index ranging from 18 to 25 kg/m².

Participants were excluded if they had received trigger point injections within the previous six months; had a history of neck or upper back surgery, trauma, or fracture; a history of whiplash injury; cervical radiculopathy; neck or spinal deformities; fibromyalgia syndrome; vascular syndromes; sensory disturbances; skin diseases, lesions, or malignancy.

All participants provided written informed consent prior to participation. Verbal and written explanations regarding the study objectives and procedures were provided. Participants were randomly allocated using a computer-generated random sequence. Allocation concealment was ensured through the use of opaque, sealed envelopes.

2.2 | Study Design

A total of 30 participants were randomly assigned into two groups. Group A received cryo-air flow therapy in addition to therapeutic exercises muscle energy technique, and trigger point release techniques for two weeks (n = 15), whereas Group B (control group) received only therapeutic exercises,

muscle energy technique, and trigger point release techniques only for two weeks (n = 15). The study flow chart is presented in Fig. 1. All interventions were conducted at the outpatient clinics of Deraya University, Minya, Egypt.

Figure 1. Flow chart of participant recruitment, allocation, and follow-up

2.3 | Interventions

Mechanism and application of cryo-airflow: Most patients had their trigger points at the supraclavicular region of the neck surface, so it is the area of choice to apply the regimen. The patient is positioned in a comfortable relaxed setting position with relaxed Shoulder head is slightly lateral flexed to open up the angle between neck and clavicle at the treated site to optimize tissue accessibility. The device is typically set to a therapeutic dose, between - 20 to - 30 according to patient tolerance for the duration of 2–5 minutes, this rapid localized decrease in temperature causes thermal shock as skin temperature is lowered below 13.6, the applicator nozzle is held approximately at a distance of 10–15 cm from skin surface. Applicator insures he is not delivering the dose at a focal point to avoid discomfort and harm, continuous sweeping or circular movements is the delivery way, during the treatment continuous monitoring of skin response and patient feedback. Some precautions were held for the treatment as given the proximity of subclavian vessels and brachial plexus in the supra clavicle region, prolonged stationary focal point application shall be avoided.

Therapeutic exercises regimen included stretching of the upper trapezius and levator scapula to minimize the tension and reduce tightness, postural correction ex to treat forward head position and rounded Shoulder's posture, strengthening to deep cervical flexors and scapular stabilizers. The entire exercise program focuses on restoring muscle balance and postural control.

Muscle energy technique application: A mild isometric contraction (20–30% of maximum effort) was performed for 5–10 seconds against the resistance of the therapist after the muscle was engaged at its restrictive barrier. The muscle was stretched to a new barrier once it had relaxed. To increase cervical and scapulothoracic mobility, decrease hypertonicity, and encourage post-isometric relaxation, this process was repeated.

Technique for Trigger Point Release: Palpable trigger sites in the upper trapezius were subjected to prolonged ischemia compression until tissue tension and discomfort subsided. Restoring normal muscular function, improving local circulation, and decreasing pain sensitivity are the goals of this method.

2.5 Outcomes

Range of motion of the neck and shoulder was assessed using a universal goniometer. Pain intensity was evaluated using the Visual Analogue Scale (VAS). Functional status and disability were assessed using the Neck Disability Index (NDI) questionnaire to evaluate neck-related functional limitations.

Assessment procedures

All participants were assessed before and after completion of the treatment program. **Pain intensity** was measured using the Visual Analogue Scale (VAS), which consists of a 10-cm horizontal line, where 0 represents no pain and 10 represents the worst imaginable pain. Participants were instructed to mark the point that best reflected their perceived pain intensity.

Functional disability was assessed using the Arabic version of the Neck Disability Index (NDI), which has demonstrated high validity and reliability. The NDI consists of 10 multiple-choice items related to neck pain–associated functional activities, with each item scored from 0 to 5. The total score ranges from 0 (no disability) to 50 (maximum disability). Disability levels were categorized as mild (10–28%), moderate (30–48%), severe (50–68%), and complete disability ($\geq 72\%$).

