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Review Article

Interventions for Forward Head Posture and Neck Disability among Administrative Population: A Systematic Review

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Abstract

Background: Forward Head Posture (FHP) is highly prevalent among working adults, particularly in desk-based occupations, and is associated with neck pain, disability, and musculoskeletal dysfunction. Various interventions, including exercise protocols, ergonomic modifications, and digital feedback training, have been proposed to correct FHP, but a synthesized review of their effectiveness is limited. ***Objective:*** To systematically review and summarize the evidence on the effectiveness of interventions for FHP in working adults, focusing on improvements in posture angles, neck pain, and disability. ***Methods:*** Electronic databases were searched for randomized controlled trials (RCTs) and intervention studies published between 2021 to 2025, targeting working adults with FHP. Key outcomes included craniovertebral angle (CVA), neck pain (VAS/NPRS), and neck disability index (NDI). Study characteristics, interventions, outcomes, and findings were extracted and tabulated. ***Results:*** Nine studies met inclusion criteria, involving interventions such as scapular stabilization exercises, cervical and thoracic strengthening, postural education, and digital biofeedback. Most studies reported significant improvements in CVA, reduction in neck pain, and improved NDI scores, with combined exercise and ergonomic interventions showing the greatest effect. ***Conclusion:*** Exercise-based interventions, particularly those incorporating scapular and thoracic strengthening, are effective in improving posture and reducing neck pain and disability in working adults. Integration of ergonomic modifications and digital feedback enhances outcomes. Future studies should include long-term follow-up and standardized protocols for workplace-based interventions.

Keywords: Forward Head Posture (FHP), Working Adults, Neck Pain, Randomized Controlled Trials (RCTs), Craniovertebral Angle (CVA).

INTRODUCTION

Forward Head Posture (FHP) is a postural deformity characterized by the anterior positioning of the head relative to the vertical line of the body's center of gravity, resulting in deviation from normal cervical spine alignment and compensatory changes in the thoracic spine and pelvis [4]. The development of FHP is multifactorial, involving both intrinsic and extrinsic factors. Intrinsic factors include individual anatomical variations, altered cervical curvature, and muscle imbalances, whereas extrinsic factors are largely associated with lifestyle and environmental influences [5]. Prolonged use of computers and mobile devices, poor ergonomic workstation design, extended sitting durations, and reduced levels of physical activity significantly contribute to sustained forward head positioning and maladaptive postural habits. The increasing prevalence of sedentary, office-based occupations following industrialization and rapid technological advancement has further amplified the incidence of FHP in modern populations [6].

Neck pain is a common health problem in modern societies and is frequently chronic in nature [19] Approximately 70% of individuals experience neck pain at least once during their lifetime, and nearly 5–10% of the elderly population develops disability as a consequence of neck pain [20, 21]. Cervical structures may be adversely affected by various etiological factors, including degenerative conditions, trauma, and inflammatory disorders, all of which can contribute to the onset of neck pain. In addition to these causes, mechanical neck pain represents a substantial subset of cases and arises primarily from habitual postures and

degenerative mechanical stresses acting on the cervical spine. [22,23]. Clinically, neck disability associated with FHP manifests as nociceptive pain, reduced range of motion, and functional impairments that significantly affect daily activities and quality of life, underscoring the importance of postural correction in both preventive and therapeutic strategies [10].

Objectives of the Study

Primary Objective:

To systematically review and synthesize evidence on the effectiveness of interventions (exercise programs, ergonomic education, and digital feedback) for improving Forward Head Posture in working adults.

Secondary Objectives:

- To evaluate the impact of these interventions on posture angles (e.g., craniovertebral angle).
- To assess the effectiveness of interventions in reducing neck pain and neck disability.
- To compare different types of interventions and determine which strategies are most effective in office/administrative populations.
- To identify gaps in current research and recommend areas for future studies, including long-term follow-up and combined workplace interventions.

METHODOLOGY

Source of Information and Research Methods –

This systematic review was conducted in accordance with established guidelines for evidence synthesis in health research. A comprehensive search of the literature was performed across multiple electronic databases, including PubMed, Scopus, Medline, Embase, PEDro, Google Scholar, and the Cochrane Library to identify relevant intervention studies published between 2021 and 2025. The search strategy combined both free-text keywords and Medical Subject Headings (MeSH) terms using Boolean operators (AND, OR) to enhance precision and sensitivity. Key search terms included "Forward Head Posture" OR "FHP", "exercise intervention", "ergonomic education", "digital feedback", "neck pain", and "neck disability" to capture studies evaluating posture correction strategies among working adults.

