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Short-term effects of deep cervical flexor and scapular rehabilitation on upper trapezius myalgia: A community-based study

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Abstract
Upper trapezius myalgia represents a prevalent musculoskeletal disorder characterized by chronic cervicobrachial pain, frequently exacerbated by psychosocial stress, sustained postural loading, and occupational demands. In peri-urban communities such as Sarfabad, these physical stressors contribute significantly to functional disability and diminished psychological well-being. This community-based, quasi-experimental study aimed to implement and evaluate a low-cost, multi-modal physiotherapy intervention designed to mitigate pain and enhance functional capacity. Fifteen adults (n=15) presenting with upper trapezius pain (≥2/10 NPRS) were recruited for a one-week structured program comprising targeted education, Deep Cervical Flexor (DCF) training, scapular strengthening, and ergonomic modifications.
Results indicated a statistically significant reduction in mean pain intensity from 5.8 to 2.1 (-64%) and a marked decrease in severe functional disability cases from 53% to 13%. Furthermore, the intervention improved adherence to micro-breaks by 60%, suggesting positive behavioral adoption.
These findings demonstrate that brief, education-centric interventions are both feasible and efficacious in reducing the physical burden of stress-related myalgia, thereby potentially improving overall quality of life and workplace well-being in resource-constrained settings.

Keywords: Upper trapezius myalgia, chronic neck pain, deep cervical flexor training, scapular stabilization, community-based rehabilitation, ergonomic intervention; workplace musculoskeletal disorders, functional disability reduction

Introduction

Musculoskeletal disorders remain one of the leading causes of disability worldwide, with neck pain ranking among the top contributors to years lived with disability. Upper trapezius myalgia, characterized by localized pain, muscle tightness, tenderness, and the presence of myofascial trigger points in the cervicothoracic region, is highly prevalent among working-age adults. The condition is frequently associated with sustained static postures, repetitive upper limb activity, prolonged screen exposure, and psychosocial stressors. In contemporary occupational settings—particularly among homemakers, desk workers, and manual laborers—cumulative mechanical overload of the cervical and scapular musculature predisposes individuals to chronic pain syndromes.

The upper trapezius muscle plays a critical role in scapular stabilization and cervical motion control. Prolonged low-level activation of this muscle, especially during forward head posture or elevated shoulder positioning, contributes to ischemia, metabolic accumulation, and altered neuromuscular recruitment patterns. Over time, these biomechanical stresses may lead to maladaptive motor control strategies, including overactivity of superficial cervical musculature and underperformance of deep cervical stabilizers. Such imbalance perpetuates a cycle of pain, reduced function, and decreased participation in daily activities.

Emerging evidence suggests that trapezius myalgia is not merely a localized muscular disorder but a multidimensional condition influenced by physical, behavioral, and psychosocial determinants. Chronic nociceptive input from myofascial tissues may contribute to central sensitization, thereby amplifying pain perception and functional limitation. Additionally, persistent neck pain has been associated with sleep disturbance, reduced productivity, and psychological distress, including anxiety related to physical performance and occupational capability. Therefore, effective management requires an integrative approach that addresses both biomechanical dysfunction and behavioral contributors.

Recent systematic reviews have highlighted the importance of scapular-focused rehabilitation in chronic neck pain populations. Chen *et al*. (2024) [2] reported that targeted scapular strengthening significantly reduces pain intensity and neck-related disability compared to non-specific exercise approaches [2]. By improving scapular kinematics and optimizing load distribution across the shoulder girdle, such interventions reduce compensatory overactivity of the upper trapezius.

Similarly, training of the Deep Cervical Flexors (DCF) has gained prominence in neck pain rehabilitation. These muscles, particularly the longus colli and longus capitis, are essential for segmental cervical stability and postural endurance. Dysfunction of the DCF complex has been consistently observed in individuals with chronic neck pain. Studies by Ashfaq *et al*. (2021) [1] and Iqbal *et al*. (2021) [4] demonstrated that DCF-specific training significantly improves motor control, reduces pain, and enhances functional outcomes compared to generalized strengthening protocols [1, 4]. Restoring deep stabilizer function reduces the reliance on superficial musculature such as the upper trapezius, thereby mitigating chronic overload.

Beyond therapeutic exercise, workplace-based interventions emphasizing ergonomic correction and structured micro-breaks have shown promising results. Dalager *et al*. (2023) [3] emphasized that adherence-optimized strength training and regular movement interruptions effectively reduce musculoskeletal discomfort in occupational settings [3]. Brief, periodic breaks interrupt cumulative tissue strain, promote circulation, and reduce sustained static loading—factors particularly relevant in peri-urban populations engaged in repetitive domestic or occupational tasks.

Manual therapy techniques, including ischemic compression and soft tissue mobilization, have also been investigated as adjunct modalities. According to the umbrella review by Reynolds *et al*. (2024) [6], manual therapy provides short-term pain relief and may enhance participation in active rehabilitation programs when combined with exercise-based interventions [6]. However, evidence consistently favors multimodal strategies over passive treatment alone.