3 | Statistical analysis:

All statistical analyses were conducted using the Statistical Package for Social Sciences (SPSS, IBM Corp., Armonk, NY, USA). Data were tested for normality using the Shapiro–Wilk test and presented as mean $\pm$ standard deviation (SD) for continuous variables and frequencies for categorical variables. Baseline comparisons between the treatment group (Group A) and control group (Group B) were performed using independent samples *t*-test for age and weight and Chi-square test for gender distribution. Within-group comparisons between pre- and post-treatment measurements for cervical range of motion (flexion, extension, lateral flexion, and rotation), pain intensity (VAS), pressure pain threshold (algometry), and Neck Disability Index (NDI) were analyzed using paired samples *t*-test. Between-group differences in post-treatment outcomes were assessed using independent samples *t*-test. The level of statistical significance was set at $p < 0.05$.

Results/Findings

Participant Characteristics

A total of 30 participants were selected, with 15 in each group. At baseline, demographic and clinical characteristics were similar within the treatment (Group A) and control (Group B) groups (See Table 1). No significant differences were noted for age (21.20 ± 2.17 vs 20.60 ± 2.19 years, $p = 0.879$), gender distribution (males: 11 vs. 6; females: 4 vs. 9; $p = 0.465$) as well as weight (70.26 ± 13.61 vs. 69.40 ± 12.83 kg, $p = 0.999$).

Table 1
Demographic and clinical characteristics of patients

Age (years) mean ± SD	Treatment Group (A)	Control Group (B)	P value
	21.20 ± 2.17	20.60 ± 2.19	0.879
Gender (M / F)	11/4	6/9	0.465
Weight (Kg)	70.26 ± 13.61	69.40 ± 12.83	0.999

Data are given as mean ± SD and P value, F female, M male, chi-square test

Within group comparison:

Table 2

shows the within-group comparison of pre- and post-treatment outcomes in the treatment group (Group A), demonstrating statistically significant improvements in cervical range of motion, pain intensity (VAS), pressure pain threshold, and Neck Disability Index (NDI) scores ($p < 0.001$).

OUTCOME MEASURES	Mean		Standard Deviation		T value	P value
	Pre-Test	Post Test	Pre-Test	Post Test		
Flexion	32.3333	53.1333	4.25385	3.71996	-42.458	0.000
Extension	30.7333	52.7333	5.39135	4.36654	-36.570	0.000
RT Lateral Flexion	29.6667	43.4000	5.40723	1.80476	-12.929	0.000
LT Lateral Flexion	30.6667	43.6667	4.27061	1.54303	-15.083	0.000
RT Rotation	67.2000	86.6667	6.54872	2.94392	-17.371	0.000
LT Rotation	67.4667	86.2667	6.26631	3.28344	-21.248	0.000
Pain(VAS)	6.5333	1.2667	1.12546	1.03280	34.362	0.000
Pain (pressure algometry)	1.6053	3.0793	0.54643	0.37890	-18.733	0.000
NDI	35.4667	16.1333	5.51448	2.29492	18.664	0.000

Within group comparison:

Table 3

illustrates the within-group comparison of pre- and post-treatment outcomes in the control group (Group B), revealing statistically significant improvements in cervical range of motion, pain intensity (VAS), pressure pain threshold, and Neck Disability Index (NDI) scores ($p < 0.001$), although to a lesser extent than Group A.

