

EFFECTS OF SMARTPHONE USE ON NECK PAIN, POSTURE AND FUNCTIONAL ABILITY IN HEALTHY STUDENTS POST-COVID

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Abstract : Post pandemic, the use of smartphones among young students has increased extensively. The emergence of smartphones introduced a new term, 'text neck', which would suggest a scenario where smartphone use may lead to neck pain. Of primary importance is whether the increased frequency and/or longer duration of neck flexion associated with smartphone use directly contribute to neck pain. This study aims to explore whether smartphone use is a primary cause of neck pain or merely one of several contributing factors. The aim of this study was to investigate the effects of prolonged smartphone use on posture and the occurrence of neck pain in healthy students. An observational cross-sectional study with 100, 18-25-year-old healthy students from different colleges in Pune was performed. Demographic data of participants was collected which included their daily smartphone usage hours, purpose of smartphone use, etc. Data was collected using Smartphone Addiction Scale- Short Version, Neck Disability Index and Visual Analog Scale. Posture assessment was done using Plumb Line Assessment (Lateral View). This study has shown that increased smartphone use after the pandemic has led to increased neck pain and forward head posture. Increased smartphone use can have adverse effects on the health of the students if necessary precautions are not being taken.

Index Terms - Neck pain, text neck, posture, smartphone overuse, post pandemic

INTRODUCTION

Approximately 30–50% of the adult population experiences neck pain. The occurrence of neck pain has a tendency to increase. However, those complaints are increasingly observed in adolescents and young adults. In the young adult population, the annual occurrence of neck pain ranges from 42% to 67%.¹

During the last few years, a growing reporting of data is showing that the “text neck syndrome” might be considered as an emerging 21st-century syndrome. This clinical condition refers to the onset of cervical spinal degeneration that results from the repeated stress of frequent forward head flexion while we look down at the screens of mobile devices and while we “text” for long periods of time. Text neck syndrome is more common in adolescents, who, for several hours a day and for several days a year, hunch over smartphones and personal computers more frequently than in the past. It is estimated that 75% of the world’s population is hunched over their handheld devices hours daily with their heads flexed forward.² The advancement of technology has made nearly everyone an owner of a device such as a mobile phone. In 2022, approximately 83% of people worldwide were estimated to own a mobile phone.¹

The term ‘text neck’ was first used by chiropractor Dr. L. Fischman. Dr. Fischman noted that the tension associated with prolonged, repetitive, and frequent maintenance of a flexed neck and head position while using electronic devices such as smartphones or tablets leads to strain, injuries, and stiffness in the cervical spine area. Text neck syndrome may be referred to as: ‘turtle neck posture’, ‘smartphone neck syndrome’, ‘tech neck’, ‘SMS neck’, or ‘iNeck’. The text neck posture is characterized by an increased flexion of the cervical spine and is caused by activities that require looking down, below eye level, such as when typing text messages. Depending on the degree of progression, the text neck syndrome may present with a varied clinical picture.¹

Addiction to the smartphone emerges as a crucial global concern in recent times, especially during the COVID-19 pandemic. During the recent COVID-19 lockdown and social isolation, online platforms and web-based tools were used to carry out employment and educational needs. Moreover, people spent a considerable amount of time engaging on social media and networking sites using smartphones which further increased addiction among the users.³

In the post-pandemic era, the significance of digital platforms and mobile phones in the daily lives of university students is on the rise. It is well documented that digital platforms and mobile phones were expanded in universities following the onset of the pandemic.⁴ This is evidenced by the fact that the average daily mobile phone usage time has increased. The impact of neck pain on work efficiency and health expenditures has resulted in an increase in research on the topic.⁴

The symptoms of smartphone addiction include a longing for, withdrawal, tolerance, disturbances in daily life, and an inclination towards virtual online community companionship. Smartphone addiction and the subsequent overuse were associated with memory and attention problems resulting in a significant reduction in academic performance and health-related quality of life among students.³

It is reported that the most frequent internet users are adolescents and young adults and they may use it without awareness of its potential negative consequences. Hence, they are more vulnerable to the adverse effects of SP overuse.⁵