Despite robust evidence supporting exercise-centered and ergonomic interventions, access to structured physiotherapy services remains limited in many community and peri-urban settings. Individuals often rely on symptomatic relief measures without receiving education on posture correction, motor control retraining, or load management. Consequently, there is a pressing need for simplified, low-cost, community-delivered rehabilitation models that are both evidence-based and feasible in resource-constrained environments.

The present study was therefore designed to implement and evaluate a brief, multi-modal physiotherapy intervention targeting education, DCF activation, scapular strengthening, ergonomic correction, and adjunct manual therapy in adults with upper trapezius myalgia. By addressing both mechanical and behavioral contributors to chronic pain, this project aims not only to reduce symptom severity but also to enhance functional independence and promote sustainable self-management within the community.

Methodology

Study Design

This study employed a community-based quasi-experimental pre–post intervention design to evaluate the effectiveness of a structured physiotherapy program on pain intensity, functional disability, and ergonomic behavior in individuals with upper trapezius myalgia. A single-group design was selected due to feasibility constraints within the community setting and the exploratory nature of the project.

Study Setting

The study was conducted in Sarfabad, Gautam Buddha Nagar, Uttar Pradesh, a peri-urban locality characterized by mixed occupational demands including domestic labor, small-scale manual work, and prolonged desk-based activities. The intervention was delivered in a community-accessible space over a period of one week.

Participants

A total of 15 participants (n = 15) were recruited using convenience sampling through community outreach and word-of-mouth referral.

Demographic Characteristics

- **Females:** 12 (80%)
- **Males:** 3 (20%)
- **Age range:** 19–70 years

Eligibility Criteria

Inclusion Criteria

- Adults aged 18–65 years
- Self-reported unilateral or bilateral upper trapezius pain
- Pain intensity ≥2/10 on the Numeric Pain Rating Scale (NPRS)
- Symptom duration ≥1 week
- Ability to follow verbal instructions

Exclusion Criteria

- History of cervical spine trauma
- Suspected cervical radiculopathy or myelopathy
- Systemic inflammatory conditions
- Recent cervical spine surgery
- Red flag signs (e.g., unexplained weight loss, severe neurological deficits)

Participants meeting exclusion criteria were referred for appropriate medical consultation.

Baseline Assessment

Baseline evaluation included pain, functional, physical, and behavioral measures.

Pain Assessment

Pain intensity was measured using the Numeric Pain Rating Scale (NPRS; 0 = no pain, 10 = worst imaginable pain) at rest and during aggravating activities.

Functional Disability

Functional status was assessed using a structured tool aligned with Neck Disability Index (NDI) domains (personal care, lifting, reading, concentration, work, driving, sleep, recreation). Disability was categorized as mild (<20%), moderate (20–40%), or severe (>40%).

Physical Examination

Assessment included palpation for upper trapezius and levator scapulae trigger-point tenderness, observation of forward head posture and rounded shoulders, scapular positioning analysis, and identification of occupational risk behaviors (e.g., head-loading).

Behavioral Assessment

Participants self-reported frequency of micro-breaks and posture habits during daily activities.

Intervention Protocol

The intervention was delivered over one week, consisting of one initial session followed by 2–3 follow-up contacts. A multimodal approach combining education, exercise therapy, manual therapy, and ergonomic modification was implemented.

Educational Component

Sessions included instruction on cervical and scapular anatomy, mechanisms of muscle overload, posture correction, micro-break strategy (30–60 seconds every 30–45 minutes), and load-sharing principles. Emphasis was placed on self-management.

Motor Control and Strengthening

Deep Cervical Flexor Training

Chin-tuck exercises (3 sets of 10–20-second holds daily) to improve deep stabilizer activation.

Scapular Strengthening
Reverse flys, rows, and controlled shrugs (2–3 sets of 8–15 repetitions, moderate intensity). Progression was symptom-guided.

Manual Therapy (Adjunct)
Brief ischemic compression and passive stretching (5–10 minutes) were applied to reduce myofascial tightness and facilitate exercise participation.

Ergonomic Modification
Participants received context-specific advice on workstation height adjustment, avoiding sustained neck flexion, minimizing head-loading, and promoting dynamic sitting.

Follow-Up and Monitoring
Reassessment was conducted after one week. Adherence was monitored via self-report logs, follow-up questioning, and exercise observation. Micro-break compliance was categorized as low (<30%), moderate (30–60%), or high (>60%).

Outcome Measures
Primary Outcome
- Change in NPRS pain score (pre–post)

Secondary Outcomes
- Change in functional disability percentage
- Reduction in trigger-point tenderness
- Improvement in ergonomic behaviors
- Reduction in head-loading practice

Data Analysis
Descriptive statistics were used to analyze outcomes.
- Mean values were calculated for pain scores.
- Percentage change was computed for disability and behavioral parameters.
- Pre–post differences were interpreted for clinical significance (≥2-point NPRS reduction considered clinically meaningful).