OUTCOME MEASURES	Mean		Standard Deviation		T value	P value
	Pre-Test	Post Test	Pre-Test	Post Test		
Flexion	32.0667	42.6667	6.54071	5.48591	-8.100	0.000
Extension	33.2000	44.0667	6.13188	6.22744	-15.314	0.000
RT Lateral Flexion	34.1333	41.7333	5.09715	3.53486	-15.043	0.000
LT Lateral Flexion	33.4000	40.8667	5.56520	3.66190	-11.422	0.000
RT Rotation	66.7333	79.0667	10.20831	5.98172	-9.789	0.000
LT Rotation	66.6667	79.2000	7.29644	5.67199	-18.963	0.000
Pain (VAS)	6.1333	3.4000	1.35576	1.35225	7.933	0.000
Pain (pressure algometry)	1.6427	1.1433	0.61797	0.53810	10.776	0.000
NDI	30.5333	20.5333	5.55321	3.41983	10.742	0.000

Table 4
Between groups comparison:

Outcome measures	Group	N	Mean	SD	MD	T Value	P Value
Flexion	A	15	53.13	3.71	10.46667	6.116	0.000
	B	15	42.66	5.48			
Extension	A	15	52.73	4.36	8.66667	4.413	0.000
	B	15	44.06	6.22			
RT Lateral Flexion	A	15	43.40	1.80	1.66667	1.626	0.119
	B	15	41.73	3.53			
LT Lateral Flexion	A	15	43.66	1.54	2.80000	2.729	0.013
	B	15	40.86	3.66			
RT Rotation	A	15	86.66	2.94	7.60000	4.415	0.000
	B	15	79.06	5.98			
LT Rotation	A	15	86.26	3.28	7.06667	4.176	0.000
	B	15	79.20	5.67			
Pain (VAS)	A	15	1.26	1.03	-2.13333	-4.856	0.000
	B	15	3.40	1.35			
Pain (pressure algometry)	A	15	3.07	0.37	1.93600	11.393	0.000
	B	15	1.14	0.53			
NDI	A	15	16.13	2.29	-4.40000	-4.138	0.000
	B	15	20.53	3.41			

4.1 | Descriptive Analysis

Table 1 showed no significant difference ($p > 0.05$) in age, gender, weight among groups.

4.2 | Inferential Analysis

Within-Group Comparisons

Group A (Treatment Group)

All outcome measurements showed significant improvements pre-test vs post-test (Table 2). Cervical range of motion (ROM) showed considerable increases in flexion (32.3° to 53.1°), extension (30.7° to

52.7°), and both right lateral flexion (67.2° to 86.7°) and left lateral flexion (67.5° to 86.3°) bilateral rotation. There was marked reduction in pain (VAS: 6.5 to 1.3; pressure pain “algometry”: 1.6 to 3.1 kg/cm) and neck disability (NDI) improved from 35.5 to 16.1.

Group B (Control Group)

From all results, significant pre-post differences were to be observed ($p < 0.001$) although these were to a lesser extent compared to Group A. ROM showed moderate increases (flexion: 32.1° to 42.7°; rotation: 66.7° to 79.1°). Pain relief improved, but not to the same extent as the other Group (VAS 6.1 to 3.4; pressure algometry: 1.6 to 1.1 kg/cm) and NDI improved from 30.5 to 20.5 (Table 3).

Comparison between Both Groups

The outcomes of the intervention were noticeably better for the treatment group as shown in the table provided. ROM: Those in Group A had higher gains in flexion (MD = 10.47, $p < 0.001$), extension (MD = 8.67, $p < 0.001$), left lateral flexion (MD = 2.80, $p = 0.013$), and both right (MD = 7.60, $p < 0.001$) and left (MD = 7.07, $p < 0.001$) rotation. Right lateral flexion showed no significant change ($p = 0.119$). Pain: Results from group A showed significantly less pain with lower VAS scores (MD = - 2.13, $p < 0.001$) and higher-pressure pain thresholds (MD = 1.94 kg/cm, $p < 0.001$). Function: Analysis of the NDI outcome also illustrated greater improvement for Group A with less reported disability (MD = - 4.40, $p < 0.001$) (Table 4).

