Study Protocol

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Effect of Body Mind Exercises and Specific Neck Exercises in Chronic Mechanical Neck Pain.

By

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CHAPTER I

INTRODUCTION

Chronic mechanical neck pain is one of the most prevalent musculoskeletal disorders globally, lacking a clearly identifiable pathology or specific anatomical cause **(Alagingi, 2022).** The condition is associated with high levels of pain intensity, functional limitation, and psychosocial factors like fear avoidance and catastrophizing, which contribute to poor prognosis **(Mansell et al., 2021).** It affects approximately 25.8% of the population, with 5% experiencing disability **(Cohen, 2015, Hoy et al., 2010).**

Exercise therapy is a widely recommended conservative treatment approach in clinical practice guidelines for managing chronic mechanical neck pain **(Blanpied et al., 2017; Côté et al., 2016).** Among various types, two main categories have emerged: general exercises (e.g., aerobic or body-mind exercises like brisk walking, cycling, stationary rowing, jogging, running, yoga and tai chi), and specific exercises (targeting deep neck flexors, extensors, and scapulothoracic stabilizers) **(Li et al., 2019; Blomgren et al., 2018).**

General exercises are easily accessible, can be performed individually or in groups, and provide additional psychological and social benefits **(Miyamoto et al., 2019).** However, their direct biomechanical effect on the cervical musculature may be limited compared to specific exercises, which target known muscular imbalances such as reduced activation of deep stabilizers and over activity of superficial neck muscles **(Lauche et al., 2016; Ylinen et al., 2004).**

Despite the widespread use of both approaches, the current evidence is inconclusive regarding which is superior in improving pain and function. A recent systematic review and meta-analysis concluded that general exercises are **not superior** to specific exercises in reducing pain and disability in the short, medium, or long term, but also highlighted the **low quality of available studies** and the need for high-quality randomized controlled trials **(Vieira Rosa et al., 2024).**

Statement of the Problem

Does the **addition of Body mind exercise, specific neck exercises or both to conventional physical therapy** reduce pain, disability, improve neck range of motion, isometric neck muscle strength and quality of life in patients with chronic mechanical neck pain?

Purpose of the Study

To investigate the effect of addition of body mind exercise, specific neck exercises or both to conventional physical therapy in patients with chronic mechanical neck pain on neck pain severity, functional disability, neck flexion range of motion, isometric neck muscle strength and quality of life.

Significance of the Study

Body mind exercises (mindful aerobic exercises) has been identified as a beneficial intervention for managing chronic mechanical neck pain. A recent systematic review and meta-analysis of randomized controlled trials found that body mind exercises (mindful aerobic exercises) significantly reduced pain intensity and disability in individuals with chronic mechanical neck pain, particularly when combined with other therapies such as strengthening exercises or acupuncture **(De Oliveira-Souza et al., 2024**).

Another systematic review focusing on patients with chronic mechanical neck pain highlighted that moderate-intensity aerobic exercises, performed three times per week for 30–45 minutes, led to improvements in pain, function, and disability levels **(Paraskevopoulos et al., 2023).** These findings underscore the importance of incorporating aerobic exercises into treatment plans for chronic mechanical neck pain to enhance patient outcomes.

Spinal stabilization exercises are popular for treating and preventing musculoskeletal neck disorders by the activation of deep muscles and controlling the over activity of surface muscles. **(Ibrahim Elnaggar et al., 2022)**

Ibrahim Elnaggar et al., (2022) compared the efficacy of cervical stabilization exercises and scapular stabilization exercises on neck pain severity, neck functional disability and neck mobility in treatment of patients with chronic mechanical neck pain. They found that cervical and scapular stabilization provided significant improvement in all the measured variables.

