Effectiveness Of Deep Cervical Flexors And Shoulder Retractors Strengthening To Improve Forward Head Posture Among Desktop Users – Experimental Study.

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Abstract:

Background : Forward head posture (FHP) is a common postural deviation observed among individuals who spend prolonged hours working at desktop computers. Poor ergonomics and sustained neck flexion contribute to weakness of the deep cervical flexors and scapular retractors, leading to reduced cervical mobility, muscle fatigue, and pain. Strengthening of these muscle groups has been proposed as an effective intervention strategy to restore postural alignment.

Aim: This study aims to evaluate the effect of strengthening exercise program to improve posture

Methods: An experimental study was conducted among desktop users working for more than 3 hours per day for at least one year. Participants with a Craniovertebral Angle (CVA) less than 50° were included. CVA was measured using a universal goniometer. The intervention consisted of a four-week strengthening program performed four times per week, including chin-tuck exercises for deep cervical flexors and resistance-based shoulder retractor strengthening. Participants demonstrated exercise proficiency prior to commencing the program. Pre-and post-intervention CVA measurements were compared to determine improvement.

Results: The exercise program led to a measurable improvement in craniovertebral angle, indicating enhanced cervical alignment after four weeks of targeted strengthening. The findings support the role of specific strengthening exercises in correcting FHP among regular desktop users

Conclusion: A structured strengthening protocol targeting deep cervical flexors and shoulder retractors is effective in improving forward head posture in individuals with prolonged desktop use. Early identification and correction of postural deviations may prevent long-term musculoskeletal complications. Incorporating simple corrective exercises into daily routines can significantly enhance posture, cervical mechanics, and overall musculoskeletal health

KEYWORDS : Forward head posture ,Craniovertebral angle, Deep cervical flexors, Shoulder retractors, Desktop users, Strengthening exercises, Postural correction

INTRODUCTION

Forward head posture (FHP) is an excessive anterior positioning of the head which is associated with weakness in the deep cervical short flexor muscles (rectus carpitis anterior, rectus carpitis lateralis, longus carpitis) and mid-thoracic scapular retractors (i.e., rhomboids, middle and lower fibres of the trapezius)

Forward head posture (FHP) is a head-on-trunk misalignment and is described (in sitting or standing) as the excessive anterior positioning of the head in relation to a vertical reference line, increased lower cervical spine lordosis (head forward, middle cervical spine extended, lower cervical spine flexed), and rounded shoulders with thoracic kyphosis (1) In addition to muscle imbalance, With FHP alignment, the Centre of gravity of the head is anterior to the vertical axis (often measured by a plumb line), thereby increasing the load on posterior neck muscles (1) FHP has been linked to pain, fatigue, and restricted movement of the neck as well as symptoms attributed to excessive joint and muscle loading. Muscular and skeletal structures can change into an incorrect shape due to a reduction in physical activity and inappropriate posture habits in daily living. (2) There are various methods to evaluate FHP, but many studies have declared that Craniovertebral angle (CVA) is the best indicator to measure the FHP. (4)

The CVA is defined as the angle formed between, a horizontal line passing through the spinous process of the seventh cervical vertebra (C7) and a line connecting the tragus of the ear to the C7 spinous process.(4)

A smaller CVA indicates a greater degree of forward head posture, while a larger CVA represents a more neutral or ideal head alignment. A CVA less than 50 degrees is considered indicative of FHP(5)

The use of computers has increased dramatically over the past decade in various offices so that staffs spend a lot of time sitting behind the computer. These rapid changes may be accompanied by increased prevalence of poor posture and resultant neck pain.

FHP (forward head posture) and rounded shoulders are defined as protrusion of the head and shoulders in the sagittal plane.

Desktop work demands, long time Infront of computer screens and if there lack of awareness of proper body positioning which can lead to forward head posture. An exercise program for FHP guided by strengthening principles that address underlying soft tissue imbalances would include deep cervical flexor and shoulder retractor strengthening.

Early diagnosis of forward head posture will help to minimize the consequences. This study aims to investigate the incidence of forward head posture in desk users using Goniometer and its association with pain and range of motion of cervical spine.