Eligibility Criteria –

Studies were screened against predefined eligibility criteria. Included studies were required to: (a) recruit working adults (e.g., office, administrative, IT professionals) diagnosed with or exhibiting measurable FHP; (b) implement interventions such as exercise protocols, ergonomic education, or digital feedback training; (c) report primary outcomes related to posture (e.g., craniovertebral angle), neck pain, and neck disability measured using validated tools; (d) utilize randomized controlled trial (RCT) or quasi-experimental study designs; (e) be published in English and available in full text. Studies were excluded if they focused solely on observational postural assessments without intervention, were review articles, editorials, conference abstracts, or were not published in English.

Data Extraction and Synthesis –

Data extraction was conducted independently by two reviewers using a standardized data charting form. Extracted information included authors and year, study design, sample characteristics, intervention details (type, frequency, duration), assessment tools, and outcomes and findings. Any discrepancies between reviewers were resolved through discussion and, where necessary, consultation with a third reviewer to ensure accuracy and consistency. Cross-verification with the full-text articles was performed to maintain data integrity. The synthesized data were narratively summarized and presented in structured tables to facilitate comparison of interventions and outcomes.

Table no 1: Summary of Included Studies

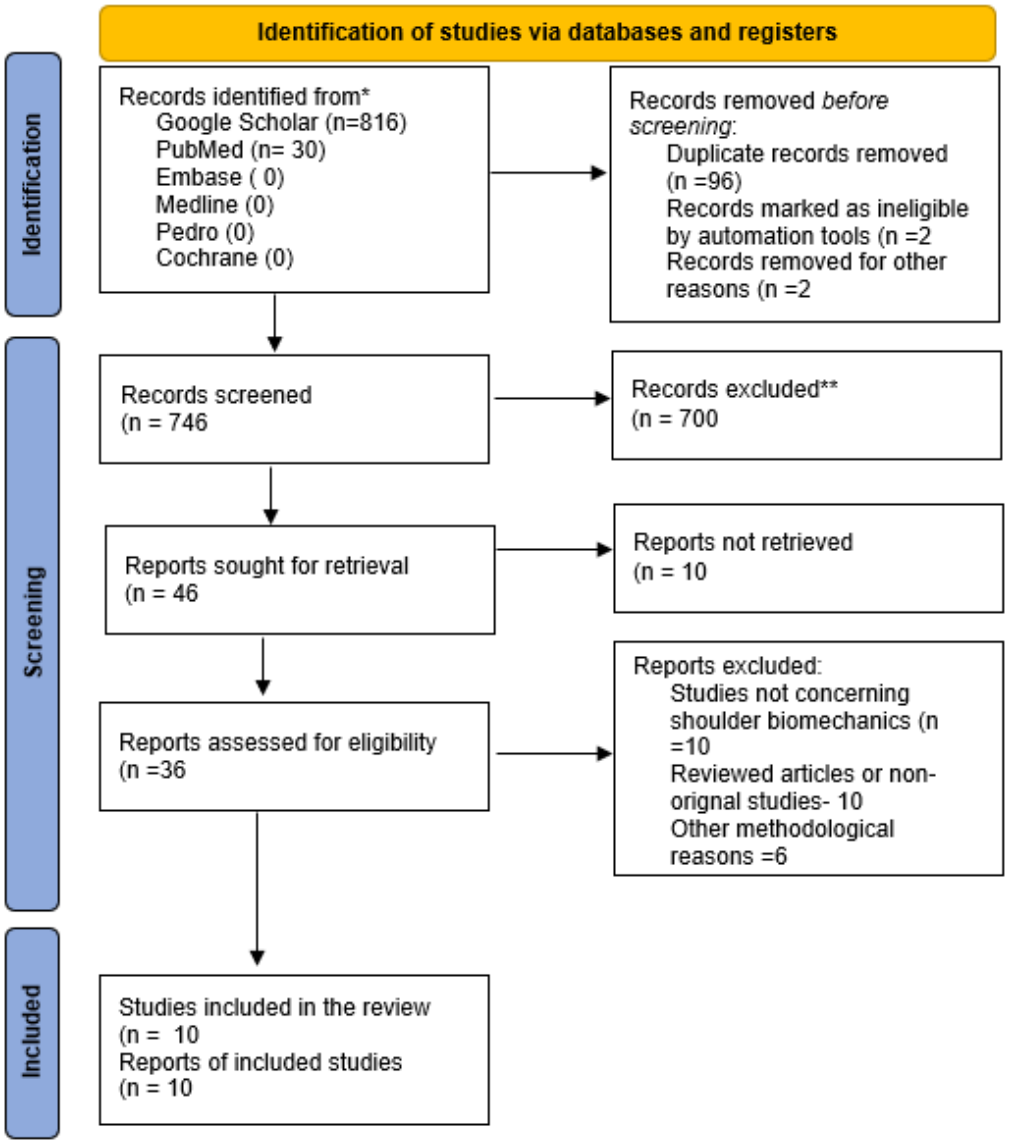
Author / Year	Study Design	Population	Intervention	Outcomes	Findings
Lee & Lee H (2021) [8]	Randomized Controlled Trial	Office workers with FHP	Scapular stabilization + thoracic extension vs cervical stabilization/stretching	CVA, VAS, NDI, FEV1	Both interventions improved posture and pain; scapular + thoracic group showed additional gains in respiration and neck disability.
Yagohubitajani Z (2022) [9]	Randomized Controlled Trial	Office workers	Online-supervised vs workplace corrective exercise	CVA, pain	Both methods improved posture and pain; online delivery feasible for remote work.
Gurudut P. (2022) [10]	Randomized Controlled Trial	Adults with FHP	Bruegger's exercises vs deep cervical flexor training	CVA, endurance	Both interventions improved CVA; Bruegger's