Discussion

The aim of this research was to examine how cryotherapy affects pain modulation, pressure pain threshold, and cervical range of motion amongst patients who have myofascial trigger points located within the upper trapezius region of the neck. We have established that the application of cryotherapy airflow can provide significant increases in terms of decreasing pain ratings, increasing pressure pain thresholds, improving cervical range of motion, and enhancing functional ability related to neck pain. The experimental group demonstrated statistically significant improvements compared with the control group in cervical flexion, extension, left lateral flexion, and bilateral rotation ($p < 0.05$). Significant reductions in pain intensity (VAS) and Neck Disability Index (NDI) scores were observed, along with a significant increase in pressure pain threshold ($p < 0.001$). No statistically significant difference was found in right lateral flexion ($p > 0.05$). This can be explained by.....

Pain Intensity and Neural Modulation

Both cryotherapy airflow and placebo groups reported significant reductions in pain intensity, but cryotherapy airflow induced a far greater magnitude of pain reduction as seen with the drastic decrease

in VAS scores compared to the control group. This suggests that cryotherapy airflow produces a greater analgesic benefit for the treatment of myofascial trigger point pain than does placebo [13,14].

Cryotherapy's analgesic effects appear to occur primarily by way of its effects on neural modulation processes. Studies have demonstrated that cooling (cryotherapy) lowers the nerve conduction velocity of both A-delta and C nociceptive pathways, resulting in decreased transport of pain signals to the central nervous system [13]. Additionally, cryotherapy has been suggested to facilitate the activation of descending inhibitory pathways, therefore modulating the processes involved in the central processing of pain [14]. Collectively, these two mechanisms account for the substantially greater levels of pain reduction seen with the intervention and are consistent with current literature on pain neuroscience.

Pressure Pain Threshold and Peripheral Sensitization

The results of this study show that in the Cryotherapy with Airflow Group, there was an increase in Pressure Pain Threshold for Trigger Points in the Upper Trapezius, and a decrease in Pressure Pain Threshold for Trigger Points in the Control Group. This indicates that for the Control Group, Trigger Points were exhibiting Continued Peripheral Sensitization, while Cryotherapy with Airflow reduces mechanical sensitivity to Trigger Points in the Upper Trapezius [15,16].

This is not surprising, as Myofascial Trigger Points have associated characteristics of Localized Ischemia, Excessive Release of Acetylcholine at the Endplate, and Abnormal Endplate Activity that all result in increased sensitivity to Pain [15] Cryotherapy may have reduced Metabolic Demands on Trigger Points, limited the release of Nociceptive Substances, and Normalized Endplate Dysfunction, therefore resulting in decreased irritability of Trigger Points [16]

Cervical Range of Motion

There were statistically significant changes in cervical ROM for both thanatophoress and cryotherapy airflow treatment groups, but the cryotherapy airflow group exhibited significantly greater changes in Cervical Rome for flexion, extension, left lateral flexion, and Rotation [17]. The reason for the lack of statistical significance was likely caused by differences in distribution of trigger points, as well as differences in range of motion (ROM) between subjects.

Cervical mobility improvements may result from decreased pain and muscular tension. It is likely that the decreased sensitivity of cryotherapy-induced trigger points allowed participants to move through a larger Rom with less discomfort, which agrees with other studies that site this relationship between pain and cervical motion in neck-related myofascial pain [17].

Functional Disability

Using the Neck Disability Index to measure neck-related disability, both treatment groups reduced their neck-related functional disability; however, the cryotherapy airflow treatment provided more significant improvement over the control group. This suggests that people who were treated with cryotherapy experienced not only relief from their symptoms but also improved daily functioning [18].

The combination of decreased pain intensity, increased pain threshold and improvement in cervical spine motion are all contributing factors to the decrease in disability in both treatment groups. The results obtained in this study are consistent with the biopsychosocial model of pain, which suggests that effective physical interventions will lead to improvements in functional performance and quality of life [18].