The objective of this study is to find the percentage of forward head posture in desk users using Goniometer and effectiveness of strengthening exercise in forward head posture in desktop users

NEED OF THE STUDY.

Study of forward head posture is important because forward head posture can cause further complications. Anterior location of Line of gravity causes an increase in the flexion moment, which requires constant isometric muscle tension to support head

Long-Term Effects of forward head posture can cause pain and fatigue ,Reduction in range of motion.

The exact impact of building up deep neck flexors on head alignment, easing neck discomfort, or boosting daily function still needs more research. Though earlier work shows better head-neck angles and longer muscle stamina after such exercises, differences in how workouts were done, how long they lasted, and what was measured make it hard to apply results widely. As people sit more and rely heavily on devices, straightforward, low-cost, real-world solutions are becoming essential - for both avoiding issues and aiding recovery. Looking into focused deep neck muscle training could lead to clearer guidelines for therapy routines and support smarter care for poor posture.

METHODOLOGY:

- Study Design: Experimental study

- Study Type: Survey based

- Target Population: Desktop users

- Sample Size: 33

- Sampling Duration: 6 month

- Study Setup: Government Irrigation Offices in Pune.

MATERIALS:

- Paper

- Consent Form

- Universal goniometer

- Elastic resistance

OUTCOME MEASURES

Craniovertebral angle measured by universal goniometer

Criteria :

Inclusion Criteria

Desktop users who work for >3hrs/day on Desktop for 1 year(4).

Both males and females age group 25 and above (4)

Craniovertebral angle is less than 50 degrees.(5)

Exclusion Criteria

Cervical vertebrae fracture (4)

Deformity of spine like scoliosis\ kyphosis (4)

Medical condition like vertigo, tumor in cervical region were excluded. (4)

PROCEDURE

Craniovertebral angle (CVA) is the best indicator to measure the Forward head posture. Craniovertebral angle is measured by the angle between the imaginary line which passes through C7 and tragus of the ear and a horizontal line through C7 .(4) Firstly, permission will be taken from participants The aims and objectives of the research will be explained to the participants and those who fulfilling the inclusion criteria will be included in the study The craniovertebral angle taken by goniometer Individuals with a craniovertebral angle less than 50 will be included in the study.

Exercise program

- The exercise program consisting of two strengthening (deep cervical flexor and shoulder retractor muscles) exercise (5)

- Participants were given a list and description of each exercise and were required to demonstrate the exercise

- This protocol was done for four weeks and repeated four times a week

They will be asked to perform following exercises.

(a) chin tucks: lie on your back with head touching ground, do a chin tuck - next step is lifting head up while keeping that tuck, hold for six seconds

(b) shoulder retraction : This exercise is done in the standing position by using a thera-band pulling the shoulders back. Squeeze shoulder blades tight - no shrugging, no leaning forward (hold this position for 6 sec and then relax)

*T*able 1

Brief description of exercises and progression

| Exercise	Progression 1	Progression 2	Progression 3	Progression 4
Strengthen Deep Cervical Flexors	Lying chin tuck	Lying chin tuck with head lift*		
Strengthen Shoulder Retractors	Standing shoulder pull back with elastic resistance	Shoulder pull back L and R	Shoulder pull back with elastic resistance L and R	
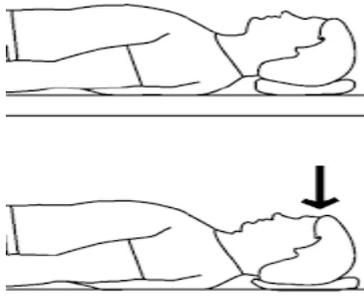
Statistical Analysis

