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Combined Efficacy Of Forward Head Corrective Exercises And Scapular Stabilization Exercises For Craniovertebral Angle In Desktop Workers

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ABSTRACT

Background: Forward Head Posture (FHP) is a common musculoskeletal issue among desktop workers due to prolonged computer use, poor posture, and lack of ergonomic awareness. It is characterized by the anterior displacement of the head, leading to muscular imbalances, reduced craniovertebral angle (CVA), and increased strain on the cervical spine. The study aims to evaluate the combined efficacy of Forward Head Corrective Exercises (FHCE) and Scapular Stabilization Exercises (SSE) in improving the craniovertebral angle and cervical mobility in desktop workers.

Methodology: This quasi-experimental study included 51 participants (aged 28-45) with a CVA of less than 48°. Participants underwent a 4-week intervention comprising FHCE and SSE, targeting key postural muscles. The primary outcome measures were CVA (measured using Kinovea software) and cervical range of motion (ROM) (assessed with a goniometer). Data were analysed using paired t-tests. Results: Post-intervention analysis showed a statistically significant improvement in CVA from 43.02° ± 2.65 to 51.35° ± 1.84 ($p < 0.001$). Cervical flexion improved from 75.37° ± 2.79 to 84.69° ± 3.04 ($p < 0.001$), while cervical extension increased from 64.98° ± 2.60 to 69.22° ± 2.13 ($p < 0.001$). These findings indicate that FHCE and SSE effectively enhance postural alignment and cervical mobility in desktop workers.

Conclusion: The study demonstrates that a structured 4-week exercise program combining FHCE and SSE significantly improves craniovertebral angle and cervical mobility, thereby reducing the effects of FHP in desktop workers. This intervention is a practical, non-invasive approach to mitigating postural strain and enhancing workplace ergonomics. Future studies with larger sample sizes and extended follow-up periods are recommended to assess long-term efficacy.

Keywords: Forward Head Posture, Craniovertebral Angle, Scapular Stabilization, Desktop Workers, Postural Correction, Ergonomics..

1. INTRODUCTION:

In the era where computers have become an inseparable part of day-to-day life both personal and professional. The invention process of these computers started around 3000 years ago in the form of “Abacus”. The first digital computer was invented by Blaise Pascal in 1642. Since then, the computing devices have been evolving in the terms of their size, use, efficacy and much more. At the present time we are using 5th generation of the computing devices along with AI and beyond. These computing devices have made everything immensely trouble-free and trouble-some at the same time. Computers have equal amount of advantage and disadvantages. In almost every institution be it banks, government agencies, corporate organizations, autonomous institutions, etc. everything is computerized, and so the number of desktop workers has also increased. Use of computers in sustained posture for more than 6-7 hours a day is the basic demand of such jobs. Wrong

posture while working leads to incorrect shape of muscular and skeletal structures. The factors causing this can include abnormal posture, reduced physical activity, inappropriate postural habits, long term use of computer or gadgets in ergonomically incorrect posture (1,2).

Forward head posture (FHP) is defined as a protrusion of the head in the sagittal plane. It is characterized by flexion of the lower cervical (C4-C7) and hyperextension of the upper cervical spine (C1-C3) (4). This postural deformity is commonly seen in desktop workers. The prevalence of FHP is reported to be approximately 60-70% (4). As per shown by previous studies forward head posture is associated with numerous musculoskeletal disorders, such as temporomandibular disorders, shoulder and neck pain, reduced vital capacity, tension-type headache, trigger points in suboccipital muscles and dyskinesia at the shoulder complex and cervical spine. It may also lead to some serious implications such as decreased cervical proprioception, subacromial impingement syndrome, thoracic outlet syndrome, increased reaction times and movement velocity of the center of gravity and vestibular hypofunction (4).