4.1 | Limitations Directions for Future Research

Although the results of this study with regard to cryotherapy airflow to manage upper trapezius myofascial trigger points are encouraging, it is important to note that this study was conducted with a relatively small sample size and short follow-up period. Future studies should evaluate not only the long-term therapeutic effects of cryotherapy airflow, but also the best treatment protocols, such as the most effective cryotherapy airflow parameters and comparison with other evidence-based therapies like dry needling, manual therapy, and shockwave therapy [16,17]

5 | Implications on Physiotherapy Practice

As a result of this study, it appears that cryotherapy airflow has the potential to be a safe and effective non-invasive treatment option for patients suffering from upper trapezius myofascial trigger points by influencing the body's neurobiological system, decreasing sensitivity (peripheral sensitization), increasing cervical spine mobility and improving functional outcomes. Therefore, cranial cryotherapy is beneficial in conjunction with rehabilitation programs and/or physical therapy [13,14, 15].

Conclusion

The findings of this study indicate that the integration of cryotherapy airflow with conventional therapeutic interventions—comprising therapeutic exercises, muscle energy techniques, and trigger point release—provides significant clinical benefits for individuals with upper trapezius myofascial trigger points. Participants receiving cryotherapy demonstrated marked improvements in cervical range of motion, particularly in flexion, extension, left lateral flexion, and bilateral rotation, along with significant reductions in pain intensity as measured by the Visual Analogue Scale. Additionally, pressure pain threshold increased significantly, and functional limitations, assessed via the Neck Disability Index, were considerably reduced. The only exception was right lateral flexion, which did not show a statistically significant change. These results underscore the value of cryotherapy airflow as an effective adjunctive therapy, enhancing the outcomes of standard musculoskeletal rehabilitation protocols. Clinicians may consider incorporating cryotherapy airflow into routine management strategies for patients with myofascial trigger points to optimize pain modulation, functional recovery, and overall quality of life.

Declarations

Author contribution

Authors contribution to this study as follows: study conception and design by Osama M. Abdelraheem; for data collection results by Wael Gomaa; all authors for data analysis, interpretation, writing and revision of manuscript; all authors read and approved the final submitted

Conflict of interest

The authors declare that there is no conflict of interest in this study. The manuscript has been read and approved by the authors.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Data availability

Data will be available on request from corresponding author.

Acknowledgement

The authors would like to thank all patients who participated in this study for their collaboration.

Ethics approval

The study was approved by the Ethical Committee of the Faculty of Physical Therapy, Deraya University (No. DCSR-011-025-85).

Ethics Statement:

All procedures performed in this study were conducted in accordance with the ethical standards of the institutional research committee and with the 1964 Declaration of Helsinki and its later amendments. Written informed consent was obtained from all participants prior to their inclusion in the study.

Patient consent

The study procedures were elucidated to the patients, and they provided their consent by signing forms before the commencement of the study procedures.