Incorporating both cervical and scapular stabilization exercises into rehabilitation programs can provide comprehensive benefits for individuals suffering from neck disorders. These exercises not only alleviate pain but also restore functional movement patterns, contributing to long-term musculoskeletal health **(Tian et al., 2025).**

This study addresses a crucial clinical question raised by a recent systematic review. Whether general or specific exercises are more beneficial in the treatment of chronic mechanical neck pain **(Vieira Rosa et al., 2024).** By using a randomized controlled trial design with well-defined outcome measures, this study aims to provide higher quality evidence to inform clinical guidelines and individualized treatment decisions **(Vieira Rosa et al., 2024).**

A secondary analysis of data from a randomized controlled trial reported that combining moderate general exercises and neck-specific exercise improved the work ability of patients with neck pain more than neck-specific exercise alone. The combination should be recommended in health promotion programs and will be investigated in the current study **(Daher A, 2021).**

Hypotheses

1. There will be no significant difference between body mind exercises, specific neck exercises or both on neck pain severity in patients with chronic mechanical neck pain.
2. There will be no significant difference between body mind exercises and specific neck exercises or both on functional disability in patients with chronic mechanical neck pain.
3. There will be no significant difference between body mind exercises and specific neck exercises or both on neck flexion range of motion in patients with chronic mechanical neck pain.
4. There will be no significant difference between body mind exercises and specific neck exercises or both on neck extension range of motion in patients with chronic mechanical neck pain.
5. There will be no significant difference between body mind exercises and specific neck exercises or both on neck right lateral flexion range of motion in patients with chronic mechanical neck pain.
6. There will be no significant difference between body mind exercises and specific neck exercises or both on neck left lateral flexion range of motion in patients with chronic mechanical neck pain.
7. There will be no significant difference between body mind exercises and specific neck exercises or both on neck right rotation range of motion in patients with chronic mechanical neck pain.
8. There will be no significant difference between body mind exercises and specific neck exercises or both on neck left rotation range of motion in patients with chronic mechanical neck pain.
9. There will be no significant difference between body mind exercises and specific neck exercises or both on isometric neck flexor muscles strength in patients with chronic mechanical neck pain.

10. There will be no significant difference between body mind exercises and specific neck exercises or both on isometric neck extensor muscles strength in patients with chronic mechanical neck pain.
11. There will be no significant difference between body mind exercises and specific neck exercises or both on quality of life in patients with chronic mechanical neck pain.

Delimitations

The study will be delimited to

- Eighty patients
- Male and female patients diagnosed with chronic mechanical neck pain.
- The participants will be aged 50–65 years.
- Duration of illness will be greater than 3 months
- Intervention will last for 6 weeks, with 3 sessions per week.
- The interventions will include:
    - Conventional therapy: heat, massage, stretching exercises.
    - Body mind exercises (mindful walking).
    - Specific Exercises: Cervical and scapular stabilization exercises.
    - Combined Exercises: Mindful walking, cervical and scapular stabilization exercises.

Assumptions

- All participants will attend the scheduled sessions and comply with the prescribed home exercise program
- All participants will provide full effort during assessments and follow therapist instructions.
- No participants will receive additional treatment or medication during the study period.

Definition of Terms

- **Body mind exercise** is a fitness activity that integrates physical and psychological elements. It emphasizes the coordination of body movements and mental processes, aiming to promote physical health while also contributing to mental well-being **(Dong Y et al 2024).**
- C**hronic Mechanical Neck Pain**: Neck pain without a clearly identifiable cause, persisting for more than 3 months **(Alagingi NK., 2022).**
- **Functional Disability:** Measured by the Neck Disability Index (NDI).
- **Muscle Strength:** The strength of neck flexor and extensor muscles, evaluated using handheld dynamometry
- **Pain Intensity:** Assessed using the Visual Analog Scale (VAS) or Numeric Pain Rating Scale (NPRS).
- **Range of Motion (ROM):** The degree of movement available at the cervical joints. Measured by cervical range of motion (CROM) device.
- **Specific Exercises:** Resistance training targeting deep cervical flexor/extensor and scapular muscles to improve muscular balance and motor control **(Blomgren et al., 2018).**

Abbreviations

- NPRS: Numeric Pain Rating Scale
- NDI: Neck Disability Index
- ROM: Range of Motion

CHAPTER II

LITERATURE REVIEW

Chronic Mechanical Neck Pain

Chronic mechanical neck pain is defined as pain in the cervical region lasting for more than three months with no identifiable specific pathology such as infection, neoplasm, or fracture **(Alagingi, 2022).** High pain intensity, functional disability, and catastrophizing beliefs are known predictors of poor prognosis in these patients **(Mansell et al., 2021).** Risk factors for chronic mechanical neck pain include poor posture, prolonged sedentary behavior, psychological stress, and weak neck musculature **(Blanpied et al., 2017).**