The collected data were analysed using IBM SPSS Statistics version 26.0. Descriptive statistics were used to summarize the demographic variables and outcome measures. Age was expressed as mean ± standard deviation (SD), while gender distribution was presented in frequencies and percentages. The craniovertebral angle (CVA) values obtained before and after the intervention were assessed for normality using the Shapiro–Wilk test. The results indicated that both pre- and post-intervention data were not normally distributed (W = 0.834 and 0.819; p < 0.001), warranting the use of a non-parametric test for further analysis. To determine the effectiveness of the strengthening program on forward head posture, the Wilcoxon signed-rank test was applied to compare pre- and post-intervention CVA values. The mean CVA increased from 44.9 ± 3.46° before intervention to 46.8 ± 3.37° after four weeks of training, reflecting an average improvement of 2.0 ± 0.25°. The difference was found to be statistically significant (Z = 3.50, p < 0.001), with a large effect size (r = 0.981), indicating a strong practical impact of the intervention. These findings suggest that the deep cervical flexor and shoulder retractor strengthening exercises produced a significant enhancement in craniovertebral angle, signifying a measurable correction of forward head posture among desk users. Hence, the intervention effectively fulfilled both study objectives: accurate assessment of craniovertebral angle using a universal goniometer and significant postural improvement following the targeted strengthening protocol

INTERPRETATION

Descriptives						
	N	Mean	Median	SD	Minimum	Maximum
AGE	33	34.6	30	8.52	25	54
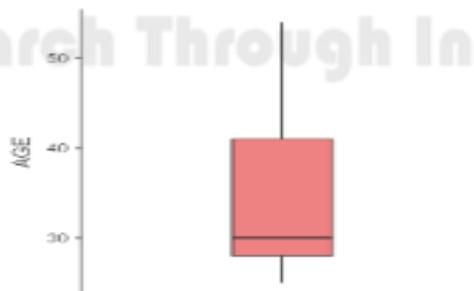
Frequencies			
Frequencies of GENDER			
GENDER	Counts	% of Total	Cumulative %
FEMALE	10	30.30%	30.30%
MALE	23	69.70%	100.00%
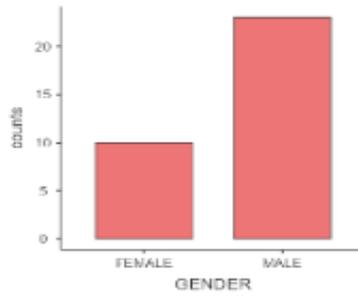
Descriptives							
Shapiro-Wilk							
	Mean	Median	SD	Minimum	Maximum	W	p
CVA_Pre	44.9	45	3.46	35	48	0.834	<.001
CVA_Post	46.8	48	3.37	37	50	0.819	<.001

Paired Samples T-Test									
							95% Confidence Interval		
			Statistic	p	Mean difference	SE difference	Lower	Upper		Effect Size
CVA_Pre	CVA_Post	Wilcoxon W	3.50[a]	<.001	-2	0.25	-2.5	-2	Rank biserial correlation	-0.981
Note. H_a μMeasure 1 - Measure 2 ≠ 0									
[a] 6 pair(s) of values were tied									
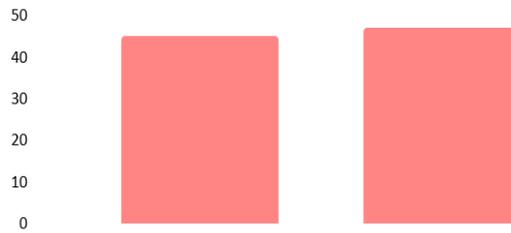
Table 1. Demographic Characteristics of Participants (N = 33)				
Variable	Mean ± SD	Median	Minimum	Maximum
Age (years)	34.6 ± 8.52	30	25	54

| Gender	Frequency (n)	Percentage (%)
Male	23	69.7
Female	10	30.3

The study included 33 desk users aged 25–54 years, with a mean age of 34.6 years. The majority of participants were male (69.7%).

