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# Additional Effect of Pectorals, Upper Trapezius and Levator Scapulae Muscle Release in Reducing Neck Pain Among Office Workers: A Single Blind Randomized Controlled Trial

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**ABSTRACT:** Neck pain is one of the most common musculoskeletal conditions among office workers. Physiotherapy interventions to date have focused on the neck musculature, such as the UT muscles. To date, there is a lack of evidence that the combination of anterior and posterior musculature release, such as the UT, LS, and pectorals, reduces neck pain in office workers. A single-session, participant-blinded randomized controlled trial was conducted. A single-session, participant-blinded randomized controlled trial was conducted. An a priori power analysis established a target of 60 participants to ensure a balanced 1:1 block design with mixed block sizes of 2 and 4. Following the exclusion of 3 prospective candidates during screening, 57 participants were enrolled and allocated via SNOSE to maintain strict allocation concealment. This resulted in a final distribution of an intervention group (n = 28) and a control group (n = 29). Both cohorts received conventional physiotherapy consisting of manual therapy, mobility exercises, and strengthening exercises, while the intervention group received additional targeted muscle release. Pre- and post-treatment metrics for pain and CROM were gathered. Due to extensive violations of data normality confirmed by Shapiro-Wilk testing, within-group changes were analysed using Wilcoxon Signed-Rank tests, and

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between-group treatment efficacy was evaluated using Mann-Whitney U tests. Both groups demonstrated highly significant within-group reductions in pain and increases in CROM from pre- to post-treatment. However, between-group comparisons verified that the intervention group achieved statistically superior immediate pain relief. The intervention group demonstrated significantly greater tracking improvements across four out of the six measured CROM directions compared to the control track, successfully validating the study's primary alternative hypotheses. Incorporating targeted manual muscle release of the pectorals, UT, and LS alongside conventional multimodal physiotherapy significantly enhances immediate clinical outcomes for occupational neck pain management. This targeted combination provides a crucial clinical boost, rapidly alleviating pain and restoring multi-directional cervical mobility within a single therapeutic session.

## INTRODUCTION

Neck pain poses as one of the major issues in today's world as its effects of it includes reduced productivity (Kazeminasab et al, 2022). It was reported to be the most common work-related musculoskeletal disorder at 58.6% among office workers (Mohammadian et al, 2025). Often, these office workers have reduced neck muscle size due to the nature of their job, which requires prolonged sitting and static posture, and this is associated with lower neck endurance, altered proprioception, and increased postural sway (Sidiropoulos et al, 2025). Additionally, muscle morphology alteration such as muscle atrophy leads to muscle weakness and are a key factor in the development and persistence of neck pain (Sidiropoulos et al, 2025). To overcome this, rehabilitative measures of muscle strengthening, postural correction and ergonomic adjustment are recommended (Frouzanian et al, 2025). According to Verhagen, A.P., the preferred evidence-based physiotherapy treatments for neck pain are the combination of manual therapy, exercise therapy, and patient education. Manual therapy includes joint mobilisation of the cervical and thoracic region and massaging the neck and back region. (Verhagen, 2021; Arsovski, 2024).

The most treated region of neck pain is often the muscles with high prevalence of myofascial trigger points such as the upper trapezius (UT), levator scapulae (LS), sternocleidomastoid (SCM), suboccipital muscles, and other shoulder muscles (Brandt et al, 2014; Lee et al, 2023; Liaqat et al, 2024; Niazi et al, 2025). The trapezius muscles are often tender in office workers, which correlates with neck pain prevalence. About 38% of office workers would have trapezius myalgia according to a study by Brant. M., et al, 2014 (Brandt et al, 2014). Other muscles that should be looked at are the levator scapulae muscle as the anatomical location and nerve distribution will aid in pain management in clinical practice (Lee et al, 2023). The repetitive tasks and static postures nature of a profession can cause increased taut bands in the levator scapulae, leading to neck pain (Liaqat et al, 2024).

Physiotherapy treatment often overlooks the pectoralis muscles in the management of neck pain (Kurt et al., 2025). A study by S.F., Mariyam Fazana, et.al, further proves that pectoralis minor muscle tightness has an influence on neck pain. (Mariyam et al, 2021). Another study by Kaur, U. et al. al states that Muscle Energy Technique on the pectoralis muscle helps in improving the efficiency of computer users from many occupations (Kaur et al, 2023).

## LITERATURE REVIEW

### Anatomy: Cervical Spine

The structure of the neck begins with the base of the body, which is the spine. The spine can be divided into 7 vertebrae, where C1 to C2 are the Upper Cervical Spine and C3 to C7 are the Lower Cervical Spine. This spine allows protection of the spinal cord, supports the position and bearing weight of the head, and most importantly, supports the head-neck movements. The cervical vertebrae also serve as the origin and insertion points for the muscles (Rahman et al, 2023).

### Muscles

These neck muscles can be further divide itself based on the action it provides. Posterior neck muscles such as the erector spinae work to assist in flexion and extension of the vertebral column, whereas the other posterior neck muscles, which include

the suboccipital muscles (rectus capitis posterior major and minor and oblique capitus superior and inferior), longissimus capitis, semispinalis capitis and cervices, and splenius capitis and cervices, aid in extension, rotation and lateral flexion of the neck. The anterior neck muscles on the other hand, aid in flexion, rotation, lateral flexion, and stabilising the skull. The anterior neck muscles include the sternocleidomastoid (SCM), scalenes and platysma (Rahman et al, 2023).