Author / Year	Study Design	Population	Intervention	Outcomes	Findings
					exercises showed better retention
David A Titcomb (2023) [11]	Randomized Controlled Trial	Young adults with FHP	Postural education, myofascial release + stretching, strengthening	CVA	All active groups improved posture compared to control
Kothari VN (2023) [12]	Randomized Controlled Trial	IT professionals	Deep cervical flexor vs scapular stabilization vs isometric/stretching	CVA, NDI, VAS	Scapular stabilization showed greater improvement in posture, pain, and disability
Kim *et al.,* (2023) [13]	Randomized Controlled Trial	Adults with forward head posture and neck pain	Cervicothoracic posture correction exercises	Craniovertebral angle (CVA), Neck Disability Index (NDI), spinal muscle EMG	Both interventions significantly improved CVA and reduced neck disability; the combined cervicothoracic and lumbopelvic program showed greater improvement in NDI scores
Hussein Youssef (2024) [14]	Randomized Controlled Trial	Adults with FHP	Neck orthosis vs deep cervical flexor exercise	CVA, NDI	Improved CVA and neck endurance in intervention group
Walaa H elsayed (2024) [15]	Randomized Controlled Trial	Adults with FHP	Cervicothoracic only vs cervicothoracic + lumbopelvic exercises	CVA, NDI, EMG	Combined approach showed greater improvement in neck disability and muscle activity.
Lee & Hwang J (2025) [16]	Randomized Controlled Trial	Office workers	Standing desk vs traditional desk	CVA, discomfort, muscle fatigue	Standing desk improved CVA and reduced neck/shoulder discomfort.
Stephani Argyrou (2025) [17]	Randomized Controlled Trial	Adults with FHP	Motor learning-based exercises vs control	CVA, neck endurance	Improved CVA and neck endurance in intervention group.