Table 2. Descriptive Statistics of Craniovertebral Angle (CVA)				
Variable	Mean ± SD	Median	Minimum	Maximum
CVA (Pre-intervention)	44.9 ± 3.46	45	35	48
CVA (Post-intervention)	46.8 ± 3.37	48	37	50

There was an overall increase in the mean craniovertebral angle from 44.9° to 46.8° following the 4-week strengthening program, indicating improvement in head and neck alignment.
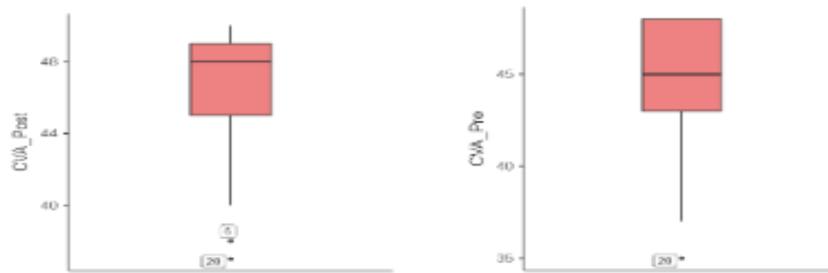
Table 3. Normality Test (Shapiro–Wilk Test)		
Variable	W Statistic	p-value
CVA (Pre-intervention)	0.834	< 0.001
CVA (Post-intervention)	0.819	< 0.001

Both pre- and post-intervention CVA data were non-normally distributed (p < 0.05). Hence, a non-parametric Wilcoxon signed-rank test was used for comparison.

Table 4. Comparison of Pre- and Post-Intervention Craniovertebral Angle						
(Wilcoxon Signed-Rank Test)						
Pair	Mean Difference	Standard Error	95% CI (Lower–Upper)	Z / W Statistic	p-value	Effect Size (r)
CVA (Pre vs Post)	−2.0°	0.25	−2.5 to −2.0	3.50[a]	< 0.001	−0.981

Interpretation: Significant improvement in CVA after intervention, indicating reduced forward head posture

RESULT:

A total of 33 participants aged between 25 and 54 years, with a mean age of 36.6 ± 8.52 years, participated in the present study. Of these, 20 were male 69.7%) and 13 were female (30.3%). The demographic distribution indicated a balanced representation of adult individuals likely to experience forward head posture due to lifestyle-related postural habits, such as prolonged use of computer or sedentary work. The Craniovertebral Angle (CVA) was used as the primary outcome measure to assess the degree of forward head posture. Baseline (pre-intervention) CVA values revealed a mean of 44.9 ± 3.16 , indicating mild to moderate forward head posture among participants. Following a four-week intervention program that included targeted

strengthening exercises for cervical flexors and shoulder retractors, the mean post-intervention CVA increased to $46.8 \pm 3.17°$.

The median CVA improved from 45° to 47", suggesting enhanced postural alignment. Normality testing using the Shapiro- Wilk test demonstrated that the CVA data were not normally distributed ($p < 0.001$). Hence, non-parametric statistical analysis was conducted using the Wilcoxon Signed-Rank Test to compare pre- and post-intervention scores.

The results revealed a statistically significant difference between the two time points ($Z = -3.50$, $p < 0.001$), with an effect size (r) of 0.891, indicating a large magnitude of change. This confirms that the intervention led to a clinically meaningful improvement in craniovertebral angle.

DISCUSSION:

The purpose of this study was to investigate the effectiveness of a targeted strengthening program focusing on cervical flexors and shoulder retractors to correct forward head posture (FHP). The increase in the CVA by approximately 3° post-intervention suggests a measurable correction toward a more neutral head position ,indicating enhanced postural alignment. This improvement is consistent with previous research highlighting the role of cervical and scapular muscle strengthening in restoring postural control and reducing mechanical strain on the neck and shoulders The findings revealed a statistically and clinically significant increase in craniovertebral angle following a four-week intervention, supporting the hypothesis that strengthening deep cervical flexors and scapular retractors can lead to notable postural improvements. In present study an intervention protocol as a form of two strengthening (deep cervical flexors and shoulder retractors) exercise was designed.(5) strengthening the deep cervical flexors, shoulder retractors, including the rhomboids and middle trapezius, contributes to scapular stabilization and neutral shoulder alignment, indirectly reducing anterior head carriage, These synergistic effects help re-establish the kinetic chain alignment between the cervical spine, thoracic region, and shoulder girdle. The significant postural improvement observed aligns with prior studies that reported similar outcomes following cervical and scapular strengthening interventions. For instance, research by Falla et al. (2004) and Lee et al. (2016) demonstrated that targeted activation of deep cervical flexors improved head posture and reduced neck pain among individuals with FHP. These findings support the principle that motor control training and endurance enhancement of deep stabilizing muscles play a central role in cervical spine rehabilitation. The large effect size ($r = 0.891$) found in the present study indicates that the intervention not only achieved statistical significance but also demonstrated a substantial clinical effect. In practical terms, this improvement in CVA translates to a noticeable correction of forward head posture reduced mechanical strain on cervical structures, and potential prevention of chronic musculoskeletal symptoms commonly associated with postural dysfunction, such as neck pain, shoulder tightness, and cervicogenic headaches. Furthermore, the four-week intervention period was sufficient to elicit measurable improvements, suggesting that even short-duration, well-structured exercise programs can produce meaningful biomechanical changes when performed consistently. This has important implications for physiotherapy practice, especially for individuals with limited time for rehabilitation or those engaged in home-based exercise programs. Another notable aspect of this study is the simplicity and accessibility of the exercise protocol. The cervical flexor and shoulder retractor strengthening exercises used were low-cost and could easily be integrated into workplace ergonomics programs.