Mechanical neck pain can be effectively managed with a combination of conventional therapies, body-mind exercises, and potentially, manual therapy. Conventional therapies include physical therapy, which may involve exercises, heat or cold therapy, and posture correction. Body-mind exercises have also shown promise in improving pain and function. Additionally, manual therapy techniques like manipulation and mobilization, especially when combined with exercise, can be beneficial **(Gross et al., 2015).**

Around 5% of individuals with neck pain suffer from persistent disability, highlighting the significant socioeconomic burden of chronic mechanical neck pain **(Cohen, 2015).** The global prevalence of neck pain is approximately 25.8%, making it one of the leading musculoskeletal disorders worldwide **(Hoy et al., 2010).**

Assessment Tools in Neck Pain

Assessment tools for neck pain include physical examinations, imaging studies, and self-report questionnaires. Physical examinations assess neck alignment, range of motion, muscle strength, and tenderness. Imaging studies like X-rays, CT scans, and MRI can reveal structural abnormalities or nerve compression. Self-report questionnaires, such as the Neck Disability Index (NDI), measure pain intensity, disability, and psychosocial impact **(Misailidou et al., 2010)**

To evaluate cervical range of motion, goniometry and inclinometers are common tools due to their reliability and ease of use **(Kiatkulanusorn et al., 2023)**. The **Numeric Pain Rating Scale (NPRS)** is widely used for evaluating pain intensity due to its simplicity, sensitivity to change, and strong psychometric properties **(Alghadir et al., 2016).** For assessing **muscle strength**, handheld dynamometry has been found to be a reliable method, especially in evaluating deep cervical flexor and extensor performance **(Ghamkhar et al., 2011).** The **Neck Disability Index (NDI)** is a validated questionnaire for measuring self-reported functional disability in patients with neck pain and is frequently used in clinical trials and practice **(Vernon and Mior, 1991).**

Treatment of chronic mechanical neck pain

The most recent systematic reviews concluded that a range of interventions for chronic mechanical neck pain, such as electrotherapy, massage, psychological intervention, pain education, neck manipulation and mobilization or exercise, can have a variable degree of effectiveness **(Valenza-Peña et al., 2023).**

General exercises

Aerobic training has been shown to induce exercise-induced hypoalgesia, a mechanism that may contribute to pain relief in musculoskeletal disorders **(Wewege et al., 2021).** General exercises include aerobic activities (e.g., walking, cycling) and mind-body interventions (e.g., yoga, tai chi), which aim to improve overall physical health, cardiorespiratory fitness, and psychosocial well-being **(Miyamoto et al., 2019).** These exercises are typically performed in group settings or independently and require minimal supervision or specialized equipment **(De Zoete et al., 2019).** However, general exercises may lack the targeted muscular benefits required to correct cervical movement dysfunctions commonly seen in CNSNP **(Lauche et al., 2016).** Mind-body practices have been associated with improved psychological outcomes, such as reduced stress, anxiety, and depression, which are often present in individuals with chronic mechanical neck pain **(Cramer et al., 2013a; Cramer et al., 2013b).**

Specific Exercises for Chronic Mechanical Neck Pain

Reduced activation of deep neck flexors and increased reliance on superficial muscles, such as the sternocleidomastoid and upper trapezius, are commonly observed in patients with chronic mechanical neck pain **(Sakinepoor et al., 2025).** Specific training aims to restore motor control, improve postural alignment, and reduce compensatory movement strategies **(Mera, Natalya et al., 2025).** Specific exercises are designed to target impaired muscular and motor control patterns associated with chronic mechanical neck pain **(Blomgren et al., 2018).** These include deep cervical flexor training, scapulothoracic stabilization, and resistance-based neck strengthening **(Price et al., 2020).** Resistance exercises have demonstrated improvements in neck strength, function, and pain levels when applied consistently over several weeks **(Gross et al., 2016).**

Comparative Studies: General vs Specific Exercises

Vieira Rosa et al. (2024) conducted a systematic review and meta-analysis including 14 articles from 12 randomized controlled trials that compared general and specific exercises for chronic mechanical neck pain. The review found no significant differences in pain intensity between aerobic and specific exercises in the medium term (MD 0.95, 95% CI -1.62 to 3.51) or long term (MD 0.32, 95% CI -1.05 to 1.68) (Vieira Rosa et al., 2024). Similarly, mind-body exercises were not superior to specific exercises for reducing pain in the medium (MD 0.54, 95% CI 0.00 to 1.08) or long term (MD 0.06, 95% CI -0.59 to 0.46) **(Vieira Rosa et al., 2024).** Functional disability outcomes also showed no significant differences between groups in both the medium (MD 0.01, 95% CI -0.25 to 0.27) and long term **(Vieira Rosa et al., 2024).** The review concluded that although both exercise types may provide benefit, the quality of evidence remains very low to low, indicating a need for high-quality RCTs **(Vieira Rosa et al., 2024).**