While those muscles serve as the general neck muscle, several muscles such as the trapezius, interspinales, LS, semispinalis and rhomboid minor which has cervical spinal attachments, also participates significantly in the movements of the neck (Rahman et al, 2023). The trapezius is a large muscle that can be divided into 3 components, the superior, middle and inferior portion. The region that plays a large role in the extension of the neck is the superior portion, also known commonly as the UT (Ourieff et al, 2023). The tightness of the UT and the weakness of the middle and lower trapezius leads to muscle imbalance in the scapulothoracic region neck pain and cervicogenic headaches (Kang & Kim, 2022).

Besides, LS assists in neck extension with the UT, functions to do ipsilateral neck rotation, lateral neck flexion and most importantly, elevate the scapulae. The positioning of the LS makes this muscle an important structure of the neck. It originates from C1 to C4 and inserts to the medial scapular border and is overlaid with the SCM and trapezius muscle. It also has an innervation of the dorsal scapular nerve, which runs down the neck to the mid border of the back (Henry & Munakomi, 2023).

**Pectorals Muscle**

The pectorals muscles consist of two groups, the pectoralis major and the pectoralis minor. The pectoralis major is a big bulk of muscle located at the medial and superior chest, whereas the pectoralis minor is thinner and triangular, an anterior chest muscle. These muscles are muscles of the anterior chest wall. The pectoralis major muscle helps in flexing the arm and depress and abducting the scapula, whereas the pectoralis minor depresses the scapula to stabilise it (Baig & Bruno, 2023).

**Relationship of Pectorals to Neck**

While the pectorals are not related to the neck anatomically, it plays a role in inducing the pain of the neck. Prolonged static sitting is an occupational hazard among office workers, as they tend to cause adverse effects on neck and shoulder health as the longer the sitting periods and computer use, the more flexed head and rounded shoulder progression occur (Nakphet & Chaikumarn, 2023). As office workers adapt to a slouched posture, the postural imbalance can disrupt muscle control; namely, the neck and shoulder muscles remain in a semi-flexed position. As the pectoralis muscles help stabilise the scapula, being slouched tightens up the muscles (Maheshwari et al, 2024)

**Conventional Physiotherapy Treatment**

In the standardised physiotherapy care of the neck, several methods have been practiced by physiotherapists for years. Among those are passive joint mobilisation, which targets the passive articular structures of the cervical spine and is only done with low velocity, posteroanterior facet glide. By doing this manual glide, it will stretch the ligaments bounding the facet joints and the joint capsule, inducing rapid analgesia (Aquino et al, 2009).

Next, manual therapy has been used as it is effective for acute and chronic neck pain cases. (Reynolds et al, 2025). Myofascial release and general muscle release uses sustained mechanical shear forces across the superficial tissue to alter the physical state of the extracellular matrix. This can aid in lowering overall neck stiffness and improving blood circulation (Çağrı et al, 2025).

Besides mobility exercises, strengthening exercises are commonly given to encourage movements to recovery. Exercise can increase muscle strength and provide support to the cervical structure, leading to a reduction in pain. Exercises conducted should be dependent on the type of pain the patient is facing, as they would have different responses (Zoete, 2023).

**Ho**: There is no significant difference in pectoralis, upper trapezius, and levator scapulae muscle release on neck pain and cervical range of motion among office workers.

**Ha**: There is a significant difference in pectoralis, upper trapezius, and levator scapulae muscle release on neck pain and cervical range of motion among office workers.

## METHODOLOGY

This study used a single participant-blinded randomized controlled trial whereby the participants was randomly assigned to the intervention and control group by using the block method. Participants were unaware of their treatment allocation. The investigator served as both the treating therapist and the outcome assessor and was not blinded to treatment allocation.

Both groups received conventional physiotherapy neck treatment of manual therapy, mobility exercises and strengthening exercises. The intervention group received an additional pectorals, upper trapezius and levator scapulae muscle release.

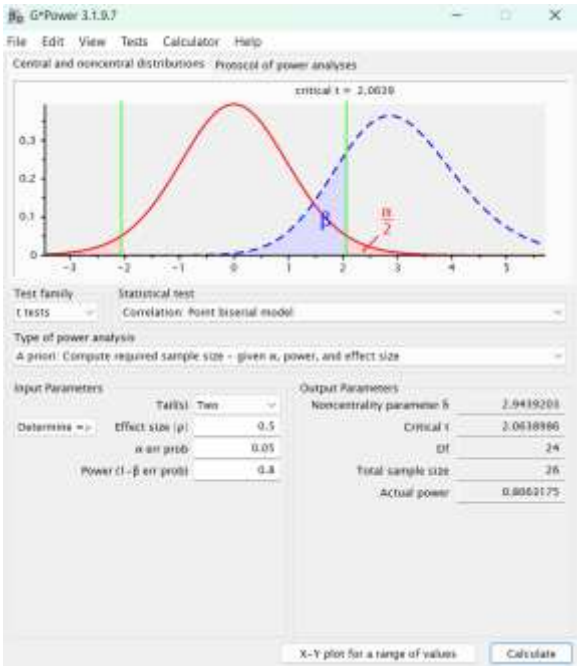
An a priori power analysis was performed using G*Power software to determine the necessary sample size for the study. The calculation was based on a two-tailed statistical test with a medium effect size of Cohen's ($d = 0.5$), an alpha level of ($\alpha = 0.05$), and a statistical power ($1 - \beta$) of 0.80. Based on these parameters, minimum final sample size of $N = 52$ participants ($n = 26$ per group) was required for the final analysis.

