



Impact Of Smartphone Addiction On Pectoralis Minor Tightness Among Asymptomatic Healthy Adults A Correlational Study

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ABSTRACT

Background: The excessive use of smartphone addiction can impact on musculoskeletal health. Prolonged smartphone use, particularly with poor posture, may contribute to musculoskeletal issues, including tightness of the pectoralis minor muscle. This muscle plays a critical role in shoulder biomechanics, and its tightness can lead to postural abnormalities and associated pain syndromes. Despite the potential implications, the relationship between smartphone addiction and pectoralis minor tightness remains underexplored.

Aim: To investigate the impact of smartphone addiction on pectoralis minor tightness among asymptomatic young adults.

Method: A cross-sectional study was conducted among 82 healthy young adults students in which females were (n=49) and males were (33), between the age of 18-25 years of age. Samples were collected by screening the inclusion and exclusion criteria. As an outcomes SAS-SV for smart phone addiction and inch tape measurements for pectoralis minor length were used.

Result: Pearson's analysis was done to analyze the data. The results indicated a positive weak correlation between smart phone addiction and pectoralis minor tightness for both the genders ($r= 0.372$, $p=0.001$), weak positive correlation between smart phone addiction and pectoralis minor tightness in males ($r= 0.287$,

$p=0.001$), moderate positive correlation between smart phone addiction and pectoralis minor tightness in females ($r= 0.460$, $p=0.001$).

Conclusion: This study concluded that there is a weak to moderate positive correlation between smartphone addiction and pectoralis minor tightness, with a more pronounced effect observed in females.

Key words: Asymptomatic adults, Musculoskeletal health, Pectoralis minor tightness Smartphone addiction, SAS-SV

INTRODUCTION

A smartphone is a common gadget with a touchscreen interface, internet connectivity, social networking capabilities, and gaming applications. It is capable of handling complex tasks.^[1] The increasing usage of cellphones in daily life has changed a lot in the last few years, impacting both mental and physical health in different ways ^[2].

The effects of prolonged smartphone use on musculoskeletal health particularly with relation to posture and muscular tightness—are one area of growing concern ^[3]. People virtually always use smartphones and visual display terminals (VDTs) in their homes and workplaces. They use smartphones for a variety of daily chores, which might cause poor posture ^[4].

An increasing problem in communities is smartphone addiction, which falls under the area of behavioural addiction. Behavioural addiction generates instant reward, which could result in persistent behaviour even when one is aware of the negative outcomes ^[5]. Smartphone addiction and dependence result in several behavioural abnormalities, such as impaired focus and self-awareness, which impair one's ability to maintain proper posture whether sitting, standing, or lying down and may raise the risk of developing chronic musculoskeletal discomfort ^[6].

College students who suffer from internet addiction may also have skeletal muscle pain ^[7]. This is because prolonged lengths of time spent in an incorrect posture can cause changes in muscle tone and local pressure, which can eventually contribute to the development of skeletal muscle pain ^[8].

Smartphone users are often required to read screens by holding their arms out in front or by glancing sharply. This forward head posture puts excessive strain on the cervical spine and neck muscles and results in an excessive anterior curve in the lower cervical vertebrae and an excessive posterior curve in the upper thoracic vertebrae to maintain balance ^[9].

A forward head posture can cause imbalance in the musculoskeletal mechanics of the upper quadrant by not only affecting the neck but also the thoracic spine and shoulder blades^[10]. A postural dysfunction pattern known as upper crossed syndrome characterises the abnormal tone of the musculature in the shoulder girdle and cervicothoracic region of the body ^[11].

The "flare out" of the shoulder blades gives the appearance of rounded shoulders. The rounded shoulder posture eventually modifies the glenoid fossa's mechanical axis of rotation. As a result of these modified mechanics, the levator scapulae, subscapularis, upper trapezius, pectoralis minor, and supraspinatus muscles must provide extra stabilisation for the humerus and there is also a disturbance in the mobility of the scapula [12].

This posture can result in various postural abnormalities (e.g., head and shoulder shifted anteriorly) because it has some weaker muscles (rhomboids, Serratus anterior, middle and lower Trapezius) and some tightened/overactive muscles (upper Trapezius, pectoralis major and minor, and levator scapulae) [13].