Smartphone addiction associated with an inharmonious body posture has negative effects on the physical health of adolescents, resulting in postural alterations, musculoskeletal discomfort, in addition to aggravating the already established alterations.⁶ Smartphone addiction and overuse are associated with MSDs, especially in the neck and upper limbs. While viewing the smartphone the user flexes the neck to look down at the screen resulting in excessive lordosis in the lower cervical region with a compensatory kyphosis in the upper thoracic region. This faulty posture due to excessive gravitational moment could abnormally load the articular structures of the cervical spine and neck extensor muscles resulting in inefficiency and fatigue.³

The visual display terminal, which has a small screen, requires users to bend their neck more, thereby also increasing the activity of the shoulder muscles. This means that when using a small screen, there is increased muscle activity required to stabilise the neck in the more flexed position. To keep the neck balanced, the extensor muscles are activated, thereby increasing the load placed on the cervical erector spinae and the trapezius muscles. The weight on the spine dramatically increases when flexing the head forward at varying degrees; an adult head weighs 10–12 pounds in the neutral position. As the head tilts forward the forces on the neck surge to 27 pounds at 15°, 40 pounds at 30°, 49 pounds at 45° and 60 pounds at 60°.⁶

With the rise of smartphones, the term text neck has emerged, suggesting a link between smartphone use and neck pain. However, flexing the neck is not a new behavior—people have been doing so for centuries while reading, writing, or engaging in other tasks. The key concern is whether the increased frequency and prolonged duration of neck flexion due to smartphone use directly contribute to neck pain. While smartphones are often blamed, other factors like posture, muscle fatigue, and sedentary behavior may also play a role. This study aims to explore whether smartphone use is a primary cause of neck pain or merely one of several contributing factors.

NEED OF THE STUDY

Neck pain is an increasingly common symptom in recent years, especially among students, with excessive use of smartphones being one of the major contributors. Online learning, social interactions, and screen-based entertainment have increased in the post-pandemic era, which can lead to a spurt in screen time, prolonged poor posture, and resultant forward head positioning. Studies suggest that excessive smartphone use thus can alter cervical spine alignment, reduce muscle endurance, and increase the risk. Such chronic pain conditions can thus afflict everyone. Students are one of the most affected populations; hence, the assessment of their relationship between smartphone use and its effects on posture and neck pain is important. Finding these associations will help raise awareness, promote ergonomic practices, and emphasize preventive and corrective physiotherapy interventions that could reduce or mitigate long-term complications.

AIM

To investigate the effects of prolonged smartphone use on posture and the occurrence of neck pain in healthy students.

OBJECTIVES

1. To assess the extent of smartphone use among students.
2. To evaluate the severity of neck pain.
3. To assess postural deviations related to smartphone usage.
4. To determine the level of neck functional disability among students

METHODOLOGY

Sample Size : 100

Study Design : Observational Study

Sampling method : Convenient Sampling

Study Population : Students From Batches post - 2020

Study Setting : Colleges in Pune

Study Duration : 1 month

MATERIALS

1. Pen
2. Paper
3. Consent Form
4. Questionnaire
5. Plumb Line

INCLUSION CRITERIA

1. Students aged 18–25 years. (4)
2. Students from batches post 2020. (3)
3. Minimum 2 hours of smartphone use pre-COVID with at least 2 hours added post-COVID daily. (5)
4. Any previously diagnosed injury caused due to smart phone.

EXCLUSION CRITERIA

1. Students with a history of any fracture, injury, or recent trauma affecting the spine.
2. Students with diagnosed neurological conditions affecting posture, balance, or neck function.
3. Students who use orthotic devices like a cervical collar or braces for neck support.

OUTCOME MEASURES

1. Plumb Line Assessment.⁸
2. Visual Analog Scale (VAS): A 0–10 scale to measure the intensity of neck pain experienced by participants.⁴
3. Neck Disability Index (NDI): Scores will measure the impact of neck pain on daily activities.⁹
4. Smartphone Addiction Scale - Short Version.¹⁰

PROCEDURE

Ethical clearance obtained from the institutional ethical committee. Participants were included according to the inclusion and exclusion criteria, and consent was taken from the subjects by signing the consent form. The procedure was explained to the subjects. After filling out the consent form, the assessment proforma was completed.

In the assessment, demographic data that included age, gender, height, weight, and average daily smartphone usage were recorded for each participant. Then, participants underwent postural assessment and evaluation of neck pain and smartphone addiction levels with standardized outcome measures. Postural assessment was conducted using the Plumb Line Method (Lateral View). The following anatomical landmarks were marked in the patient: earlobe, acromion process, greater trochanter, and lateral malleolus. The patient was asked to stand in front of the plumb line and march for a minute. The patient was asked to stop and the plumb line was measured along the marked points.