To safeguard the study against dropouts of 10%, the initial recruitment target was inflated to 57.78, which was rounded up to 58 and rounded up again to the nearest balance target of $N = 60$ participants ($n = 30$ per group) to ensure perfect group balance in a 1:1 block design with mixed block sizes of 2 and 4.

Following a screening phase, 3 prospective participants failed to meet the strict inclusion criteria. Consequently, enrolment was closed at a final sample size of ($N = 57$) participants. To preserve the allocation sequence to maintain the integrity of the random blocks, the resulted final distribution was 29 participants in the control group and 28 participants in the intervention group. As this was a single-session study, all randomized participants completed their assigned protocols and post-treatment assessments, and no data were missing from the final analysis. No adverse events or unintended effects were observed throughout the study.

To protect the participant-blinded design, an independent researcher generated the allocation sequence using Sealed Envelope. The principal investigator screened eligible participants, obtained signed consent, and enrolled participants into the study. Allocation was implemented using SNOSE, which were opened only after eligibility had been confirmed.

**Exhibit 1** Measurement of G*Power



**Inclusion Criteria:** Participants fulfilled the following criteria to be included in the study. They were aged between 23-60 years old, worked more than 6 hours in the office and had neck pain for more than 1 month. Both male and female office workers were included in the study.

**Exclusion Criteria:** Office workers that were excluded includes those that has previous history of cervical fracture, currently receiving physiotherapy treatment for the neck and recent surgery within 6 months.

Data collection was conducted across 3 distinct locations which are Weststar Auto, Your Physio and Alfred Design and Decoration, to ensure a representative sample. A designated local representative at each location provided a pre-screened list of prospective participants who had expressed formal interest in the study. The recruitment date was from March 2026 to June 2026. These individual lists were compiled into a centralized screening database. Following the initial baseline screening, 3 prospective participants were excluded because they did not satisfy the strict inclusion criteria. The remaining N = 57 eligible participants proceeded to the allocation phase.

To prevent cross-contamination of treatments and maintain a strict participant blind, data collection at each location was organized using separate physical rooms. Upon arrival at their respective testing site, participants were immediately directed to individual, isolated waiting rooms based on their allocation. The intervention group and the control group were kept physically separated in these distinct rooms for the entire duration of the testing session. This environmental control ensured that participants could not discuss the procedures, compare protocols, or inadvertently determine their group assignment, thereby securing the integrity of the single-blinded trial design.

The Numerical Pain Rating Scale (NRS) is used to assess the pain pre- and post-treatment. This is the primary outcome of the study. NRS a self-reported outcome measure of pain which exhibited moderate reliability (ICC = 0.72) in short term. The ICC was significant at the 1st to 4th week mark as compared to 3 months (Young et al, 2025). This shows that NRS is a suitable as a self-reported outcome measure of pain in this study as it gives a highly accurate pre- and post-treatment rating scale.

The CROM was used as a secondary outcome. It was measured in this study with a goniometer. Six directions were measured namely, cervical flexion, cervical extension, cervical right and left lateral flexion and cervical right and left rotation. The positioning of the goniometer and the range were referenced according to Norkin & White (Norkin & White, 2016).

**Pre-Treatment Assessment**

The selected participants were asked to the room one-by-one according to their allocated group and was explained the consent form. A simple pre-treatment assessment was conducted to understand their neck condition and underlying issues before starting any treatment. Their pain scale and cervical range of motion were taken.

**Exhibit 2:** Signing consent form**.**



**Exhibit 3**: Measuring Cervical Flexion ROM



**TREATMENT**

**Manual Therapy**

General muscle release consists of releasing the SCM, scalene and deep cervical muscles. All which includes the anterior, lateral and posterior neck muscles. These muscles were released in supine position, with the fingers of the therapist place under the neck for the lateral and posterior muscles and moving in circular motions around the muscles for releasing. The SCM were released with the picking-up motion in supine position. The release can be done 3 times a week, moderate intensity for 5 minutes total.

Joint mobilisations were also given depending on the stiffness of the cervical joint when assessed. As the cervical is a sensitive region of the body, a gentle joint mobilisation was given. The fingers were placed at the stiff cervical facet joint and pushed upwards with minimal force for 5 seconds to allow the gravity to counter the force and pushing the cervical joint upwards. Depending on the joint condition, the frequency depends on necessity of it, at Grade I to II, for 2 minutes, 60 oscillations, 5 seconds hold.

Myofascial release towards the tight ligaments and fascia were given to reduce the tightness of the surrounding structures that may be hindering the full range of motion of the neck. It can be done 3 times a week along with the general muscle release, with low-load stretch, for 5 minutes.