The major causative factor of forward head posture, as per the previous studies conducted is overuse of gadgets such as mobile phones, computers, laptops, tablets, etc. As per reports the use of computers has substantially increased in past 10 years. Computers boost productivity and efficacy at work, but prolonged use may cause many musculoskeletal issues. The desktop workers typically stay in fixed position for long period, they tend to hunch their heads forward. Previous studies have established that people having head, neck, and shoulder discomfort have smaller craniovertebral angle, which is indicative of forward head posture. Head and shoulder protrusion in the sagittal plane is the characteristic feature of FHP and rounded shoulders and hence neck and shoulder pain are the main complaints of subjects having FHP [1,2]. Similar studies in occupational settings have found a strong correlation between forward head posture and neck pain, with prolonged computer use being a key risk factor (5). Muscle imbalances, particularly in the upper trapezius and levator scapulae, have also been implicated in sustaining this abnormal posture (6).

The craniovertebral angle (CV) is a reliable way to assess Forward head posture. The normal range of CV is 48-54. The CV angle is the angle formed between a horizontal line passing through C7 and a line extending from the tragus of the ear to C7, this angle is significantly reduced in subjects with FHP [1, 2].

Major muscles causing forward head posture:

Upper Trapezius: This muscle is located in the upper back and neck. It becomes overactive in FHP as it compensates for the forward head positioning by raising and stabilizing the shoulder blades. This leads to muscle tightness and discomfort.

Levator Scapulae: This muscle, which runs from the upper part of the shoulder blade to the neck, can become tight in FHP, contributing to neck pain and stiffness.

Sternocleidomastoid (SCM): The SCM muscle, which runs from the sternum and collarbone to the skull behind the ear, becomes overactive in FHP, creating tension in the front of the neck. It plays a role in lifting the head to counterbalance the forward head position.

Suboccipital Muscles: These small muscles located at the base of the skull are often overworked in FHP. When the head moves forward, these muscles strain to stabilize the head and neck.

Deep Neck Flexors (Longus Colli and Longus Capitis): These muscles help to stabilize and flex the cervical spine. In FHP, they tend to be weak and unable to support proper alignment, leading to an increased curve in the neck. **Lower Trapezius:** The lower part of the trapezius muscle helps to stabilize the scapula and upper back. Weakness in this muscle contributes to poor posture and scapular instability, worsening the forward head position. **Rhomboids:** These muscles, located between the shoulder blades, assist in retracting and stabilizing the shoulder blades. When weak, the shoulder blades move forward, which can exacerbate FHP.

exacerbate FHP. **Middle Trapezius:** This muscle also helps to retract the shoulder blades and is often weak in those with forward head posture, contributing to an overall imbalance in the upper back [8].

Corrective exercises are essential for managing and improving **Forward Head Posture (FHP)**. FHP can lead to several musculoskeletal issues, including chronic neck pain, headaches, shoulder discomfort, and even upper back stiffness. The key reason for incorporating corrective exercises is to address the muscular imbalances that are typically present in FHP.

2. METHODOLOGY

A Quasi Experimental, Interventional study conducted on Desktop Workers fulfilling inclusion and exclusion criteria for a duration of 1 year using Convenience sampling method. Materials used Android Phone, Goniometer, Data collection sheet.

Inclusion criteria both genders of age group 28-45, desktop workers working for more than 5 hours a day, working for 5 days a week, craniovertebral angle less than 48 degrees, work experience more than 3years **Exclusion criteria** patients with cervical pathology, infectious pathology in or around the spinal column, history of cervical surgery, recent fractures, recent injuries.

3. PROCEDURE

The study protocol was presented for approval in front of research protocol committee of D Y Patil college of physiotherapy. After getting approval of the protocol committee, it was approved by institutional ethical committee of D Y Patil University Kolhapur, after that consulting subjects were selected according to inclusion criteria and explained about the study. The procedure was explained to the subject. A written consent was taken from the subjects who were to participate. The subjects were assessed for craniovertebral angle and range of motion using Kinovea software and goniometer respectively.