The intensity of neck pain was measured by VAS, which asked the participants to mark their pain on a 10 cm scale, ranging from 0 (no pain) to 10 (the worst pain imaginable).

Functional disability due to neck pain was measured using the Neck Disability Index, a questionnaire with 10 items rating the functional impact of neck pain. The total score ranges from 0 to 50 and is categorized as follows: 0-4 (no disability), 5-14 (mild), 15-24 (moderate), 25-34 (severe), ≥ 35 (complete disability).

Smartphone addiction levels were assessed using the Smartphone Addiction Scale (SAS), which measures smartphone dependency in terms of disturbance in daily life, withdrawal symptoms, and overuse. The total score ranges from 10 to 60, with higher scores indicating greater addiction. The severity classification includes 10–30 (low addiction), 31–40 (moderate addiction), and ≥ 41 (high addiction).

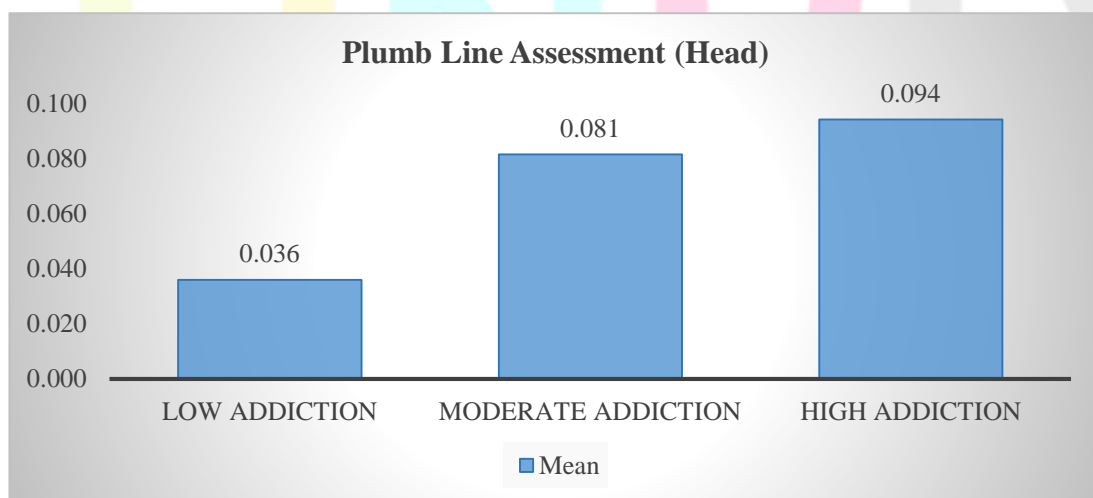
Data was recorded using Microsoft Excel sheet. Data was analysed using statistical test.

STATISTICAL ANALYSIS

Plumb Line Assessment (Head)	N	Mean	SD	SE	F-Value	P-Value	Result
Low Addiction	39	0.036	0.067	0.011	5.620	0.004903	Sig
Moderate Addiction	27	0.081	0.079	0.015			
High Addiction	34	0.094	0.089	0.015			

ANOVA test is carried for comparison of mean score according to smartphone addiction levels. From above table, we can observe that P-Value is less than 0.05. Hence, we can conclude that, there is significant difference observed in mean score according to smartphone addiction level.