A simple passive stretch of the upper trapezius and levator scapulae were done to aid in the tightness of the muscles. The stretch is held for 10 seconds, with 5 repetitions. This exercise can be performed ideally for 3 times a week, gently without any pain.

**Exhibit 4:** Manual therapy of the neck.



**Exhibit 5:** Passive stretch of the neck.



**Mobility Exercises**

Mobility exercises help in mobilising the muscles and joints to prevent stiffness and improve flexibility. Among the mobility exercises given are chin tucks, neck rotations and chest opening (butterfly) that can be done as a daily exercise in the office to prevent constant static posture. An exercise programme of 30 repetitions, 3 sets for the chin tuck and butterfly exercise were done and 5 neck rotations in both directions were done. The total time taken for the exercise was 5 minutes.

**Exhibit 3:** Chin tuck exercise.



**Exhibit 4:** Neck rotation exercise



**Figure 5:** Chest opening (butterfly) exercise.



**Strengthening Exercises**

Often time, muscle endurance is lacking in office workers leading to neck injuries from prolonged static posture as they are unable to sustain a static posture for a period. Hence, strengthening the neck muscles are important as part of their rehabilitation programme.

As the cervical region is a sensitive part, isometric neck strengthening is one of the exercises that focuses on strengthening the deep cervical muscles without aggravating any pain. Isometric neck exercise in four different directions (flexion, extension, right lateral flexion and left lateral flexion) were done. An exercise programme of 10 seconds hold, 10 repetitions, 2 sets were given in each direction. The total time taken for the exercise was 3 minutes.

**Exhibit 9:** Isometric neck strengthening exercise.



**Additional Treatment**

The intervention group received this additional treatment whereby, specific muscle release towards the pectorals, UT and LS were given. In supine, the therapist was seated above their head to release the UT and LS muscle. The muscles are released in circular and cross-fibre motions. The pectorals muscles were released with the therapist seated facing away from the feet. These muscles are released until the tension, and trigger point is reduced. Similarly to general muscle release and myofascial release, it can be done 3 times a week, moderate intensity for 5 minutes total.

**Exhibit 6:** Upper trapezius muscle release.





**Figure 7** Pectorals muscle release.

**Post-Treatment Assessment**

After the treatment was completed, a post-treatment assessment was done to measure the pain scale and CROM. The differences were observed and noted down on a paper.

**Exhibit 8** CROM measured after the treatment.



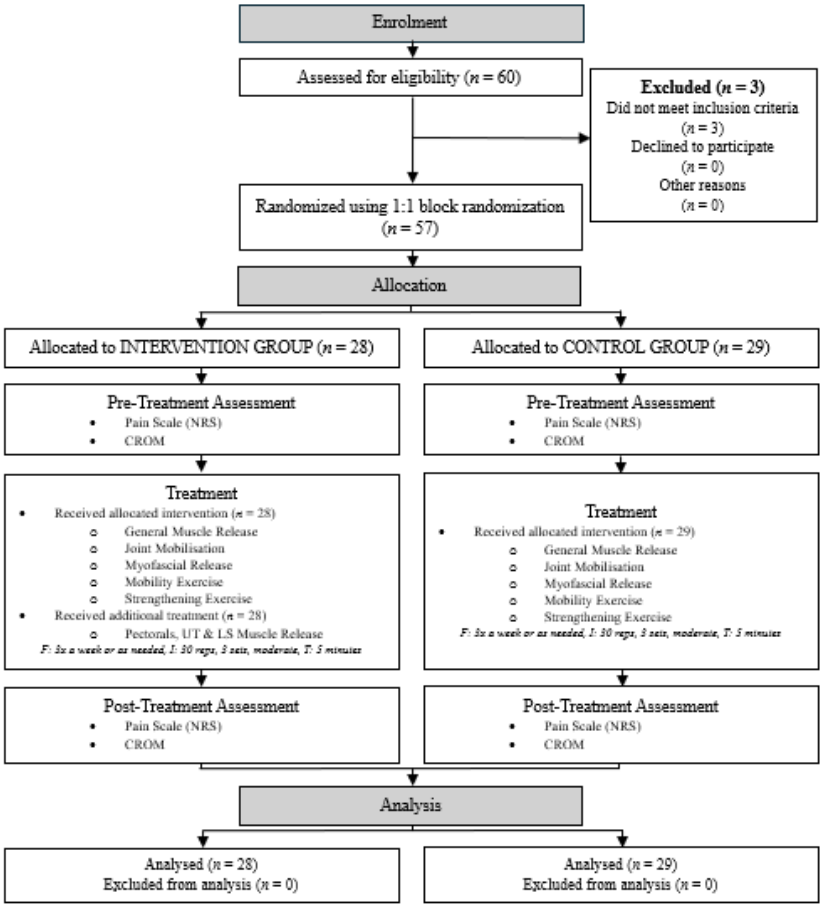
**Data Analysis**

Descriptive statistics of this study were reported based on means, standard deviations, and medians. First, the Shapiro-Wilk test was used to check the normality of data distribution. As the data violated the default assumptions of parametric statistics, non-parametric methods were implemented. A Wilcoxon signed-ranks test was used for within-group comparisons (pre-test vs. post-test). A Mann-Whitney U test was utilized to compare between-group differences using calculated change scores, evaluating medians for homogeneous variables and mean ranks for the variable with unequal variance. All the statistical analyses were performed in SPSS software Version 32 at a significance level of 0.05, and all the tests were considered two-sided.