Set of exercises were taught to the patients-

Strengthening exercises Chin tuck in supine lying with the head in contact with the head in contact with the floor, T-to-Y exercises in prone position, Y-to-W exercises in the prone position, Prone horizontal abduction with external rotation, Side-lying external rotation, 2 sets of 15 repetitions of each exercise, 5 times a week

Stretching exercises One-sided unilateral self-stretch, Static sternocleidomastoid and levator scapulae stretch, Cat stretch, 3 repetitions of each stretch and hold for 30 seconds

After 4 weeks of the intervention the craniovertebral angle and range of motion of cervical spine of subjects were examined to check the improvement.

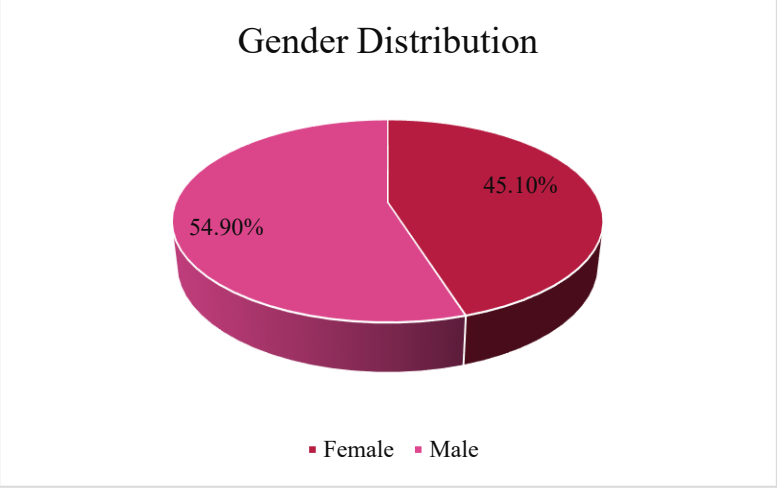
4. RESULTS

An experimental study done through convenience sampling from 51 desktop workers between the age of 28-45 years from Gallagher from September 2024 to March 2025.

Kinovea software was used for the assessment of craniovertebral angle and goniometer was used for assessing cervical flexion and extension ranges with confidentiality and privacy ensured to be maintained with the written consent taken from them.

Ethical approval for the study was obtained from D. Y. Patil educational society and research institute, Kolhapur. Demographic details like Name, Age, Gender, Years of experience, hours of work, was obtained from participant. After that we gave the information about our study to participants. The participants were assessed using Kinovea software and goniometer for craniovertebral angle and cervical ROM respectively. Then the subjects were selected having forward head posture according to the Kinovea software and they were given 4 weeks of forward head corrective exercises combined with scapular stabilization exercises.

It was observed that from total 51 participants 28 were male i.e.; 54% and 23 were female i.e.; 45%. The gender distribution is nearly balanced, with slightly more male participants.