People who adapt this posture for an extended period of time may have neck and upper back pain, even if it is not always painful [14]. According to a study in 2010, individuals with UCS had more internal rotation of the shoulder joint and scapular anterior tilting than those without the condition. These postural abnormalities in the shoulder girdle were linked to UCS [15].

Sitting in a forward head position causes flexion of the lower cervical region, extension of the upper cervical region, and rounded shoulders. This reduces muscle fibre length, resulting in extensor torque around upper cervical joints [16]. The pectoralis minor is one muscle that is commonly linked to pathologies of the shoulder and upper quadrant; a reduction in its length has been linked to a forward head posture [18]. The pectoralis minor muscle's tension has drawn attention among the postural problems associated with prolonged smartphone use because of its connection to the development of upper crossed syndrome (UCS) and related musculoskeletal ailments [19].

Pectoralis muscle tightness is also attributed to the disruption of the blood flow to the upper limb [20]. Excessive anterior mobility of the clavicle and humerus due to tight PMM results in a tense posterior capsule surrounding the glenohumeral joint. As a compensatory action during elevation, the taut posterior capsule forces the scapula to tilt anteriorly and rotate internally [21]. The position of scapula is very important for muscle balance, there is a significant relationship between the contraction abilities of the muscles in the shoulder region, and the position of scapula and shoulder protraction is developed due to the poor posture creates disadvantage for muscle function [22]. It has also been found that people with forward shoulder posture need to stretch their pectoralis minor. Normal flexibility would not be displayed by a very short pectoralis minor muscle due to adaptation [23]. A possible cause of adaptive pectoralis minor tightening is repetitive upper extremity use for tasks that extend and rotate the scapula downward [24]. Extended variations in posture can lead to modifications in soft tissue flexibility, joint congruency, and muscle lengths [25].

An addiction to smartphones may result in extended durations of forward head and rounded shoulder posture. The pectoralis minor, a muscle in the chest, becomes shortened and taut in this prolonged posture. This constriction has the potential to cause musculoskeletal problems as well as discomfort and decreased range of motion over time [26].

This study explores the relationship between smartphone addiction and pectoralis minor tightness, aiming to uncover the underlying mechanisms and broader implications of this association^[27].

METHODS

This cross sectional study was conducted at Alvas college of Physiotherapy to Evaluate the correlation between smartphone addiction and pectoralis minor tightness. The subjects were selected for the study based on following selection criteria. Age between 18 – 27 years both Male and Female SAS-SV for male <36, female <33 and students who have agreed to participate in the study known case of musculoskeletal disorder students who did not agree to participate was excluded from study. Verbal consent was obtained from all participants who were included in study. Ethical clearance was obtained from Alvas college of Physiotherapy and research center. Material used for this study were couch, measuring tape, pen, paper. Before evaluation weight and height of participants were recorded.

Pectoralis Minor Length Test

The pectoralis minor tightness was tested using this method. The test subjects were instructed to assume a neutral, relaxed posture while lying supine on a typical treatment table. Using a measuring tape on the hand dominance side, the distance between the acromion process and the examination table was determined.

Outcome measures

The Smartphone Addiction Scale Short Version (SAS-SV) has been widely used in research, but little is known about the measurement invariance across gender.

SAS-SV is a self-reported measure for assessment of smartphone addiction severity. The scale consists of 10 items. All participants were told that “please indicate to what extent you agree that this is true for you”, and were asked to answer the following question: “Is missing planned work due to smartphone use?”. Responses were recorded by a 6-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree).

STATISTICAL ANALYSIS

The collected data were analyzed using the statistical package SPSS 22.0 (SPSS Inc., Chicago, IL). To check the normality Kolmogorov Smirnov test was used. As the data were normally distributed, Pearson's correlation analysis was used to correlate between smart phone addiction and pectoralis minor tightness. The tests were applied at a power of 80% and confidence interval of 95% and the p value and level of significance was set as < 0.05.