Several individual studies included in the meta-analysis echoed these findings. **Iversen et al. (2018)** observed modest improvements in both groups, with no significant differences in pain or disability. Similarly, **Lauche et al. (2016)** found comparable effects between tai chi and neck-specific exercises in reducing symptoms over 12 weeks.

CHAPTER III

SUBJECTS AND METHODS

Study Design

This study will be a randomized controlled trial (RCT) conducted to compare the effects of body mind exercises (mindful aerobic exercises), specific neck exercises and combined (body mind and specific) exercises in addition to conventional therapy on neck pain severity, functional disability, neck range of motion, isometric neck muscle strength and quality of life in patients with chronic mechanical neck pain.

The study will follow CONSORT guidelines for randomized trials and will be conducted at the outpatient physical therapy clinic of the Faculty of Physical Therapy, Cairo University.

Ethical approval will be obtained from the institutional review board (IRB) of the Faculty of Physical Therapy, and the trial will be registered on ClinicalTrials.gov before patient enrollment.

Sample Size Calculation

Sample size was calculated using **G*Power software version 3.1.9.7**, referencing effect size data from a recent RCT comparing general and specific exercises in neck pain **(Vieira Rosa et al., 2024).** A priori power analysis for a repeated measures ANOVA (within-between interaction) was used with an effect size of 0.25, alpha level (α) = 0.05, and power ($1-\beta$) = 0.95. The estimated sample size required was **76 participants**, which was increased to account for potential dropouts as shown in (**Figure 1).** Thus, the total sample will include **80 patients**, randomly allocated into four equal groups (n = 20 per group):

- **Group A:** Conventional therapy.
- **Group B**: Conventional therapy + Body mind exercises (mindful aerobic exercise).
- **Group C:** Conventional therapy + specific neck exercises (cervical and scapular stabilization exercises)
- **Group D:** Conventional therapy + combined (body mind and specific) exercises