Permission to reproduce material from other sources

Not applicable

References

1. M. S. Alayat *et al.*, "The Effectiveness of Cryoflow Cooling on Forearm Skin Temperature and Nerve Conduction Velocity in Normal Subjects: A Case-Control Study," *NeuroSci*, vol. 7, no. 1, Dec. 2025, doi: 10.3390/neurosci7010001.
2. R. Grieve, S. Barnett, N. Coghill, and F. Cramp, "The prevalence of latent myofascial trigger points and diagnostic criteria of the triceps surae and upper trapezius: a cross sectional study," *Physiotherapy*, vol. 99, no. 4, pp. 278–284, Dec. 2013, doi: 10.1016/j.physio.2013.04.002.
3. D. C. Ribeiro, A. Belgrave, A. Naden, H. Fang, P. Matthews, and S. Parshottam, "The prevalence of myofascial trigger points in neck and shoulder-related disorders: a systematic review of the literature," *BMC Musculoskelet. Disord.*, vol. 19, no. 1, p. 252, Jul. 2018, doi: 10.1186/s12891-018-2157-9.
4. M. D. Freeman, A. Nystrom, and C. Centeno, "Chronic whiplash and central sensitization; an evaluation of the role of a myofascial trigger points in pain modulation," *J. Brachial Plex. Peripher. Nerve Inj.*, vol. 4, p. 2, Apr. 2009, doi: 10.1186/1749-7221-4-2.
5. P. Kanjibhai Rathva and Y. Unmesh Shukla, "Effect of cryoflow versus ultrasound in acute trapezitis on pain, range of motion and quality of life: A comparative interventional study," *Int. J. Health Sci. Res.*, vol. 13, no. 12, pp. 199–214, Dec. 2023, doi: 10.52403/ijhsr.20231225.
6. G. Onik *et al.*, "Myofascial trigger points therapy modifies thermal map of gluteal region," *Biomed Res. Int.*, vol. 2020, p. 4328253, Feb. 2020, doi: 10.1155/2020/4328253.
7. A. A. Algaflly and K. P. George, "The effect of cryotherapy on nerve conduction velocity, pain threshold and pain tolerance," *Br. J. Sports Med.*, vol. 41, no. 6, pp. 365–9; discussion 369, Jun. 2007, doi: 10.1136/bjsm.2006.031237.
8. N. M. Oliveira-Campelo, C. A. de Melo, F. Alburquerque-Sendín, and J. P. Machado, "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.*, vol. 36, no. 5, pp. 300–309, Jun. 2013, doi: 10.1016/j.jmpt.2013.04.008.
9. Hubbard TJ, Denegar CR. Does cryotherapy improve outcomes with soft tissue injury? *Journal of Athletic Training*. 2004;39(3):278–279.
10. Dommerholt J, Fernández-de-las-Peñas C. Trigger Point Dry Needling: An Evidence and Clinical-Based Approach. Edinburgh: Elsevier; 2013.
11. Woolf CJ. Central sensitization: Implications for the diagnosis and treatment of pain. *Pain*. 2011;152(3 Suppl):S2–S15. doi:10.1016/j.pain.2010.09.030
12. Furlan AD, Giraldo M, Baskwill A, Irvin E, Imamura M. Massage for low-back pain. *Cochrane Database of Systematic Reviews*. 2015;(9):CD001929. doi:10.1002/14651858.CD001929.pub3
13. Algaflly, A. A., & George, K. P. (2007). The effect of cryotherapy on nerve conduction velocity, pain threshold and pain tolerance. *British Journal of Sports Medicine*, 41(6), 365–369. <https://doi.org/10.1136/bjsm.2006.031237>

14. Bleakley, C. M., Glasgow, P., & MacAuley, D. C. (2012). Cryotherapy for acute ankle sprains: A randomized controlled study of two different icing protocols. *British Journal of Sports Medicine*, 46(9), 615–621. <https://doi.org/10.1136/bjsm.2009.064075>
15. Gerwin, R. D. (2014). Diagnosis of myofascial pain syndrome. *Physical Medicine and Rehabilitation Clinics of North America*, 25(2), 341–355. <https://doi.org/10.1016/j.pmr.2014.01.003>
16. Fernández-de-Las-Peñas, C., & Dommerholt, J. (2018). Myofascial trigger points: Peripheral or central phenomenon? *Current Rheumatology Reports*, 20(8), 1–9. <https://doi.org/10.1007/s11926-018-0732-1>
17. Cagnie, B., Castelein, B., Pollie, F., Steelant, L., Verhoeyen, H., & Cools, A. (2015). Evidence for the use of ischemic compression and dry needling in the management of trigger points of the upper trapezius. *Journal of Bodywork and Movement Therapies*, 19(2), 205–213. <https://doi.org/10.1016/j.jbmt.2014.11.002>
18. Kamper, S. J., Apeldoorn, A. T., Chiarotto, A., Smeets, R. J., Ostelo, R. W., Guzman, J., & van Tulder, M. W. (2015). Multidisciplinary biopsychosocial rehabilitation for chronic low back pain. *Cochrane Database of Systematic Reviews*, 9, CD000963. <https://doi.org/10.1002/14651858.CD000963.pub3>