RESULT**DESCRIPTIVE ANALYSIS OF SMART PHONE ADDICTION AND PECTORALIS MINOR TIGHTNESS:-**

This study was conducted for 82 healthy young adults with mean age of (22.48±1.78) which includes 33 males (23.24±1.41), 49 females (21.95±1.83). Mean BMI for both the genders (21.91±3.71) for males (22.8±3.56), for females (21.2±3.72). Descriptive statistics of all independent and dependent variables are explained in Table 1.

Table- 1: Descriptive analysis

Variables	Both Gender	Male	Female
Age	22.48±1.786	23.24±1.41	21.95±1.83
Gender	1.60±.493	1±0	2±0
BMI	21.91 ± 3.720	22.83±3.568	21.29±3.72
SAS-SV	32.50±5.136	32.61±4	32.42±5.81
PMTR	2.13±.581	2.26±0.67	2.04±0.501

Table – 2 : Mean age analysis

Group	Mean	SD
Both genders	22.48	1.786
Males	23.24	1.41
Females	21.95	1.83

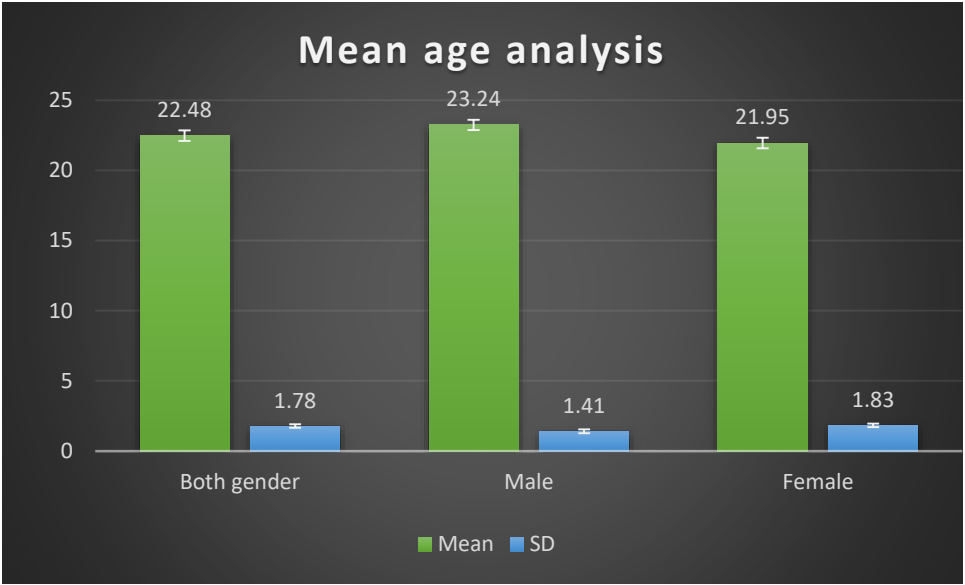


Fig A :Mean age analysis

Table 3 : Mean BMI analysis

Group	Mean	SD
Both genders	21.91	3.71
Males	22.8	3.56
Females	21.2	3.72

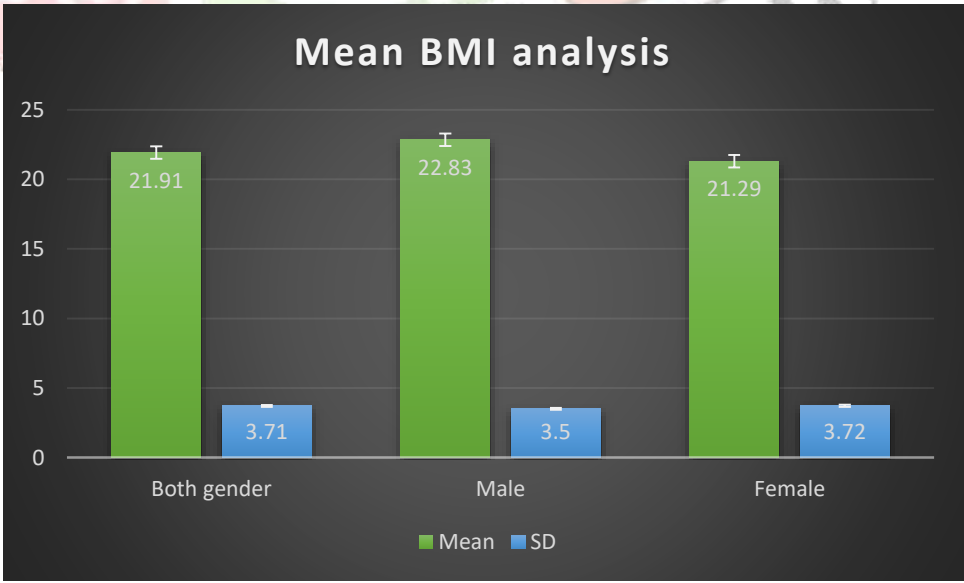
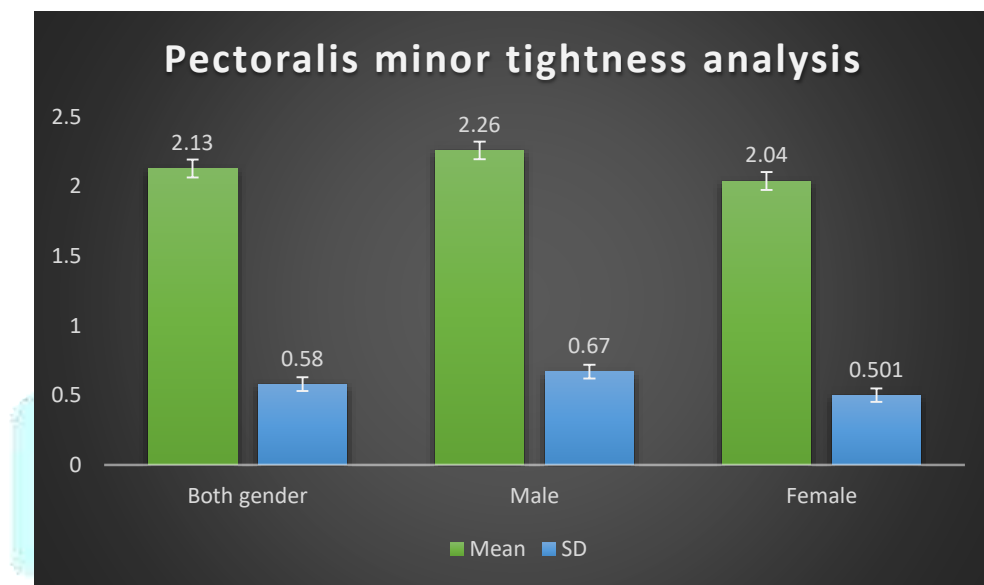


Fig B : Mean BMI analysis

Table 4 : Pectoralis minor tightness analysis

Group	Mean	SD
Both gender	2.13	0.581
Males	2.26	0.67
Females	2.04	0.501

**Fig C : Pectoralis minor tightness analysis**

RELATIONSHIP BETWEEN SMART PHONE ADDICTION AND PECTORALIS MINOR TIGHTNESS

The results indicated a positive weak correlation between smart phone addiction and pectoralis minor tightness for both the genders ($r = 0.372$, $p = 0.001$), weak positive correlation between smart phone addiction and pectoralis minor tightness in males ($r = 0.287$, $p = 0.001$), moderate positive correlation between smart phone addiction and pectoralis minor tightness in females ($r = 0.460$, $p = 0.001$).

The analyzed data were tabulated, and the results were interpreted as follows (Table 5), Figure D shows that there is positive weak correlation between smart phone addiction and pectoralis minor tightness for both the genders.

(Table 6), Figure E shows that there is positive weak correlation between smart phone addiction and pectoralis minor tightness for males.

(Table 7) Figure F shows that their positive moderate correlation between smart phone addiction and pectoralis minor tightness for females.