This enhances the feasibility and scalability of such interventions in both clinical and community settings However, the findings must be interpreted considering certain limitations.

The study sample was relatively small and comprised only 33 participants, which may restrict generalizability to broader populations. Additionally, the absence of a control group prevents direct comparison with natural postural correction or alternative interventions. Subjective outcomes such as pain reduction and functional improvement were not formally assessed, although participants qualitatively reported positive changes. Future studies should incorporate larger randomized controlled trials, long-term follow-up, and additional outcome measures such as muscle activation patterns (EMG) or self-reported quality-of-life indices. Despite these limitations, the present study contributes valuable evidence supporting the role of specific strengthening exercises in correcting FHP.

Conclusion :

The study concludes that deep cervical flexor and shoulder retractor strengthening exercises are effective in improving forward head posture among desktop users. The intervention resulted in a statistically significant increase in CVA, shows a positive shift toward neutral head alignment.

Thus strengthening exercise program for 4 weeks is effective to decrease forward head posture

The results suggest that systematic strengthening of these key postural muscles effectively enhances head and neck alignment by correcting muscular imbalances responsible for anterior head displacement.

Future studies with larger sample sizes and long-term follow-up are recommended to evaluate sustained benefits and potential preventive effects of this exercise protocol.

REFERENCES:

1. Katherine Harman, Effectiveness of an Exercise Program to Improve Forward Head Posture in Normal Adults: A Randomized, Controlled 10-Week Trial (The Journal of manual & manipulative therapy (June 2023) Vol. 13 No. 3 (2005), 163 – 176)

2. Do Youn Lee, MS, PT, Chan Woo Nam, PhD, PT, Youn Bum Sung, MS, PT, Kyoung Kim, PhD, PT, Hae Yong Lee, PhD, PT Changes in rounded shoulder posture and forward head posture according to exercise methods, (J. Phys. Ther. Sci. 29: 1824–1827, 2017)

3. CHIDAMBARAM RAJAVANNIAN ,RUSHIKESH SASTE, PROF. ALBIN JEROME, R. CHIDAMBARAM PREVALENCE OF FORWARD HEAD POSTURE IN PATIENTS DIAGNOSED CLINICALLY WITH FROZEN SHOULDER (INTERNATIONAL JOURNAL OF HEALTH Sciences and Research (www.ijhsr.org) Volume 14; Issue: 5; May 2024)

4. Dr Arvind Kumar, Samarth Patel, Dr. Honey Panchal , Dr. Arvind Kumar, ASSOCIATION OF FORWARD HEAD POSTURE WITH PAIN AND CERVICAL RANGE OF MOTION IN DESK USERS (July – 2023)

5. Zahra Abdollahzade, Kazem Malmir, Azadeh Shadmehr, Nastaran Ghotbi, Research Paper: Effects of 4 Week Postural Corrective Exercise on Correcting Forward Head Posture (April 2017, Volume 11, Number 2)

6. CYNTHIA C NORKIN (JOINT STRUCTURE AND FUNCTION A COMPREHENSIVE ANALYSIS.