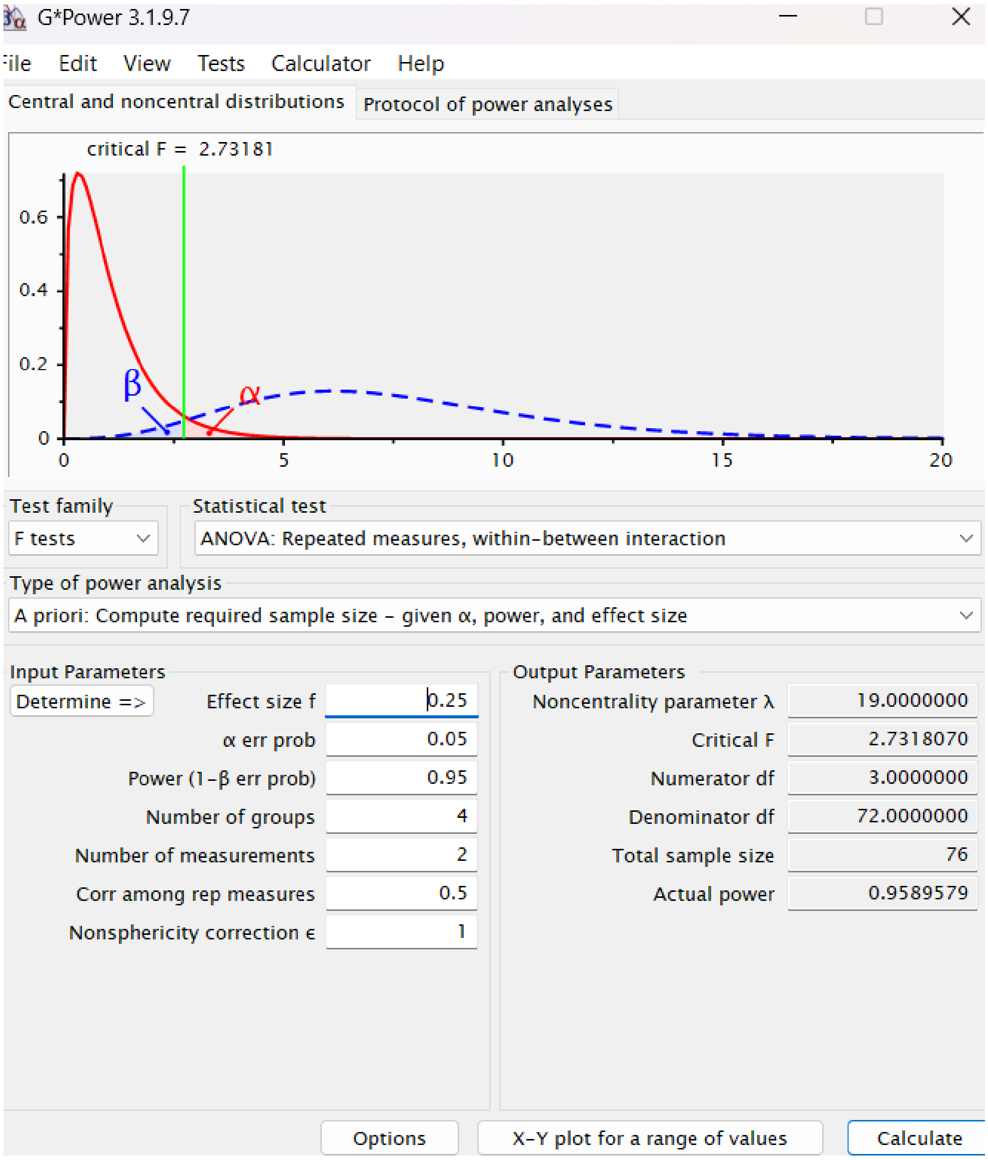


Figure 1 sample size calculation

Patients

A total of 80 patients (50-65 years old) with chronic mechanical neck pain will be recruited from outpatient orthopedic and physical therapy clinics. All participants will provide written informed consent prior to enrollment.

Inclusion Criteria (Daher et al., 2021)

- Adults aged between 50-65 years
- Diagnosis of chronic mechanical neck pain (pain duration $\geq$ 3 months)
- Pain intensity of at least 3/10 on the NPRS

Exclusion Criteria

- History of cervical surgery
- Specific neck conditions (fractures, neoplasm, infection)
- Pregnancy
- Severe cardiopulmonary disease or other systemic illness affecting participation

Randomization and Blinding

Participants will be randomly allocated into four groups using a computer-generated block randomization method. Allocation concealment will be ensured using sealed opaque envelopes. The **outcome assessor** will be blinded to group allocation.

Outcome Measures

All outcomes will be measured at **baseline (pre-intervention)** and after **6 weeks (post-intervention)**.

1. Pain Intensity

Measured using the **Arabic version of the Numeric Pain Rating Scale (NPRS)**, which has been validated for Arabic-speaking populations **(Alghadir et al., 2016).** Patients will be asked to rate their neck pain intensity on a scale from 0 (no pain) to 10 (worst possible pain).

2. Functional Disability

Evaluated using the **Arabic version of the Neck Disability Index (NDI)**, a validated 10-item questionnaire assessing how neck pain affects daily activities **(Algarni et al., 2014; Vernon and Mior, 1991).**

3. Cervical Range of Motion (ROM)

Measured using **CROM device** to assess flexion, extension, lateral flexion, and rotation in both directions. Measurements will be performed with the patient in a seated position and will be repeated three times to ensure reliability **(Kiatkulanusorn S et al., 2023).**

4. Isometric Neck Muscle Strength

Assessed using a **handheld dynamometer** (HHD) placed at the forehead (flexion) and occiput (extension) in seated position. Three maximal isometric contractions (5 seconds each) will be performed, and the average value will be recorded **(Ghamkhar et al., 2011).**

5. Quality of life

The Arabic version of Arabic Version of the RAND 36-Item Health Survey 1.0 to measure the recovery of quality of life of chronic mechanical neck pain patients (**Coons et al., 1998**).

Instrumentation

- NPRS scale (Arabic version)
- Neck Disability Index (Arabic version)
- RAND 36-Item Health Survey (Arabic version)
- CROM for neck ROM
- Handheld dynamometer for neck isometric muscle strength
- Stopwatch

Intervention Procedures

All groups will receive 3 treatment sessions per week for a total of 6 weeks (18 sessions). Each session will last approximately 60- 90 minutes.