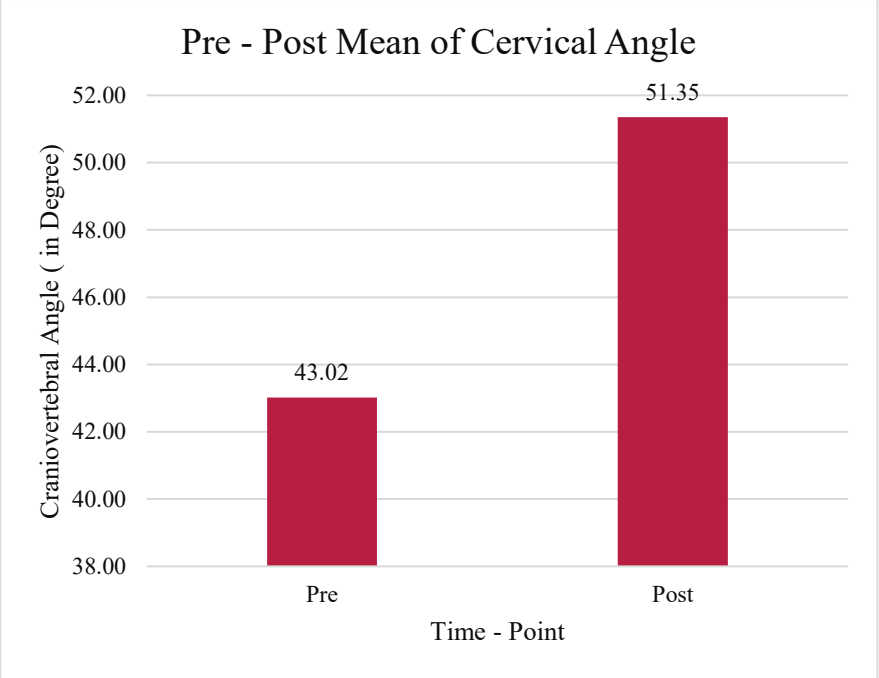


Graph no 1: Gender distribution of male and female in the study.