Table No 2: Risk of Bias Tool of summarized studies

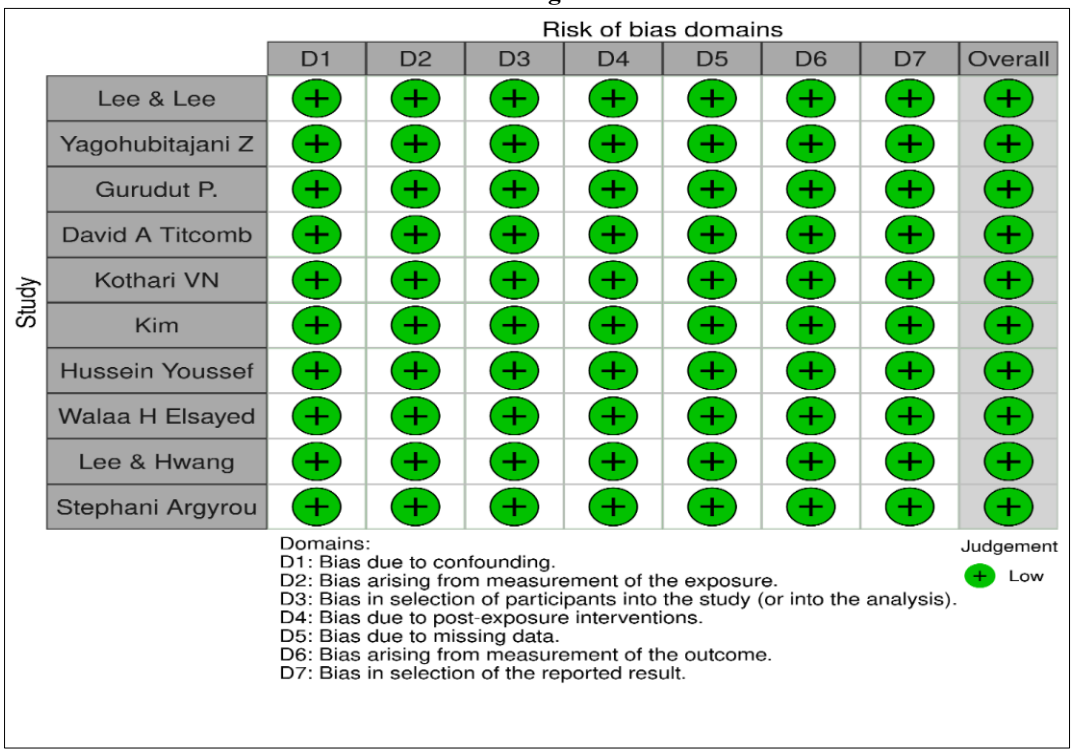
Study	Randomization Process	Deviations from Intended Interventions	Missing Outcome Data	Measurement of Outcomes	Selection of Reported Results	Overall Risk of Bias
Lee & Lee,	Low	Low	Low	Low	Low	Low
Yagohubitajani Z	Low	Low	Low	Low	Low	Low
Gurudut P.	Low	Low	Low	Low	Low	Low
David A Titcomb	Low	Low	Low	Low	Low	Low
Kothari VN	Low	Low	Low	Low	Low	Low
Kim	Low	Low	Low	Low	Low	Low
Hussein Youssef	Low	Low	Low	Low	Low	Low
Walaa H elsayed	Low	Low	Low	Low	Low	Low
Lee & Hwang,	Low	Moderate	Low	Low	Low	Low
Stephani Argyrou	Low	Low	Low	Low	Low	Low

PRISMA Flow chart of reviewed studies



The risk of bias of the included studies was evaluated using the ROBINS-E tool, which assesses methodological quality across seven domains: the randomization process, deviations from intended interventions, missing outcome data, measurement of outcomes, selection of reported results, other potential sources of bias, and overall risk of bias. Each domain was judged as low risk, some concerns, high risk, or very high risk in accordance with established methodological guidelines. The assessment indicated that the majority of studies demonstrated a low risk of bias across all domains, reflecting overall sound methodological quality. A limited number of studies exhibited some concerns, primarily related to deviations from intended interventions; however, no study was classified as having a high or very high risk of bias. Consequently, the overall risk of bias was considered low for most included studies. Traffic light plots were used to visually present the domain-wise risk of bias judgments, with green representing low risk and yellow indicating some concerns, and these plots illustrated a clear predominance of low-risk ratings across the included studies, supporting the credibility and robustness of the evidence.

Traffic Light Plot



RESULTS

A total of Ten intervention studies were included in this systematic review, focusing on administrative and office-based populations with Forward Head Posture (FHP) and Neck pain. The studies evaluated various interventions including exercise protocols, ergonomic modifications, and digital feedback training. Key outcomes assessed were craniovertebral angle (CVA), neck pain (VAS/NPRS), neck disability (NDI), and muscle activity or endurance. The following summarizes the individual studies in detail:

Lee & Lee H (2021):

This randomized controlled trial included 50 office workers with FHP. Participants were randomly assigned to either a scapular stabilization plus thoracic extension exercise program or a cervical stabilization/stretching program. Outcomes measured included CVA, VAS for neck pain, NDI, and forced expiratory volume (FEV1). Both interventions led to significant improvements in posture and pain, but the scapular and thoracic group demonstrated additional benefits in respiration and neck disability, highlighting the importance of combined thoracic and scapular exercise in correcting FHP.