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## RESULTS AND DISCUSSION

**Exhibit 13: CONSORT Flowchart**




The compiled descriptive data (Mean ± SD) of pre- and post- treatment across both groups for the pain score and CROM is shown in Table 4. At baseline of pain score, both groups presented with closely matched, with moderate-to-severe subjective pain levels, with intervention group at (5.75 ± 2.35) and control group (5.66 ± 1.61). Following the treatment timeline, both groups experienced a reduction in pain score. However, the intervention group demonstrated a much more pronounced improvement, nearly dropping 3 full points down the scale (2.76 ± 1.64), whereas the control group experienced a modest decrease of 2 points (3.79 ± 1.68).

The cervical flexion control group possessed a higher baseline range than the intervention group by roughly 6° (45.86° ± 12.33° vs 39.64° ± 12.69°). The intervention group demonstrated a substantial recovery curve, gaining an average of 10.36° of mobility to reach a post-treatment mean of 50.00° ± 11.55°. While the control group also improved, their overall mean gain was smaller (53.17° ± 9.11°).

Baseline cervical extension structural limits were nearly identical between the groups, at approximately 47° to 48°. Following the treatment course, the intervention group successfully unlocked an expanded mean movement arc of (56.61° ± 11.79°), whereas the control group's mobility gains flattened out at a post-treatment mean of (55.17° ± 9.11°).

Initial cervical right lateral flexion was uniform between the groups at baseline (35.89° ± 9.23°) vs. (36.56° ± 17.43°). In the post-treatment analysis, the intervention group displayed an advantage, increasing their mean range to (47.32° ± 10.76°). Interestingly, the control group's post-treatment standard deviation stabilized dramatically (10.44° compared to its wide 17.43° baseline spread) as their group mean shifted upward to (45.86° ± 10.44°).

At pre-treatment, the intervention group demonstrated slightly greater restriction cervical left lateral flexion (33.57° ± 7.92°) compared to the control group (3603° ± 10.12°). By the end of the therapeutic program, the intervention group caught up entirely, exhibiting a notable mean improvement to finalize at a post-treatment mean of (44.46° ± 12.93°). The control group finished at an almost identical endpoint (44.14° ± 10.18°), representing a smaller baseline-to-post movement acceleration.

Initial cervical right rotation favoured the control group at baseline by about 3° (72.07° ± 10.65° vs 69.11° ± 13.13°). Following data collection, the intervention group displayed a more powerful recovery trajectory, gaining over 10° of transverse rotation to top out at a mean of 79.64° ± 11.05° successfully surpassing the control group's post-treatment recovery endpoint of 78.45° ± 9.07°.

Mirroring the patterns found on the right side, cervical left rotation began with the control group holding a slight baseline lead (72.93° ± 12.07° vs 69.82° ± 11.67°). Post-treatment, the intervention group demonstrated its most profound directional mobility expansion in the study, surging past the 80° threshold to establish a post-treatment mean of 81.43° ± 9.70°. The control group experienced a less distinct upward shift, finishing lower at 79.14° ± 9.73°.

**Table 2:** Mean and standard deviation of the pain score and CROM of both groups, pre- and post-treatment.

| | | **Intervention Group (*n* = 28)** | **Control Group (*n* = 29)** |
|---|---|---|---|
| Pain Score | Pre-Treatment | 5.75 ± 2.35 | 5.66 ± 1.61 |
| | Post-Treatment | 2.76 ± 1.64 | 3.79 ± 1.68 |
| Cervical Flexion | Pre-Treatment | 39.64 ± 12.69 | 45.86 ± 12.33 |
| | Post-Treatment | 50.00 ± 11.55 | 53.17 ± 9.11 |
| Cervical Extension | Pre-Treatment | 47.5 ± 10.58 | 48.10 ± 9.10 |
| | Post-Treatment | 56.61 ± 11.79 | 55.17 ± 9.11 |
| Cervical Right Lateral Flexion | Pre-Treatment | 35.89 ± 9.23 | 36.555 ± 17.43 |
| | Post-Treatment | 47.32 ± 10.76 | 45.86 ± 10.44 |
| Cervical Left Lateral Flexion | Pre-Treatment | 33.57 ± 7.92 | 36.03 ± 10.12 |
| | Post-Treatment | 44.46 ± 12.93 | 44.14 ± 10.18 |
| Cervical Right Rotation | Pre-Treatment | 69.11 ± 13.13 | 72.07 ± 10.65 |
| | Post-Treatment | 79.64 ± 11.05 | 78.45 ± 9.07 |
| Cervical Left Rotation | Pre-Treatment | 69.82 ± 11.67 | 72.93 ± 12.07 |
| | Post-Treatment | 81.43 ± 9.70 | 79.14 ± 9.73 |

Source: Primary Data

**Data Distribution And Normality Testing**

Prior to inferential analyses, data distributions for the clinical outcomes were evaluated using the Shapiro-Wilk test to determine the mathematical appropriateness of parametric versus non-parametric testing. Shapiro-Wilk test was used as the data in each group was less than 50. As shown in Table 4, the pain score and CROM data demonstrated extensive violations of normality.