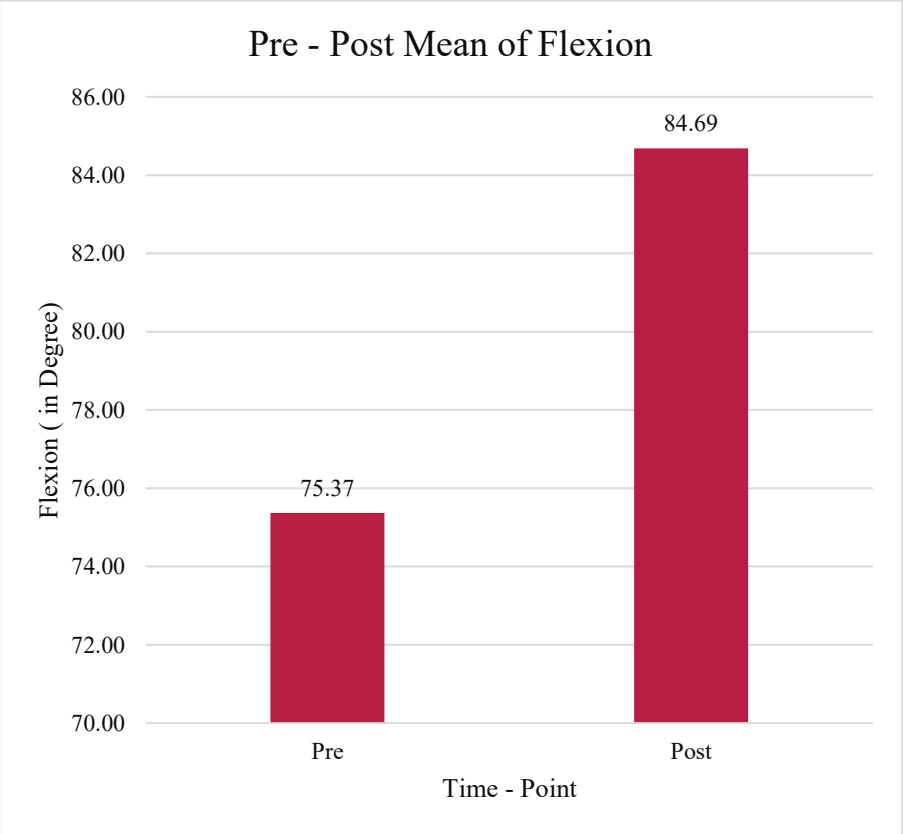
Pre – Post Comparison

Paired t test used

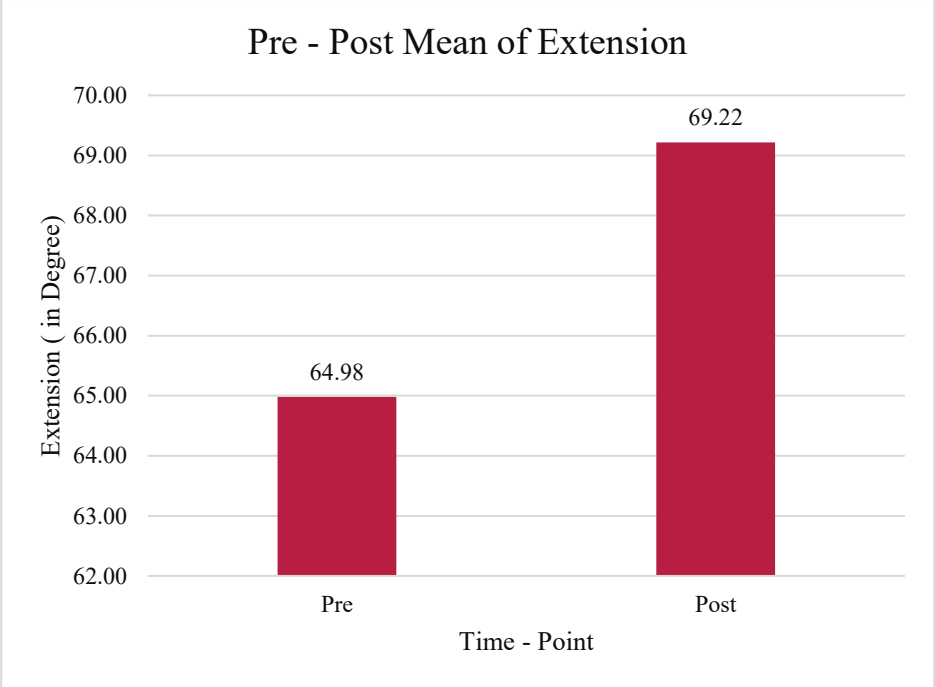
(* indicates p-value (<0.05) is significant)



Graph no 2: Mean of craniovertebral angle measured pre the post the intervention



Graph no 3: Mean of cervical flexion ROM measured pre and post the intervention



Graph no 4: Mean of cervical extension ROM measured pre and post the intervention.

5. DISCUSSION

The study titled "Combined Efficacy of Forward Head Corrective Exercises and Scapular Stabilization Exercises for Craniovertebral Angle in Desktop Workers" focused on evaluating the impact of a corrective exercise program designed to improve craniovertebral angle (CVA) and cervical mobility in individuals who spend prolonged hours working on computers. This discussion will analyse the findings, implications, and comparisons with previous studies, along with the broader impact on postural health in occupational settings.

The study analysed 51 desktop workers, assessing their craniovertebral angles before and after the intervention. The results indicated statistically significant improvements in posture and cervical mobility, supporting the effectiveness of targeted corrective exercises

This study consisted of 45% of Female participants and 54% of Male participants. This might be due to gender bias in that field and historically stereotyped gender roles in the society, which are decreasing now with change in work environment and awareness about equal opportunities for women in every field.

Mean of age of the participants in the study is 35 years as the inclusion criterion for age was 28-45 years. Mean of the years of experience is 9 years because of the inclusion criterion of age and work experience of more than 3 years.

Improvement in Craniovertebral Angle

A larger craniovertebral angle suggests a more upright head and neck position, which is crucial in reducing stress on the cervical spine and preventing postural strain. The results align with prior research, which has shown that postural corrective exercises can improve CVA within 4 weeks of intervention. This suggests that corrective exercises when combined with scapular stabilization exercises helps in restoring the function of affected muscles.

Increased Cervical Range of Motion (ROM)

The significant improvements in both flexion and extension suggest that muscular tightness and joint restrictions were reduced, allowing for greater mobility and flexibility in the cervical spine. This is particularly important for desktop workers who frequently experience stiffness and restricted movement due to prolonged static postures.