Yagohubitajani Z (2022):

This RCT included 40 office workers and compared online-supervised corrective exercises with workplace-based programs. CVA and neck pain were primary outcomes. Both groups showed significant improvements in posture and pain reduction, demonstrating that remote digital interventions are feasible and effective, especially in administrative populations.

Gurudut P (2022):

This RCT involved 28 adults with FHP, comparing Bruegger's postural exercises with deep cervical flexor training. Outcomes included CVA and neck muscle endurance. Both interventions improved posture, but Bruegger's exercises demonstrated better retention, indicating long-term efficacy in postural correction.

David A Titcomb (2023):

This study involved 45 young adults with FHP and investigated the effects of postural education, self-myofascial release, stretching, and strengthening exercises. CVA was the primary outcome. All active intervention groups showed significant improvement in posture compared to controls, indicating that multi-component exercise programs can effectively reduce forward head deviation.

Kothari VN (2023):

In this study of 35 IT professionals, participants were assigned to deep cervical flexor training, scapular stabilization, or isometric/stretching exercises. CVA, VAS for neck pain, and NDI were measured. Results showed that scapular stabilization exercises produced the greatest improvements in posture, pain, and functional disability, highlighting the importance of scapular involvement in postural correction Kim *et al.,* (2023) conducted randomized control trial further strengthened the evidence base by demonstrating significant

improvements in craniovertebral angle and Neck Disability Index scores following cervicothoracic posture correction exercises. Importantly, participants who underwent a combined cervicothoracic and lumbopelvic correction program showed greater reductions in neck disability compared with those who received cervicothoracic correction alone. These findings are consistent with the outcomes of the previously included studies and provide additional support for the effectiveness of targeted exercise-based interventions in improving postural alignment and reducing neck-related functional impairments.

Hussein Youssef (2024):

30 adults with FHP participated in this RCT comparing a neck orthosis with deep cervical flexor exercises. Outcomes measured included CVA and NDI. Both interventions improved posture and reduced neck disability, suggesting that both orthotic support and active exercises can be effective in managing FHP.

Walaa H elsayed (2024):

Conducted on 32 adults with FHP, participants were assigned to cervicothoracic exercises only or cervicothoracic plus lumbopelvic exercises. Outcomes included CVA, NDI, and EMG activity. The combined intervention group showed greater improvement in neck disability and muscle activation patterns, suggesting that addressing the entire postural chain yields better outcomes.

Lee & Hwang J (2025):

In this RCT, 60 office workers were allocated to a standing desk intervention or a traditional desk group. Postural assessment included CVA, muscle fatigue, and subjective discomfort ratings. The standing desk group showed improved craniovertebral angles and reduced neck and shoulder discomfort, suggesting that ergonomic modifications can complement exercise interventions in reducing FHP-related symptoms.

Stephani Argyrou (2025):

Conducted RCT on 40 adults with FHP, the study compared a motor learning-based exercise program with a control group. The primary outcomes were CVA and deep neck flexor endurance. Participants in the intervention group demonstrated significant improvement in posture and neck muscle endurance, emphasizing the role of motor learning and proprioceptive training in FHP correction.

DISCUSSION

1. Overall Interpretation of Findings

This systematic review synthesized evidence from ten intervention studies conducted between 2021 and 2025 focusing on administrative and office-based populations with forward head posture (FHP) and associated neck pain. The overall findings indicate that exercise-based, ergonomic, and digitally supported interventions are effective in improving postural alignment, reducing neck pain, and decreasing neck-related functional disability. Improvements were consistently observed in craniovertebral angle (CVA), pain intensity measures (VAS/NPRS), Neck Disability Index (NDI), and muscle endurance or activation, highlighting the multifactorial nature of FHP management.

These findings align with existing biomechanical and clinical models suggesting that FHP results from prolonged static postures, muscular imbalance, and altered neuromuscular control, particularly in desk-based occupations.