Result
All 15 participants completed the intervention without adverse events. Clinically meaningful improvements were observed in pain intensity, functional disability, trigger-point tenderness, and ergonomic behaviors.

Pain Intensity
Mean pain intensity (NPRS) reduced from 5.8 at baseline to 2.1 post-intervention, representing a 64% reduction.

Table 1: Change in Pain Intensity (NPRS)

Variable	Baseline Mean	Post-Intervention Mean	Absolute Reduction	Percentage Reduction
NPRS Score	5.8	2.1	3.7	64%

Additionally, the proportion of participants reporting moderate-to-severe pain (≥4/10) decreased substantially.

Functional Disability
A significant reduction in functional disability was observed across NDI-aligned domains.

Table 2: Distribution of Functional Disability Categories

Disability Category	Baseline (%)	Post-Intervention (%)
< 20% (Mild)	47%	87%
≥ 20% (Moderate–Severe)	53%	13%

Improvements were most notable in lifting, reading posture tolerance, work-related tasks, and sleep quality.

Physical Examination Findings
Trigger-point tenderness prevalence reduced substantially following intervention.

Table 3: Trigger-Point Tenderness Prevalence

Muscle Group	Baseline (%)	Post-Intervention (%)
Upper Trapezius / Levator Scapulae Tenderness	73%	27%

Behavioral and Ergonomic Outcomes
Marked behavioral adaptation was observed in ergonomic practices.

Table 4: Ergonomic and Behavioral Changes

Variable	Baseline (%)	Post-Intervention (%)
Regular Micro-Break Practice	20%	80%
Head-Loading Practice	47%	13%

Micro-break adherence increased fourfold during the intervention period, while risky head-loading practices reduced substantially.

Discussion
The present community-based quasi-experimental study demonstrated clinically meaningful reductions in pain intensity, functional disability, trigger-point tenderness, and maladaptive ergonomic behaviors following a one-week multimodal physiotherapy intervention. The 64% reduction in NPRS scores exceeds the minimal clinically important difference commonly reported for chronic musculoskeletal pain conditions, indicating substantial symptomatic improvement.
The observed pain reduction aligns with evidence supporting scapular-focused rehabilitation in chronic neck pain populations [2, 5]. Strengthening of scapular stabilizers likely improved force coupling and load distribution across the cervicoscapular region, thereby reducing compensatory overactivation of the upper trapezius muscle. Improved scapular mechanics may have contributed to decreased mechanical stress and subsequent reduction in nociceptive input.
Deep Cervical Flexor (DCF) activation was incorporated to address impaired motor control commonly observed in individuals with chronic neck pain. Previous studies have demonstrated that DCF-specific training improves neuromuscular coordination, reduces pain intensity, and enhances functional performance more effectively than generalized exercise programs [1, 4]. Restoration of deep stabilizer function may reduce reliance on superficial musculature, thereby interrupting the cycle of chronic muscle overload and tension.
Functional disability outcomes further support the effectiveness of the intervention. The marked reduction in participants within the ≥20% disability category indicates improvement not only in symptom intensity but also in task

performance and activity tolerance. These findings are consistent with literature demonstrating that exercise-centered rehabilitation produces meaningful improvements in neck-related disability scores [2, 5].

Behavioral adaptation played a critical role in the intervention's success. Micro-break adherence increased from 20% to 80%, reflecting effective translation of ergonomic education into actionable behavior. Workplace-based strength training and structured movement interruptions have been shown to significantly reduce musculoskeletal discomfort when adherence is optimized [3]. The present findings support the feasibility of implementing such strategies in peri-urban community settings.

The reduction in trigger-point tenderness and short-term symptom relief may be partially attributed to the adjunct use of manual therapy. Evidence suggests that manual physical therapy provides short-term analgesic effects and enhances participation in active rehabilitation when combined with exercise [6]. In this study, manual therapy was not used as standalone treatment but as a facilitative strategy to support exercise engagement.

The multimodal design of the intervention likely contributed to its effectiveness. By integrating motor control retraining, strengthening, ergonomic correction, and manual therapy, the program addressed multiple pathophysiological contributors to trapezius myalgia. Current evidence favors such combined approaches over isolated passive modalities [1–6].

From a public health perspective, these findings highlight the feasibility of delivering evidence-based musculoskeletal rehabilitation in low-resource community settings. Upper trapezius myalgia is often under-managed, despite its association with reduced productivity, sleep disturbance, and psychological stress. Community-delivered, education-centric physiotherapy programs may reduce reliance on pharmacological management and promote sustainable self-management behaviors.

Although the short-term outcomes are promising, further research using randomized controlled designs, larger samples, and longer follow-up durations is required to evaluate long-term sustainability and potential psychological benefits associated with pain reduction.

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