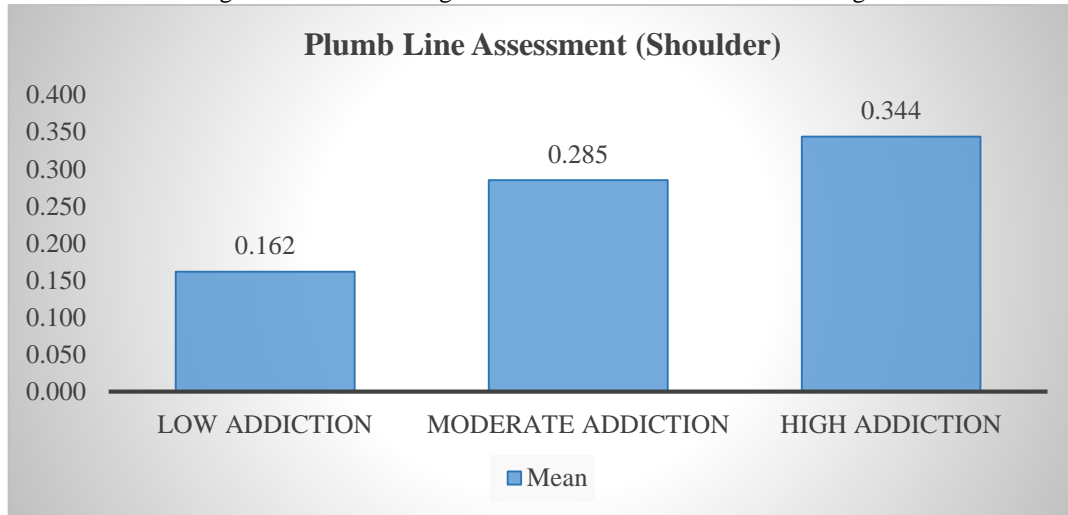
Mean score observed is maximum among individuals with high addiction level and minimum among individuals with low addiction levels.



Plumb Line Assessment (Shoulder)	N	Mean	SD	SE	F-Value	P-Value	Result
Low Addiction	39	0.162	0.171	0.027	9.137	0.000232	Sig
Moderate Addiction	27	0.285	0.183	0.035			
High Addiction	34	0.344	0.205	0.035			

ANOVA test is carried for comparison of mean score according to smartphone addiction levels. From above table ,we can observe that P-Value is less than 0.05. Hence, we can conclude that, there is significant difference observed in mean score according to smartphone addiction level.

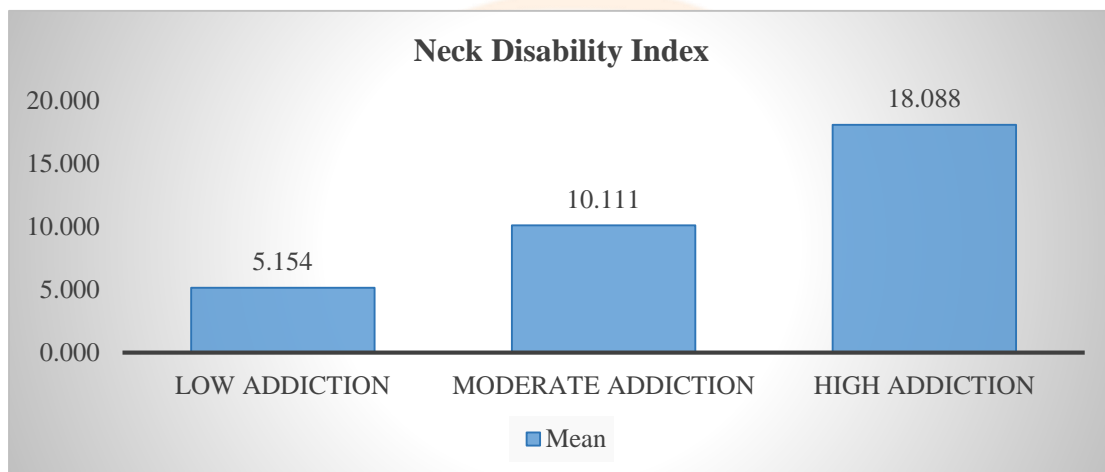
Mean score observed is maximum among individuals with high addiction level and minimum among individuals with low addiction levels.



Neck Disability Index	N	Mean	SD	SE	F-Value	P-Value	Result
Low Addiction	39	5.154	4.987	0.799	23.573	0.000000	Sig
Moderate Addiction	27	10.111	5.458	1.050			
High Addiction	34	18.088	11.779	2.020			

ANOVA test is carried for comparison of mean score according to smartphone addiction levels. From above table ,we can observe that P-Value is less than 0.05. Hence, we can conclude that, there is significant difference observed in mean score according to smartphone addiction level.