Figures

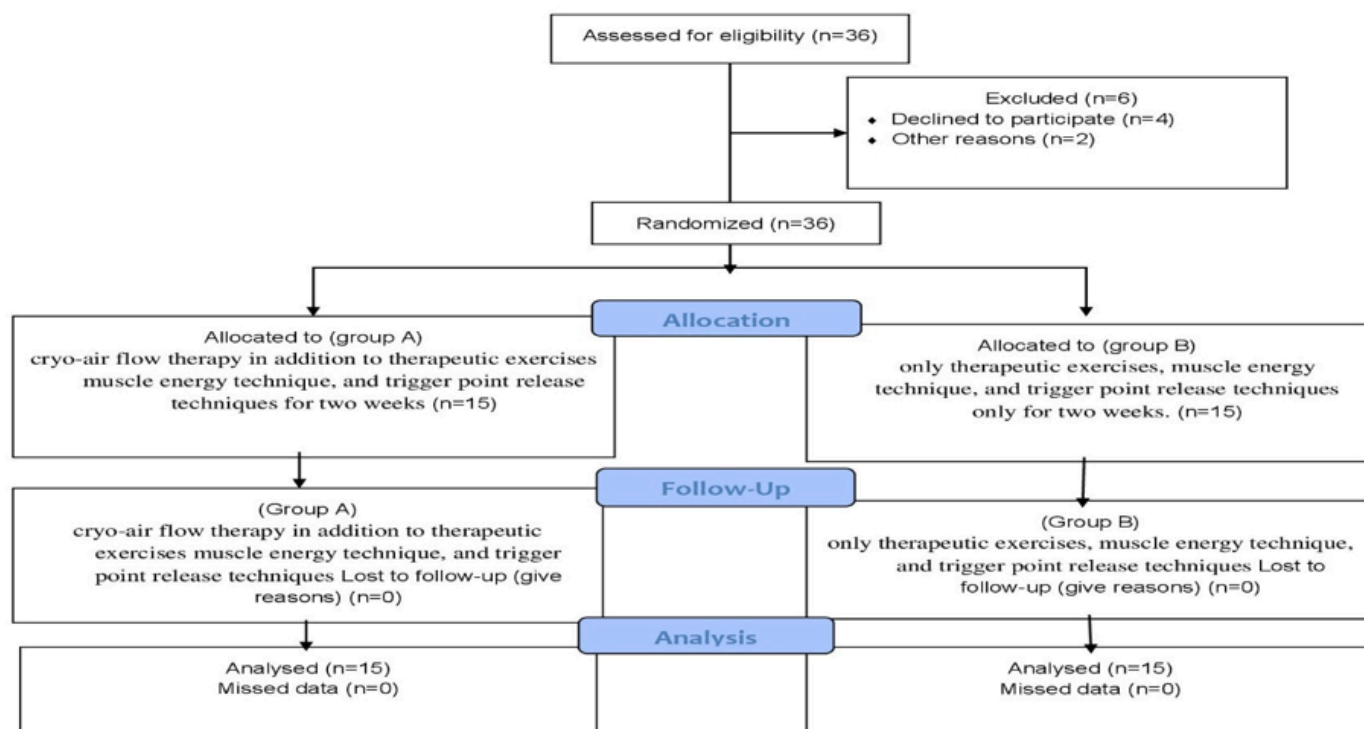


Figure 1

All interventions were conducted at the outpatient clinics of Deraya University, Minya, Egypt.