The pain score is normally distributed within the intervention group ($p = 0.063$) but significantly deviated from normality in the control group ($p < 0.001$). Besides, cervical extension, data was normally distributed within the intervention arm ($p = .101$) but broke normality in the control group ($p = 0.002$). Crucially, for all remaining CROM, both groups demonstrated statistically significant violations of normality ($p < 0.05$). As normality was consistently violated across these clinical indicators, non-

parametric analyses, Wilcoxon Signed-Rank for within-group tracking and Mann-Whitney U for between-group tracking were strictly selected.

**Table 3:** Shapiro-Wilk normality results for pain score and CROM.

| | **Intervention Group ($n$ = 28)** | **Control Group ($n$ = 29)** |
|---|---|---|
| Pain Score | 0.063 | < 0.001 |
| Cervical Flexion | 0.017 | 0.001 |
| Cervical Extension | 0.101 | 0.002 |
| Cervical Right Lateral Flexion | < 0.001 | 0.042 |
| Cervical Left Lateral Flexion | 0.011 | 0.011 |
| Cervical Right Rotation | 0.011 | 0.003 |
| Cervical Left Rotation | 0.045 | 0.002 |

Source: Primary data

**Within-Group Analysis**

To evaluate the internal clinical changes over time within each independent cohort, a Wilcoxon Signed-Rank test was performed to compare pre-treatment baseline scores against post-treatment endpoints. This test tracks if a group experienced statistically significant improvements when compared to its own starting point. As compiled in Table 5, both the intervention and control groups demonstrated statistically significant improvements across every single monitored outcome parameter ($p < 0.001$). For the primary clinical feature of pain score, both cohorts recorded highly significant drops. The intervention group's median pain rating shifted down from a baseline of 6.00 (2.00) to a post-treatment mark of 3.00 (2.00), yielding a substantial internal shift ($Z = -4.412$, $p < 0.001$). Similarly, the control group dropped from a median baseline score of 6.00 (2.00) down to 4.00 (2.00), ($Z = -4.648$, $p < 0.001$). All 6 movements of the neck also yielded a positive outcome in both groups. Similar improvements for cervical flexion limits advanced significantly in both groups, with the intervention group improving to a median of 50.00° (15.00°), ($Z = -4.436$, $p < 0.001$). For intervention group's Cervical Left Rotation expanded notably up to a median post-treatment score of 85.00° (15.00°) ($Z = -4.412$, $p < .001$), while the control group reached an identical post-treatment median threshold of 85.00° (15.00°), ($Z = -4.091$, $p < 0.001$). Crucially, because the Wilcoxon Signed-Rank test evaluates each group in historical isolation against itself, the uniform significance values ($p < 0.001$) simply state that both treatments are effective at generating internal changes. To prove mathematically that the intervention group treatment was better than the control group, we must look at the final Between-Group (Mann-Whitney U) analysis.

**Table 4:** Pain score and CROM outcomes using Wilcoxon Signed-Rank Test.

| | **Group** | **Median (IQR)** | | **Z-Score** | ***p*-value** |
|---|---|---|---|---|---|
| | | Pre-Treatment | Post-Treatment | | |
| **Pain Score** | Intervention Group ($n$ = 28) | 6.00 (2.00) | 3.00 (2.00) | -4.412[a] | < 0.001 |
| | Control Group ($n$ = 29) | 6.00 (2.00) | 4.00 (2.00) | -4.648[a] | < 0.001 |
| **Cervical Flexion** | Intervention Group ($n$ = 28) | 40.00 (15.00) | 50.00 (15.00) | -4.436[a] | < 0.001 |
| | Control Group ($n$ = 29) | 17.50 (55.00) | 50.00 (15.00) | -4.573[a] | < 0.001 |

| | | | | | |
|---|---|---|---|---|---|
| **Cervical Extension** | Intervention Group ($n$ = 28) | 45.00 (10.00) | 55.00 (13.75) | -4.244[a] | < 0.001 |
| | Control Group ($n$ = 29) | 5.00 (50.00) | 55.00 (10.00) | -4.116[a] | < 0.001 |
| **Cervical Right Lateral Flexion** | Intervention Group ($n$ = 28) | 35.00 (15.00) | 50.00 (18.75) | -4.230[a] | < 0.001 |
| | Control Group ($n$ = 29) | 17.50 (47.50) | 45.00 (10.00) | -4.283[a] | < 0.001 |
| **Cervical Left Lateral Flexion** | Intervention Group ($n$ = 28) | 32.50 (15.00) | 45.00 (20.00) | -4.319[a] | < 0.001 |
| | Control Group ($n$ = 29) | 12.50 (42.50) | 45.00 (12.50) | -4.440[a] | < 0.001 |
| **Cervical Right Rotation** | Intervention Group ($n$ = 28) | 70.00 (20.00) | 82.50 (20.00) | -4.151[a] | < 0.001 |
| | Control Group ($n$ = 29) | 20.00 (8000) | 80.00 (15.00) | -4.291[a] | < 0.001 |
| **Cervical Left Rotation** | Intervention Group ($n$ = 28) | 70.00 (17.50) | 85.00 (15.00) | -4.412[a] | < 0.001 |
| | Control Group ($n$ = 29) | 80.00 (17.50) | 85.00 (15.00) | -4.091[a] | < 0.001 |

a. Based on negative ranks

**Between-Group Efficacy Analysis**

To determine the comparative clinical efficacy between the two groups, a Mann-Whitney U test was performed. To compare the two groups, whether the additional intervention is effective, we will look at the baseline scores of the pain score and CROM of the Intervention Group ($n$ = 28) and Control Group ($n$ = 29). Looking at Table 6, we can see that the intervention group had a higher initial pain score as compared to the control group. Additionally, the intervention group has deficit in CROM in all 6 movements as compared to the control group, especially with cervical flexion, which has a notably statistically significant deficit ($p$ = 0.48, $r$ = -0.262).