Comparison with Previous Studies

Several prior studies have examined the role of postural corrective exercises in treating forward head posture, and the findings of this study are consistent with their results.

Joshi et al. (2022) found that stabilizing exercises and postural awareness training significantly reduced forward head posture in individuals with prolonged screen exposure. Their study emphasized the importance of scapular stabilization exercises in

maintaining cervical alignment, which aligns with the findings of the current study.

Singh & Sibbala (2023) conducted a comparative study between stabilizing exercises and conventional training in visual display terminal (VDT) users. Their results showed that stabilization exercises were superior in reducing FHP, supporting the efficacy of combined interventions such as the one used in this study.

Heydari et al. (2023) investigated the effects of postural corrective exercises in 103 male subjects and found significant improvements in CVA after 8 weeks. The current study observed similar improvements in just 4 weeks, suggesting that even a short-term intervention can be beneficial in reducing forward head posture.

Abdollahzade et al. (2017) demonstrated that a 4-week corrective exercise program was effective in improving postural alignment related to FHP. This directly supports the methodology and findings of the present study, reinforcing that a short-duration intervention can yield significant results.

These comparisons indicate that forward head corrective exercises, when combined with scapular stabilization exercises, offer an effective and efficient solution for improving postural health in individuals with FHP.

This aligns with findings by Harman et al. (2005), who reported significant postural improvements after a structured 10-week corrective exercise program (7). Their results further validate the effectiveness of targeting muscle imbalances and promoting postural awareness in individuals with FHP.

Mechanism Behind Improvement

The success of the intervention can be attributed to the following physiological and biomechanical factors:

Strengthening Weak Muscles

Deep Neck Flexors (Longus Colli, Longus Capitis): The chin tuck exercises targeted deep neck flexors, which counteract the forward pull caused by sternocleidomastoid (SCM) dominance.

Middle and Lower Trapezius, Rhomboids, and Serratus Anterior: The stabilization exercises improved scapular retraction and upward rotation, reducing rounded shoulders and excessive forward head posture.

Stretching Tight Muscles

Upper Trapezius & Levator Scapulae: Regular stretching helped reduce muscle stiffness and improve neck mobility.

Sternocleidomastoid (SCM): The intervention helped balance the anterior-posterior muscle forces, promoting a more neutral cervical alignment.

Neuromuscular Re-education

Postural Awareness Training: By integrating active correction techniques, participants became more conscious of their head position, allowing for long-term maintenance of improved posture.

Proprioceptive Feedback: Improved postural awareness reduces habitual forward head positioning, leading to sustainable postural corrections even after the intervention ends.

Clinical and Occupational Implications

The results of this study highlight the importance of early intervention and workplace ergonomics in preventing postural disorders. Key takeaways for clinical practice and occupational health include:

Regular Postural Assessments in Workplace Settings

Employers should implement ergonomic assessments to identify postural deviations in employees who work long hours on computers.

Exercise Programs for Prevention and Rehabilitation

Forward head corrective exercises should be integrated into corporate wellness programs to reduce work-related musculoskeletal disorders.

Workstation Modifications

Ergonomic chairs, monitor positioning, and keyboard height adjustments can complement exercise interventions in maintaining proper cervical posture.

Education and Awareness Programs

Employees should be educated about the risks of poor posture and the benefits of corrective exercises to encourage proactive postural maintenance.

6. CONCLUSION

The study demonstrated that a 4-week intervention combining forward head corrective exercises and scapular stabilization exercises significantly improved craniovertebral angle and cervical mobility in desktop workers. The findings emphasize the importance of exercise-based postural correction as an effective, non-invasive approach to preventing and managing FHP. Given the rising prevalence of postural disorders due to prolonged screen exposure, integrating corrective exercises into daily routines can significantly enhance postural health and overall well-being

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