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The Effects Of Kendall Exercises And Muscle Energy Techniques In Upper Cross Syndrome Among Bank Officers In Faisalabad

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ABSTRACT

Upper Crossed Syndrome (UCS) is frequent among sedentary workers and is characterized by muscular imbalances causing pain, postural distortion, and functional impairment. This study assessed and compared the effects of Kendall Exercises (KE) and Muscle Energy Techniques (MET) on pain, disability, and cervical range of motion (ROM) in bank personnel with UCS. In this randomized controlled experiment, 44 bank personnel with UCS were allocated to receive either KE or MET ($n = 22$ per group) across 12 sessions across four weeks. All individuals got regular baseline treatment. Cervical range of motion using a goniometer was one of the secondary objectives; the primary outcomes were pain (as measured by the Numerical Pain Rating Scale) and functional disability (as measured by the Neck Disability Index). Non-parametric tests were used to analyze the data ($p < 0.05$). Pain ($\Delta = 5.1$ vs. 2.5; $p < 0.001$) and disability ($\Delta = 17.6\%$ vs. 9.7%; $p < 0.001$) were reduced more by MET than by KE. KE, however, produced better gains in rotation range of motion (68.3° vs. 61.5°, $p < 0.001$) and cervical flexion (49.1° vs. 45.2°, $p = 0.001$). There were no negative outcomes noted. While KE improves cervical mobility, MET is better at quickly reducing pain and impairment. For occupational UCS rehabilitation, a stepwise strategy that starts with MET and moves on to KE might provide the best results.

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KEYWORDS: Pain, Disability, Cervical Range of Motion, Upper Crossed Syndrome, Muscle Energy Technique, Kendall Exercises, Officers of Banks

INTRODUCTION

A common neuromuscular postural disorder known as Upper Crossed Syndrome (UCS) is typified by a systematic imbalance of cervicothoracic muscle activation. In addition to concurrent weakness of the deep cervical flexors, lower trapezius, and pectoralis major and minor, it is characterized by tightness of the upper trapezius, levator scapulae, and serratus anterior[OBJ][OBJ][OBJ].These abnormalities cause thoracic hyperkyphosis, rounded shoulders, and forward head posture (FHP) by warping normal alignment. In addition to compressing cervical tissues and changing scapular kinematics, the resulting biomechanical strain also causes persistent pain, limited cervical range of motion (ROM), and functional disability(1)..

Professionals who spend a lot of time seated are particularly at risk. UCS risk is increased by bank officers' prolonged periods of inactive posture, repetitive arm motions, and less-than-ideal ergonomic settings. These include high-frequency keyboard use, non-adjustable chairs, and misaligned monitors. According to a cross-sectional study conducted in Faisalabad, Pakistan, 54.1% of bankers had symptoms of UCS, and there was a substantial link between UCS and computer use longer than eight hours.per day (2). (3) discovered that women with UCS had much better forward-head and rounded-shoulder posture after completing a 12-week remedial exercise program.In addition to decreasing physical comfort and productivity, occupational UCS is associated with a higher risk of musculoskeletal impairment, as indicated by an elevated Neck impairment Index (NDI).) scores(4)

Muscle Energy Techniques (MET) and Kendall Exercises (KE) are two popular physiotherapy methods for managing UCS. KE places a strong emphasis on correcting posture by strengthening blocked muscle groups and carefully stretching tight muscles. The goal of exercises like scapular stability exercises and chin tucks is to restore muscle symmetry. MET, on the other hand, uses passive stretching after submaximal isometric contractions to decrease muscle hypertonicity through proprioceptive and autogenic inhibition. (5). A systematic review by (6) verified that in UCS situations, alignment is consistently improved by therapy exercises that target forward-head posture.

Although MET is said to relieve muscle tension more quickly and pain (7), KE is thought to be necessary for sustained neuromuscular re-education and postural correction(8).

Although both modalities are widely used, there is little clinical data comparing their efficacy, particularly in working groups. The majority of earlier research either concentrates on non-occupational populations like athletes or students (9),lack established intervention procedures or leave out important clinical indicators like function tests, pain scores and disability indices(10). For doctors looking for the best, evidence-based treatment approaches for UCS in sedentary workers, this results in a sizable evidence gap.

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Objective:
The purpose of this randomized controlled study (RCT) was to evaluate how well KE and MET worked for bank officers with a clinical diagnosis of UCS in terms of three important outcomes: cervical range of motion (ROM), functional disability (as determined by NDI), and pain (as evaluated by NPRS). The findings are intended to provide focused treatment plans for UCS rehabilitation in populations at work.