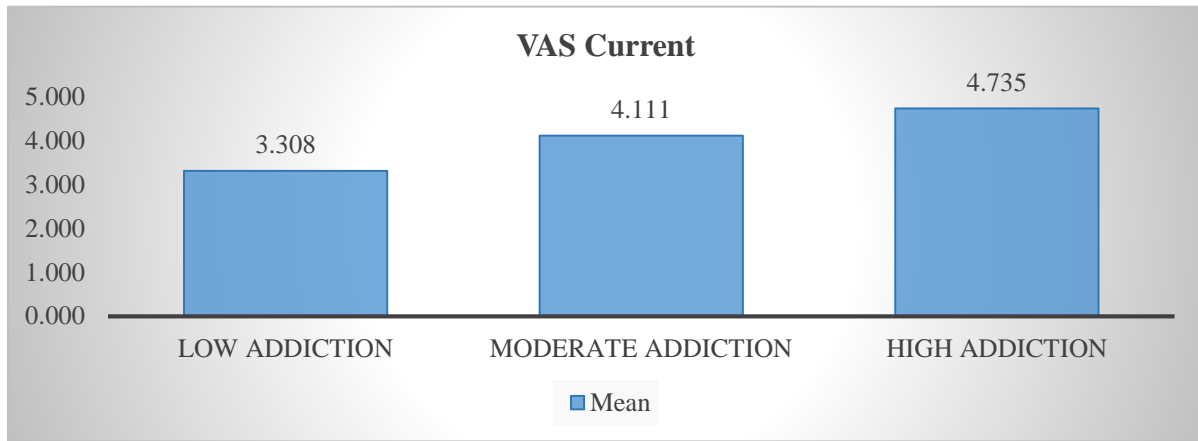
Mean score observed is maximum among individuals with high addiction level and minimum among individuals with low addiction levels.



VAS Current	N	Mean	SD	SE	F-Value	P-Value	Result
Low Addiction	39	3.308	1.704	0.273	5.279	0.006665	Sig
Moderate Addiction	27	4.111	1.502	0.289			
High Addiction	34	4.735	2.300	0.395			

ANOVA test is carried for comparison of mean score according to smartphone addiction levels. From above table ,we can observe that P-Value is less than 0.05. Hence, we can conclude that, there is significant difference observed in mean score according to smartphone addiction level.

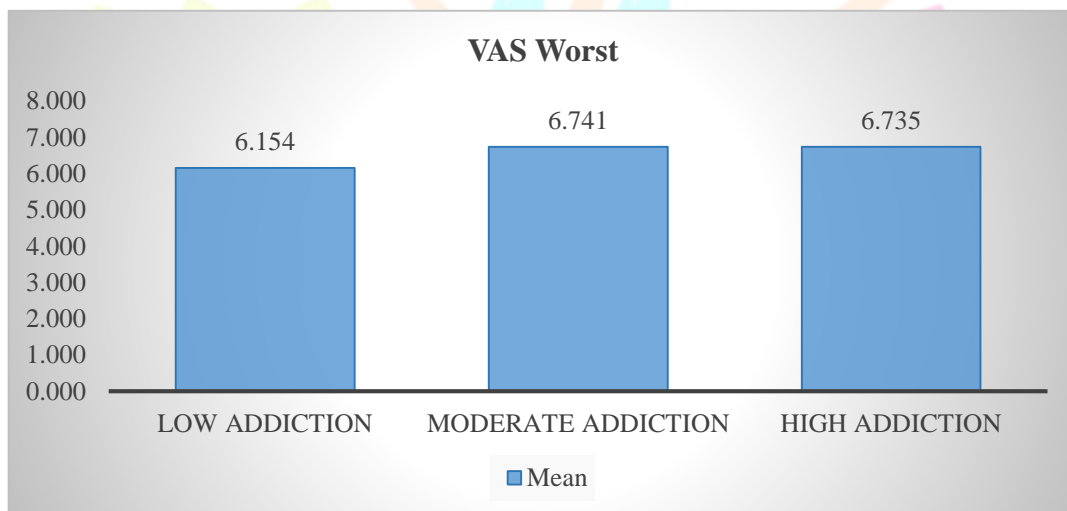
Mean score observed is maximum among individuals with high addiction level and minimum among individuals with low addiction levels.



VAS Worst	N	Mean	SD	SE	F-Value	P-Value	Result
Low Addiction	39	6.154	2.379	0.381	0.939	0.394526	Sig
Moderate Addiction	27	6.741	1.583	0.305			
High Addiction	34	6.735	2.050	0.351			

ANOVA test is carried for comparison of mean score according to smartphone addiction levels. From above table, we can observe that P-Value is less than 0.05. Hence, we can conclude that, there is significant difference observed in mean score according to smartphone addiction level.