All groups will receive conventional therapy **(Mahesvi, Hafiz & Graha et al., 2023)** which includes: heat therapy (infrared) for 10 minutes, massage therapy 10 min, stretching of neck (Scalene, SCM, UFT, Levator scapulae) and pectoral muscles 20 min.

Home program: patients will be instructed to do self-stretching exercises according to a given brochure at home. This will monitored for compliance using a structured calendar sheet.

Group A: Conventional physical therapy group (Control group)

Group A will receive conventional therapy **(Mahesvi, Hafiz & Graha et al., 2023)** which includes: heat therapy (infrared) for 10 minutes, massage therapy 10 min, stretching of neck (Scalene, SCM, UFT, Levator scapulae) and pectoral muscles 20 min.

Group B: Body mind exercises group (mindful aerobic exercises)

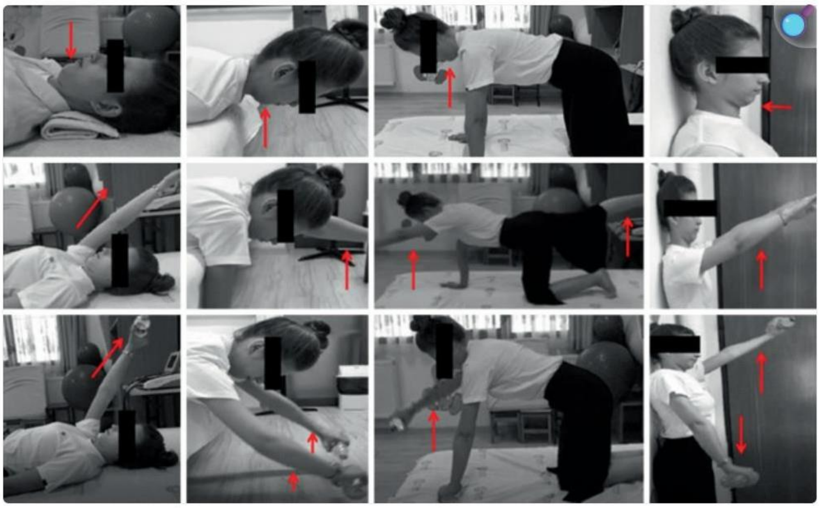
Group B will receive **conventional physical therapy** (infrared, massage, and neck stretching) in addition to **Body mind exercises (mindful aerobic exercises).** The aerobic exercise will be performed at an intensity of at least 60% of maximal oxygen consumption (VO_2 max) to effectively improve cardiorespiratory fitness. The program will include treadmill walking 30 minutes. Participation will be recorded only when conducted under instructor supervision (**Korshøj M., et al 2017**).

Group C: specific neck exercise group

Group C will receive **conventional therapy in addition to specific neck exercises.** Specific exercises will include: cervical and scapular stabilization **(Oz HE et al., 2024; Kang et al., 2021).**

Cervical Stabilization Exercises

These exercises focus on activating deep cervical flexors and extensors to support spinal stability **(Oz HE et al., 2024)**. The patients in the cervical stabilization exercise group will perform cervical stabilization exercises. The unilateral/bilateral upper and lower extremity movements with/without an external loads will be performed in four different positions: lying in supine, lying in prone, in quadrupedal, and in standing. Chin-tuck position will be maintained during each movement. The exercise program will be progressed by increasing isometric contraction times of the chin-tuck exercises and the repetitions of the movements, as shown in **(Figure 2 and 3).**



Cervical stabilization exercise samples (*red arrows* to this direction)

Figure 2 cervical stabilization exercises adopted from Oz HE et al., (2024).

Week	Movements	Chin-tuck time	Repeats (for each positio
1–2	Maintaining chin-tuck position in supine, prone, quadrupedal, and standing positions	10 s	10 times
3	Maintaining chin-tuck position plus unilateral and bilateral upper and reciprocal lower extremity movements in supine, prone, quadrupedal, and standing positions	5 s	5 times
4	Maintaining chin-tuck position plus unilateral and bilateral upper extremity with an external load of 500 ml full water bottle and reciprocal lower extremity movements in supine, prone, quadrupedal, and standing positions	5 s	12 times
5	Maintaining chin-tuck position plus unilateral and bilateral upper extremity with an external load of 500 ml full water bottle and reciprocal lower extremity movements in supine, prone, quadrupedal, and standing positions	10 s	12 times
6	Maintaining chin-tuck position plus unilateral and bilateral upper extremity with an external load of 500 ml full water bottle and reciprocal lower extremity movements in supine, prone, quadrupedal, and standing positions	15 s	12 times

Figure 3 progression of cervical stabilization exercises adopted from Oz HE et al., (2024).