**Table 5:** Between-group comparison of the baseline scores using the Mann-Whitney U Test

| | Group | Mean Rank | Sum of Ranks | U | Z-score | p-value | r |
|---|---|---|---|---|---|---|---|
| **Pain Score** | Intervention Group (n = 28) | 30.34 | 849.50 | 368.500 | -0.609 | 0.542 | -0.071 |
| | Control Group (n = 29) | 27.71 | 803.50 | | | | |
| **Cervical Flexion** | Intervention Group (n = 28) | 24.63 | 689.50 | 283.500 | -1.978 | 0.048 | -0.262 |
| | Control Group (n = 29) | 33.22 | 963.50 | | | | |
| **Cervical Extension** | Intervention Group (n = 28) | 28.23 | 790.50 | 384.500 | -0.354 | 0.723 | -0.047 |
| | Control Group (n = 29) | 29.74 | 862.50 | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Cervical Right Lateral Flexion** | Intervention Group (n = 28) | 27.61 | 773.00 | 367.000 | -0.630 | 0.529 | -0.083 |
| **Cervical Left Lateral Flexion** | Intervention Group (n = 28) | 27.18 | 761.00 | 355.000 | -0.827 | 0.409 | -0.110 |
| | Control Group (n = 29) | 30.76 | 892.00 | | | | |
| **Cervical Right Rotation** | Intervention Group (n = 28) | 27.21 | 762.00 | 356.000 | -0.808 | 0.419 | -0.107 |
| | Control Group (n = 29) | 30.72 | 891.00 | | | | |
| **Cervical Left Rotation** | Intervention Group (n = 28) | 26.61 | 745.00 | 339.000 | -1.080 | 0.280 | -0.143 |
| | Control Group (n = 29) | 31.31 | 908.00 | | | | |

Source: Primary Data

To identify which treatment approach produced mathematically superior improvements, the Mann Whitney U was utilised to compare the post-treatment change scores between the Intervention Group ($n$ = 28) and the Control Group ($n$ = 29). The between-group analysis revealed statistically significant advantages for the intervention group across the pain score and CROM ($p < 0.05$).

Despite having an initial disadvantage of higher pain score and lesser mobility of CROM, the intervention group demonstrated definitive therapeutic superiority. In terms of the pain score, the intervention group demonstrated a higher magnitude of relief ($U$ = 205.500, $Z$ = -3.333, $p < 0.0001$), reversing the baseline trend with a strong treatment effect size ($r$ = -0. 441)

In terms of CROM, the cervical flexion shows most compelling evidence of the effects of additional treatment. Although the control group had a significantly greater baseline cervical flexion mobility, the intervention group achieved a significantly greater absolute CROM gains ($U$ = 243.500, $Z$ = -2.716, $p$ = 0.007) with a higher mean rank (34.29) than the control group (23.90), yielding a clear treatment effect ($r$ = -0.360). This superior progression was also reflected in the cervical left rotation ($U$ = 223.500, $Z$ = -2.994, $p$ = 0.003, $r$ = -0.397), right lateral flexion ($U$ = 263.000, $Z$ = -2.339, $p$ = 0.019, $r$ = -0.310), and right rotation ($U$ = 279.000, $Z$ = -2.089, $p$ = 0.037, $r$ = -0.277),

In contrast, no statistically significant differences were observed between the groups for Cervical Extension ($U$ = 327.500, $Z$ = -1.302, $p$ = 0.193, $r$ = -0.172) or Cervical Left Lateral Flexion ($U$ = 348.000, $Z$ = -0.956, $p$ = 0.339, $r$ = -0.127), indicating that both groups have similar outcomes.