Mean score observed is maximum among individuals with high addiction level and minimum among individuals with low addiction levels.



RESULT

A total of 100 healthy students were divided into low, moderate, and high smartphone addiction groups. The head posture ($p = 0.0049$), shoulder posture ($p = 0.0002$), Neck Disability Index ($p < 0.0001$), and current pain on VAS ($p = 0.0067$) showed significant differences between groups, while the worst pain on VAS did not indicate any significant difference with $p = 0.394$. These results show that higher smartphone addiction is related to higher postural deviation and neck pain.

DISCUSSION

With the rapid advancement in digitalization, smartphones have become an inseparable part of life, especially among students. Convenient as it is, prolonged use of such devices often results in sustained neck flexion, muscle fatigue, and postural imbalance. Prolonged maintenance of such a posture may result in pain and dysfunction in the cervical region over time. The present study investigates the correlation between smartphone addiction and postural deviations in relation to neck discomfort among healthy students.

In this research, 100 healthy students participated. The level of smartphone addiction for each participant was measured using the Smartphone Addiction Scale – Short Version (SAS-SV), and according to scores obtained, they were categorized into low, moderate, and high addiction groups.

Postural deviations were assessed with PLA at the head and shoulder levels, while the intensity of neck pain was measured using VAS. The functional aspect of neck pain in terms of disturbances in everyday activity was assessed by the NDI. Data were collected under standardized conditions, and statistical comparison of the groups was performed using one-way ANOVA.

There were significant differences in head and shoulder posture, NDI, and VAS (current pain) between the three groups. Participants with higher smartphone addiction showed more forward head and rounded shoulder posture on PLA, indicating sustained flexed neck position during device use.

NDI scores were significantly higher in the high addiction group, at less than 0.0001, indicating greater neck disability with reduced functional efficiency. Similarly, while VAS for current pain showed statistical significance at 0.0067, VAS for worst pain did not reach any statistical significance at 0.394. Therefore, while discomfort increases with smartphone addiction, this indicates that severe or persistent pain might not be directly related.

These findings clearly indicate an association of smartphone use with postural and pain-related changes. Prolonged use of a flexed neck posture increases the mechanical stress on cervical and shoulder muscles, leading to muscular imbalance and abnormal alignment. This is supported by higher NDI scores among high-addiction individuals, suggesting impairment in functional capacity of the neck due to repetitive postural stress.

In general, increased use of smartphones seems to be contributing to the development of forward head posture, muscle strain, and early signs of musculoskeletal dysfunction. These findings confirm those of Kim et al. (2015) and AlAbdulwahab et al. (2017), who found that frequent smartphone users had more severe cervical flexion and muscle fatigue and higher neck pain scores. This trend has been evident in various cross-sectional studies among students, which assert the basis for the association between digital device overuse and musculoskeletal strain. These results highlight the importance of ergonomic awareness and prevention strategies among students. Physiotherapists and educators should emphasize the importance of maintaining a neutral neck position, taking frequent breaks during the use of smartphones, and practicing certain stretching and strengthening exercises in order to maintain cervical muscular balance. Early correction of postural habits can prevent chronic neck pain and disability in later life. The study identifies the significant relationship between addiction to smartphones and altered posture, neck pain, and disability. The participants with higher addiction demonstrated more postural deviations and discomfort, thus underlining the need for awareness, behavioral modification, and posture correction to reduce the physical impact of excessive smartphone use.

CONCLUSION

The findings indicated that higher smartphone addiction is significantly related to forward head posture, rounded shoulders, and neck disability and pain levels. Students with high smartphone addiction have higher postural deviation and discomfort than those with low addiction.

LIMITATIONS

1. This study had a very limited sample size from one population group: students.
2. The postural assessment was made using a plumb line only, without advanced imaging or motion analysis.
3. VAS and NDI are self-reported measures that may be prone to individual bias.

FUTURE SCOPE

1. Future research can target the impact of using smartphones and screen time duration on specific postural angles.
2. The psychological aspects related to overuse of smartphones, including stress, anxiety, or dependency, can be explored to understand how they influence posture and pain.
3. Comparing students with occupational groups such as IT professionals can be useful to identify the contribution of lifestyle factors to postural and musculoskeletal changes.
4. Interventions that give prominence to ergonomic awareness and proper handling of smartphones can be put in place to prevent postural issues.

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