MATERIALS AND METHODS

ETHICAL APPROVAL

The Government College University Faisalabad Institutional Review Board gave its approval to the study (Ref: GCUF/IRB/2024/PT-07). All participants provided written informed consent. The trial was carried out in compliance with CONSORT 2010 recommendations for randomized trials and the Declaration of Helsinki. (11)

STUDY DESIGN

This parallel-group, randomized, assessor-blinded controlled experiment was carried out in Pakistan's Faisalabad between April and August of 2024. Either the Muscle Energy Techniques (MET) or Kendall Exercises (KE) groups were assigned at random to the participants. The allocation ratio used in the study was 1:1.A power analysis using G*Power v3.1 software (12) indicated that a total sample of 44 participants (22 per group) was sufficient to detect a moderate-to-large effect size (d = 0.8) with 80% power at an alpha level of 0.05.

PARTICIPANT RECRUITMENT

Poster ads and HR references were used to attract forty-four bank personnel (aged twenty to fifty) from four large commercial banks in Faisalabad. Two stages of screening were used to establish eligibility:

INCLUSION CRITERIA

Age range: 20–50 years
UCS clinical diagnosis (based on symptom profile and postural evaluation)
Neck Disability Index (NDI) score ≥ 15% Numerical Pain Rating Scale (NPRS) score ≥ 4
≥20% restriction in cervical range of motion in comparison to normal values
Computer use ≥ 4 hours per day and sedentary work ≥ 6 hours per day

EXCLUSION CRITERIA

History of cervical spine trauma, fractures, or surgeries
There are systemic inflammatory illnesses like rheumatoid arthritis and fibromyalgia.
Disorders of the nerves or radiculopathy
Currently enrolled in another physical therapy program or pregnant

RANDOMIZATION AND BLINDING

Computer-generated block randomization (block size = 4) was used to allocate participants at random to either KE or MET. Sequentially numbered, opaque, sealed envelopes were used to hide allocation. To lessen assessment bias, the outcome

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assessors were blinded to group assignments. Because of the nature of the interventions, neither the participants nor the intervention therapists were blinded.

INTERVENTION PROTOCOLS

All participants first received standard baseline therapy prior to their assigned interventions, including:

Moist heat application to the cervical and upper thoracic region (70°C, 15 minutes)

Active range of motion (AROM) exercises for cervical mobility (10 minutes)

GROUP A: KENDALL EXERCISES (KE) For four weeks, sessions were held three times a week, for a total of twelve sessions.The activities were chosen based on research such as (13), which demonstrated the efficacy of progressive, resistance-based routines in UCS management.

The protocol included:

Chin Tucks: 3 sets of 12 reps, 5-second hold

Wall y-Stretches: 3 sets of 10 reps (lower trapezius activation)

Doorway Stretches: 3 sets of 30-second holds (pectoralis major/minor)

Ear-To-Shoulder Stretches: 3 sets of 30 seconds/side (upper trapezius stretch)

GROUP B: MUSCLE ENERGY TECHNIQUES (MET)

Following 30-second passive stretches, participants underwent MET for hypertonic muscles using 5-second isometric contractions at 20–30% of maximum voluntary contraction (MVC):

Upper Trapezius: Contralateral lateral flexion

Levator Scapulae: Cervical rotation with lateral flexion

Pectoralis Major: Horizontal abduction stretch.Sessions were conducted three times per week for four weeks by a licensed physical therapist

OUTCOME MEASURES

All assessments were performed at baseline and after four weeks of intervention. The primary and secondary outcomes were:

PRIMARY OUTCOMES:

Pain intensity – assessed using the 11-point Numeric Pain Rating Scale (NPRS), where 0 = no pain and 10 = worst imaginable pain.

Disability – measured using the Neck Disability Index (NDI), a validated 10-item questionnaire with scores ranging from 0–50, where higher scores indicate greater disability

SECONDARY OUTCOME:

Cervical ROM – measured using a Baseline® 12-inch universal goniometer for flexion, extension, bilateral rotation, and lateral flexion. Three trials were conducted per motion, and the average value was recorded. Reliability: intra-rater ICC = 0.92 .

Additionally, photographic postural measurement has proven to be highly reliable in evaluating UCS alignment. (14)

STATISTICAL ANALYSIS

Version 28.0 of IBM SPSS Statistics was used to analyze the data. Normality was evaluated using the Shapiro-Wilk test. Non-parametric tests were employed because

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the data were not normally distributed ($p < 0.05$):
Within-group comparisons: Wilcoxon signed-rank test
Between-group comparisons: Mann-Whitney U test
Effect size (r): calculated as $|Z| / \sqrt{N}$; thresholds: small (0.1), medium (0.3), large (0.5) All tests were two-tailed with significance set at $p < 0.05$.