2. Effectiveness of Exercise-Based Interventions

Across the included studies, exercise-based interventions emerged as the most consistently effective approach for correcting FHP and reducing neck disability. Interventions targeting the deep cervical flexors, scapular stabilizers, and thoracic extensors demonstrated significant improvements in CVA and neck-related outcomes.

The findings from Lee & Lee (2021), Gurudut *et al.,* (2022), Kothari *et al.,* (2023), and Stephani Argyrou (2025) support earlier evidence that strengthening deep cervical flexors and scapular musculature restores cervical alignment by counteracting anterior head translation. This is consistent with previous literature indicating that weakness of deep neck flexors and overactivity of superficial cervical muscles are central contributors to FHP and chronic neck pain (Jull *et al.,* 2008; Falla *et al.,* 2014).[24,25]

Notably, Bruegger's postural exercises demonstrated superior long-term retention compared to isolated cervical training, suggesting that global postural retraining may be more sustainable than localized interventions alone.

3. Role of Combined Cervicothoracic and Lumbopelvic Interventions

Several studies in this review, including Kim et al. (2023) and Walaa H. Elsayed (2024), demonstrated that combined cervicothoracic and lumbopelvic interventions produced greater improvements in neck disability and muscle activation patterns compared to cervicothoracic exercises alone. These findings emphasize the importance of addressing the entire kinetic chain rather than isolated cervical segments.

This supports the concept of regional interdependence, whereby dysfunction in the thoracic spine and lumbopelvic region influences cervical posture and loading patterns. Previous biomechanical studies have shown that thoracic kyphosis and pelvic tilt significantly affect cervical alignment and muscle recruitment (Kebaetse *et al.,* 1999; Lau *et al.,* 2010). Therefore, interventions that incorporate trunk and

pelvic stabilization may yield superior clinical outcomes. [26,27]

4. Impact of Ergonomic and Workplace-Based Interventions

Ergonomic interventions, particularly the use of standing desks as reported by Lee & Hwang (2025), resulted in meaningful improvements in CVA, muscle fatigue, and subjective discomfort. These findings suggest that modifying workplace posture demands can reduce sustained cervical flexion and static loading, which are known contributors to FHP.

Previous occupational health studies have shown that prolonged sitting and monitor positioning significantly increase cervical flexion angles and muscle fatigue in office workers (Szeto et al., 2002; Straker et al., 2009). The present findings indicate that ergonomic modifications can serve as an effective adjunct to exercise-based interventions in administrative populations. [28,29]

5. Effectiveness of Digital and Motor Learning-Based Interventions

Digital and motor learning-based approaches, such as the online-supervised exercise program (Yagohubitajani, 2022) and motor learning-based training (Stephani Argyrou, 2025), demonstrated significant improvements in posture and neck muscle endurance. These findings highlight the growing potential of technology-assisted rehabilitation, particularly for office-based and remote populations.

Motor learning strategies emphasize proprioceptive feedback, movement awareness, and postural control, which are essential for long-term postural correction. This is consistent with prior evidence indicating that proprioceptive training enhances neuromuscular control and postural sustainability in individuals with chronic neck pain (Revel *et al.,* 1994; Stanton *et al.,* 2016).[30,31]

6. Clinical Implications

The findings of this review suggest that multimodal interventions combining exercise therapy, postural education, ergonomic modification, and digital feedback offer the greatest benefit for individuals with FHP and neck disability. Clinicians should consider integrating cervicothoracic and lumbopelvic exercises, scapular stabilization, and ergonomic education into rehabilitation programs, particularly for administrative and office-based populations.

Additionally, digital and remote interventions may improve accessibility and adherence, especially in workplace and home-based settings.

7. Strengths and Limitations

The strengths of this review include the inclusion of recent randomized controlled trials, consistent outcome measures (CVA and NDI), and a focus on occupational populations with high clinical relevance. However, heterogeneity in intervention duration, exercise protocols, and follow-up periods limits direct comparison across studies. Future research should focus on standardized intervention frameworks and long-term follow-up to determine the sustainability of postural improvements.

CONCLUSION OF DISCUSSION

In summary, the evidence from this systematic review indicates that targeted exercise-based and multimodal interventions are effective in improving forward head posture and reducing neck disability in office-based populations. Interventions addressing the entire postural chain and incorporating ergonomic and motor learning principles appear to offer superior outcomes. These findings provide a strong foundation for evidence-based clinical practice and future research in the management of FHP and neck-related disorders.

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