Scapular stabilization exercises:

The Scapular stabilization exercises will be comprised of four exercise programs. The participants sat on the knees in 90° flexion position, and a Swiss ball was propped up between the chest and stomach. Looking from the side, the earlobe, acromion of scapula, and pelvis made a straight line **(Kang et al., 2021).**

A. Scapula retraction exercise: While retracting both the scapula, raise both the arms backward.

B. Scapula mobilization exercise: With thumbs up, raise both the arms sideways making a straight line with the shoulders.

C. Scapula dynamic stabilization exercise I: Raise one arm beside the ear and push out the other arm behind the back. Do the same for the opposite side.

D. Scapula dynamic stabilization exercise II: Raise both the arms beside the ears and then push them down bending and maintaining elbows at 90°. Raise both the arms beside the ears again and put them down.

Each exercise was performed with two sets of 15 reps, 10 sec per rep as shown in **(Figure 4).**

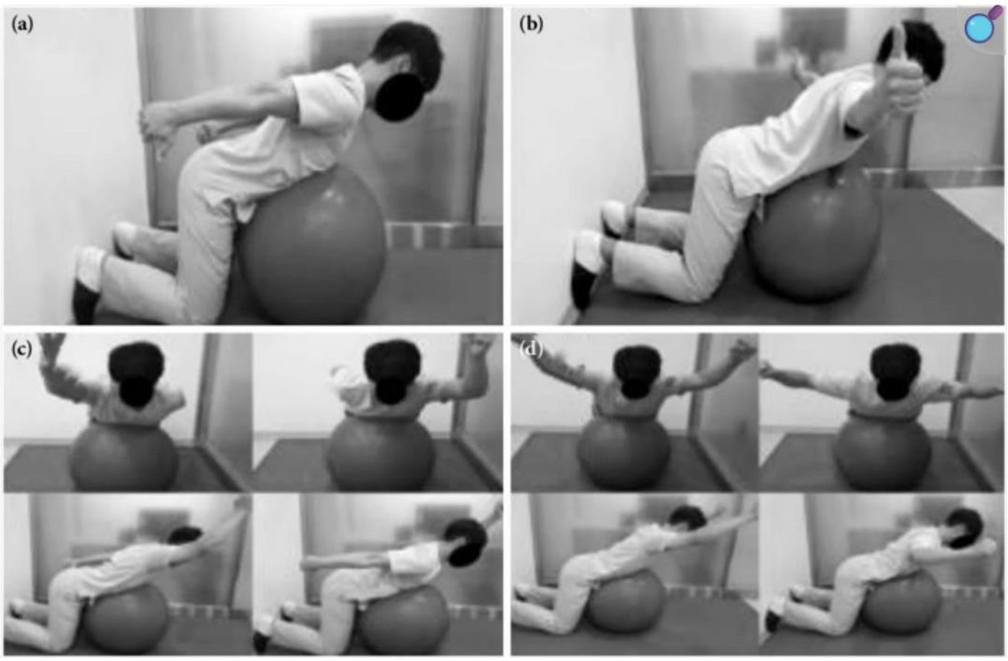


Figure 4 scapular stabilization exercises adopted from Kang et al., (2021).

Group D : Combined exercise group.

Group D will receive **conventional therapy in addition to mindful aerobic exercises, cervical and scapular stabilization.**

Statistical analysis:

Data will be analyzed using **SPSS version 27** (IBM Corp, Chicago, IL, USA). Descriptive statistics (mean ± SD) will be reported for all variables. Normality of distribution will be assessed using the **Kolmogorov–Smirnov test**. **Within-group comparisons** (pre vs post) will be conducted using **paired t-tests**. **Between-group differences** will be analyzed using **one-way ANOVA** followed by **post hoc Tukey's test**. The level of significance will be set at **$p < 0.05$**.

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