RESULTS

PARTICIPANT FLOW AND BASELINE CHARACTERISTICS

Forty-four individuals were recruited and assigned at random to either the Muscle Energy Techniques (MET) group (n = 22) or the Kendall Exercises (KE) group (n = 22). Every participant finished the 4-week intervention, which led to a 100% adherence and retention rate. During the study, there were no adverse events, protocol violations, or dropouts.
Both groups' demographics and clinical metrics were statistically comparable at baseline ($p > 0.05$). The comprehensive baseline characteristics are shown in Table 1.

Characteristic	KE Group (n = 22)	MET Group (n = 22)	p-value
Age (years)	30.5 ± 6.5	34.2 ± 10.6	0.731
Female, n (%)	17 (77.3%)	12 (54.5%)	0.524
BMI (kg/m²)	26.4 ± 3.2	27.1 ± 4.1	0.905
Daily sitting (hours)	9.2 ± 1.1	8.9 ± 1.3	0.93
Computer use (hours/day)	6.8 ± 0.9	7.1 ± 1.2	0.312
NPRS (0–10)	6.8 ± 1.2	7.1 ± 1.4	0.731
NDI (%)	28.4 ± 5.3	30.1 ± 6.0	0.524
Flexion ROM (degrees)	42.3 ± 6.5	40.8 ± 7.1	0.93

PRIMARY OUTCOMES

PAIN INTENSITY (NPRS):

The MET group showed a significant reduction in pain from 7.1 ± 1.4 to 2.0 ± 0.8 ($\Delta = 5.1$, $p < 0.001$, $r = 0.807$).
The KE group also improved, though to a lesser extent: 6.8 ± 1.2 to 4.3 ± 1.1 ($\Delta = 2.5$, $p = 0.034$, $r = 0.452$).
Between-group comparison revealed MET was significantly more effective ($p < 0.001$, $r = 0.569$).

DISABILITY (NDI):

The MET group's NDI scores decreased from 30.1 ± 6.0 to 12.5 ± 3.5 ($\Delta = 17.6$, $p < 0.001$, $r = 0.725$).
The KE group improved from 28.4 ± 5.3 to 18.7 ± 4.2 ($\Delta = 9.7$, $p < 0.001$, $r = 0.597$).
MET demonstrated superior disability reduction ($p < 0.001$, $r = 0.553$).

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SECONDARY OUTCOME: CERVICAL RANGE OF MOTION (ROM)
Table 2 shows post-intervention ROM measures. KE was more effective in increasing flexion and rotation, while MET showed greater gains in lateral flexion.

Table 2 Post-Intervention Cervical ROM (Degrees)

Movement	KE Group	MET Group	p-value	Effect Direction
Flexion	49.1 ± 5.8	45.2 ± 6.3	0.001	KE > MET
Extension	52.4 ± 6.1	50.3 ± 5.9	0.112	NS
Right Lateral Flexion	38.5 ± 4.9	42.7 ± 5.3	0.006	MET > KE
Left Lateral Flexion	39.2 ± 5.1	43.5 ± 5.6	0.002	MET > KE
Right Rotation	68.3 ± 7.1	61.5 ± 8.2	<0.001	KE > MET
Left Rotation	67.8 ± 6.9	62.1 ± 7.8	0.001	KE > MET

NS = Not significant

ADVERSE EVENTS

During the duration of the intervention, neither group experienced any adverse effects. After the first week of intervention, two members of the KE group experienced temporary muscle discomfort, which went away on its own without help.

DISCUSSION

The comparative efficacy of Muscle Energy Techniques (MET) and Kendall Exercises (KE) in treating Upper Crossed Syndrome (UCS) in bank officers—a high-risk occupational group—was assessed in this randomized controlled trial. The results showed that whereas KE was more successful in increasing cervical range of motion (ROM), especially in flexion and rotation, MET was noticeably better at lowering pain and functional impairment. These findings provide therapeutically useful data to guide customized, phase-based UCS rehabilitation plans, especially for sedentary job groups where postural dysfunction is common and reduces productivity.

INTERPRETATION OF KEY FINDINGS

On the NPRS, the MET group's mean pain reduction was 5.1 points, almost twice as much as the KE group's ($\Delta = 2.5$), suggesting a quicker and more significant impact. This is consistent with other research indicating that MET is superior at regulating

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pain via reflex muscle relaxation and autogenic inhibition. Similar results were published by(7), who discovered that MET reduced pain in UCS patients by 37% more than stretching alone ($p < 0.001$).