**Table 6:** Between-group comparison of treatment efficiacy using the Mann-Whitney U Test

| | **Group** | **Mean Rank** | **Sum of Ranks** | **U** | **Z-score** | **p-value** | **r** |
|---|---|---|---|---|---|---|---|
| **Pain Score** | Intervention Group (n = 28) | 34.80 | 974.50 | 205.500 | -3.333 | <.0001 | -0.441 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Control Group (n = 29) | 23.40 | 678.50 | | | | |
| **Cervical Flexion** | Intervention Group (n = 28) | 34.29 | 960.00 | 243.500 | -2.716 | 0.007 | -0.360 |
| | Control Group (n = 29) | 23.90 | 693.00 | | | | |
| **Cervical Extension** | Intervention Group (n = 28) | 31.80 | 890.50 | 327.500 | -1.302 | 0.193 | -0.172 |
| | Control Group (n = 29) | 26.29 | 762.50 | | | | |
| **Cervical Right Lateral Flexion** | Intervention Group (n = 28) | 24.07 | 698.00 | 263.000 | -2.339 | 0.019 | -0.310 |
| | Control Group (n = 29) | 34.11 | 955.00 | | | | |
| **Cervical Left Lateral Flexion** | Intervention Group (n = 28) | 31.07 | 870.00 | 348.000 | -.956 | 0.339 | -0.127 |
| | Control Group (n = 29) | 27.00 | 783.00 | | | | |
| **Cervical Right Rotation** | Intervention Group (n = 28) | 33.54 | 939.00 | 279.000 | -2.089 | 0.037 | -0.277 |
| | Control Group (n = 29) | 24.62 | 714.00 | | | | |
| **Cervical Left Rotation** | Intervention Group (n = 28) | 35.52 | 994.50 | 223.500 | -2.994 | 0.003 | -0.397 |
| | Control Group (n = 29) | 22.71 | 658.50 | | | | |

Source: Primary Data

**Pain Relief**

One of the findings from this study showed that by releasing the pectorals, UT and LS in addition to the conventional treatment of the neck aids in reducing the neck pain. Both groups demonstrated a highly significant within-group reductions in pain from pre-treatment to post-treatment ($p < 0.001$), with the control group effect of $Z = -4.65$ and intervention group effect of $Z = -4.41$ The immediate pain relief observed within the control group can be attributed to the myofascial release therapy which

relieves tension and neck pain (Lv et al, 2024). However, between-group analysis confirmed that the intervention group provided a better and significantly higher degree of immediate pain relief ($U = 205.50$, $p = 0.001$). This confirms that releasing the pectorals, UT and LS activates rapid physiological mechanism. The pectorals muscle tightness has proven to be one of the causes of neck pain (Mariyam Farzana et al, 2021).

Office workers are always sustained to neck and shoulder symptoms to attribute to their work environment of prolonged static sitting. Prolonged sitting in fixed posture without breaks is commonly associated with neck pain (Nakphet & Chaikumarn, 2023). The fixed posture overtime will affect the contraction abilities of muscles in the shoulder region as well as the position of the scapula leading to shoulder protraction. All these leads to the pectoralis minor and muscles of the scapula such as the UT and SCM to tighten (Maheshwari et al, 2024)

**Restoring Crom**

The multi-directional evaluation of cervical range of motion immediately following the single session revealed an amazing result. For all six movements across both groups, within-group post-treatment improvements were highly statistically significant ($p <$ .001). Nevertheless, the Mann-Whitney U tests on the pre-to-post-treatment difference scores proved that the intervention group outperformed the control group across four specific planes of motion. This implies that releasing the anterior chest and posterior neck musculature is highly effective at eliminating specific structural blocks to movement.

Limited evidence and article show that releasing the pectorals muscle aids in restoring the CROM. Nevertheless, there are several studies that show myofascial release does effectively improve CROM (Behnampour, 2024).

Conversely, not statistically significant between-group differences were observed in the remaining two directions ($p > .05$). This lack of divergence suggests that for these two movements, both the intervention and control protocols were equally competent at addressing structural restrictions within a single session.

**Clinical Implication**

For clinical practitioners, these findings offer clear guidance for treating office workers suffering from neck pain and mobility restrictions. Relying solely on standardised treatment protocols may provide basic relief, but incorporating a targeted release of the pectorals, UT, and LS ensures a significantly higher quality of immediate care. Practitioners can expect better pain score reduction and better restoration of cervical functional movements within a single session, directly translating to enhanced patient satisfaction and immediate functional relief in clinical settings.

**Limitatons & Recommendations For Further Studies**

Despite the strong statistical significance of the data, several limitations must be acknowledged. First, the sample size was limited to 57 participants with control group ($n = 29$) and intervention group ($n = 28$). While this sample was sufficiently powered to detect major differences, a larger sample size would enhance the generalizability of the findings. Second, this was a single-session study designed to evaluate immediate post-treatment outcomes; therefore, the long-term sustainability and cumulative treatment effects over weeks or months remain unknown. Finally, the data screening revealed non-normal distributions across most of the pain and movement parameters, requiring non-parametric testing. While non-parametric tests are highly immune against violations, they assess rank distributions rather than strict continuous parameters, which alters how the magnitude of physical change is evaluated.\

**CONCLUSION**

The findings suggest that adding pectorals, upper trapezius and levator scapulae muscle release to conventional physiotherapy resulted in greater immediate improvements in pain and selected cervical range of motion outcomes than conventional treatment alone. Both treatment pathways can generate highly significant within-group improvements over time, but the intervention group yielded a much better results in being able to reduce pain and improve CROM in a short period of time. The intervention successfully proven that specific muscle release onto this forgotten muscle generate better results as compared to the standardised physiotherapy treatment. These results fully validate the alternative hypothesis of the study and justify the possible integration of the manual technique in management of neck pain in the future.

As there were limitations in this study, several recommendations for future further research should be noted. A longer follow-up timeline would allow better overall investigation of the efficiency of the intervention as compared to a single-session such as incorporating a 1-month to 3-month follow-up intervals. Other than that, expansion of sample size would allow better generalisability to the larger population.

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