The impact of MET on general function was further demonstrated by the NDI scores, which improved more dramatically in the MET group ($\Delta = 17.6\%$) than in the KE group ($\Delta = 9.7\%$). This could be explained by MET's impact on neuromuscular reprogramming, which helps postural muscles like the levator scapulae and upper trapezius return to normal tone.

The KE group, on the other hand, did better than MET in regaining cervical flexion and rotation range of motion. In order to restore sagittal plane mechanics, exercises like wall Y-stretches and chin tucks focus on postural re-education and the activation of the lower trapezius and deep cervical flexors. (15). The flexion improvement (49.1° in KE vs. 45.2° in MET; $p = 0.001$) supports the effectiveness of KE for rehabilitation that focuses on mobility.

Curiously, MET demonstrated larger increases in lateral flexion, which may be because it directly inhibits hyperactive levator scapulae and upper trapezius. According to this differential advantage, KE better addresses motor control in flexion-extension tasks, whilst MET may be more appropriate for lowering muscle guarding and pain in lateral motions.This aligns with findings from(8), who demonstrated enhanced pain reduction when breathing retraining was combined with scapular stabilization in UCS patients.

CLINICAL RELEVANCE

For doctors treating UCS in work environments, these findings have important ramifications. Disability and pain might affect employment retention and productivity. In the acute or subacute phase of UCS, MET is a perfect first-line therapeutic because of its quick symptom alleviation. Following pain management, KE can be used to enhance muscle endurance and retrain posture, promoting long-term recovery and preventing relapses.

A **phased approach** is therefore recommended:

Phase 1 (Weeks 1–2): MET to decrease pain and tone in overactive musculature

Phase 2 (Weeks 3–6): KE to reinforce postural corrections and restore ROM

Maintenance: Integration of ergonomic modifications and home-based stretching

When compared to each modality alone, this procedure may produce greater long-term results since it targets both the neurophysiological and biomechanical aspects of UCS.Wheelchair basketball players showed similar results, with scapular-focused corrective workouts improving alignment and functional control.(16)

COMPARISON WITH PRIOR STUDIES

Our results echo the findings of (17), who used a corrective exercise program for office workers and showed a considerable improvement in range of motion. However, our work highlights the combined merits of MET and KE, in contrast to their single-modality approach..(18) also demonstrated that dry needling was useful in UCS for pain reduction; however, it did not evaluate range of motion or impairment, which limited its practical use. In martial arts athletes, a comparable multimodal correcting technique by (19) produced

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notable decreases in pain and thoracic kyphosis.
By assessing pain, function, and motion all at once, the present trial provides a more thorough perspective.
Furthermore, the consistent results for every participant—100% retention and no side effects—further support the safety and suitability of both therapies for use in clinical settings.

LIMITATIONS

Several limitations must be acknowledged:
Sample size: The cohort size (n = 44) may restrict generalizability and prevent subgroup analysis (e.g., gender differences), even though it is enough for discovering moderate-to-large effects.

Short duration: Long-term adherence or symptom recurrence may not be adequately captured by a four-week follow-up.

No biomechanical tools: Muscle activation patterns and posture correction were not objectively evaluated using electromyography (EMG) or motion analysis tools..

No control group: Future research would benefit from using sham or placebo interventions to isolate treatment effects, even when ethical considerations precluded a no-treatment control.

FUTURE RESEARCH DIRECTIONS

To build upon these findings, future studies should:
Enroll larger, multicenter samples from a range of professions.
Examine results across longer time periods (≥ 6 months) to gauge sustainability.
Use functional imaging, kinematic sensors, and EMG to objectively verify postural and muscle changes.
Examine combining MET and KE with other techniques as myofascial release, taping, or ergonomic training.
These research would aid in the improvement of multimodal UCS regimens designed for particular clinical subgroups and work situations.

CONCLUSION

Strong evidence that Muscle Energy Techniques (MET) are superior to Kendall Exercises (KE) in quickly reducing pain and impairment in bank officials with Upper Crossed Syndrome (UCS) is provided by this randomized controlled trial. On the other hand, KE was more successful in regaining cervical flexion and rotation range of motion, highlighting its importance in mobility training and postural correction.
According to these results, a staged rehabilitation approach is recommended, with MET being used to treat acute symptoms and KE being used to consolidate postural gains and improve functional range. Both methods are useful, safe, and appropriate for use in occupational therapy settings.
To further improve UCS management techniques, future studies should examine longer-term results, larger and more varied populations, and the incorporation of

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objective biomechanical evaluations.

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