Table 5 : Correlation between pectoralis minor tightness and smartphone addiction for both gender analysis

Variables	r value	P value
Pectoralis minor tightness and SASSV	0.372	0.01

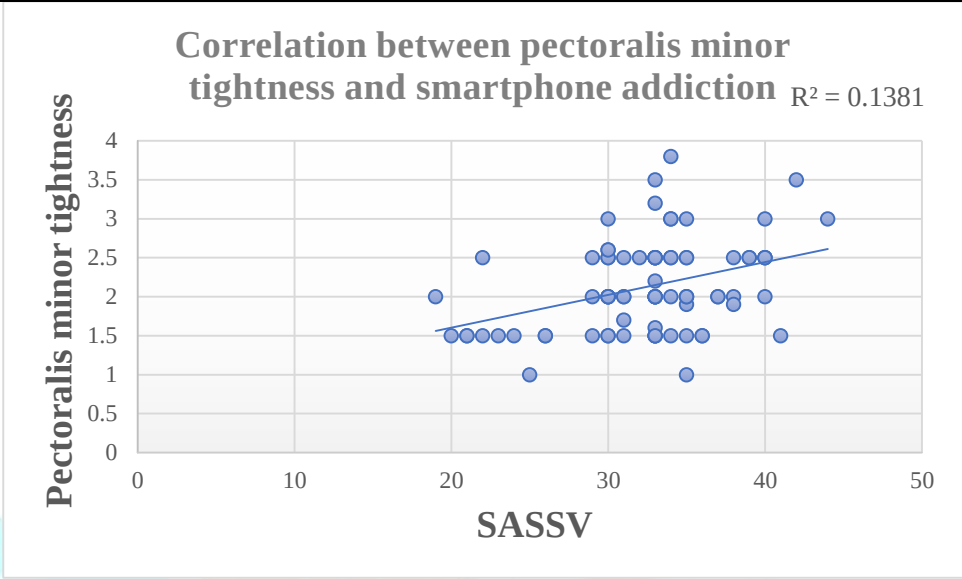


Fig D : Correlation between pectoralis minor tightness and smartphone addiction for both gender analysis

Table 6 : Correlation between pectoralis minor tightness and smartphone addiction for male

Variables	r value	P value
Pectoralis minor tightness and male	0.287	0.01

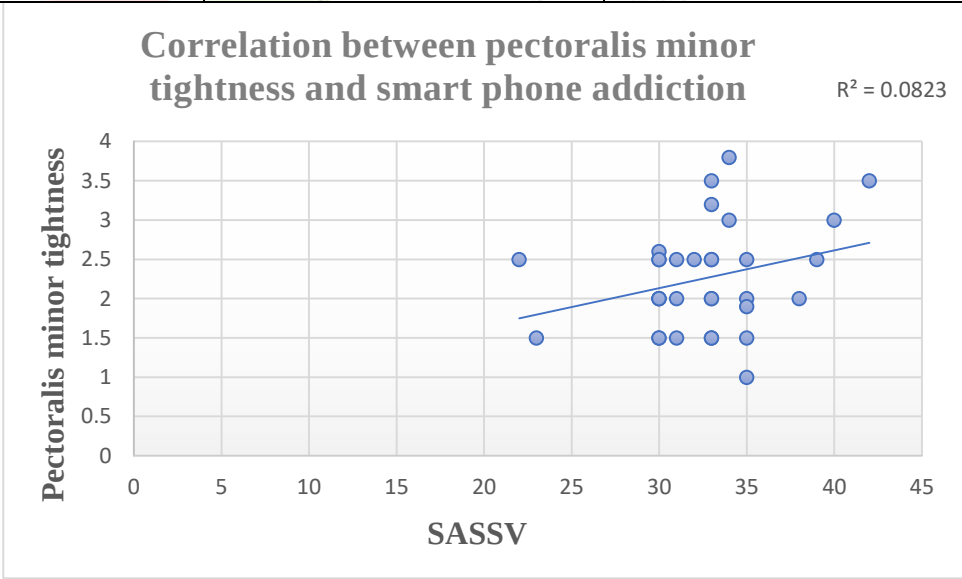


Fig E : Correlation between pectoralis minor tightness and smartphone addiction for male

Variables	r value	P value
Pectoralis minor tightness and females	0.460	0.01

Table 7 : Correlation between pectoralis minor tightness and smartphone addiction for females

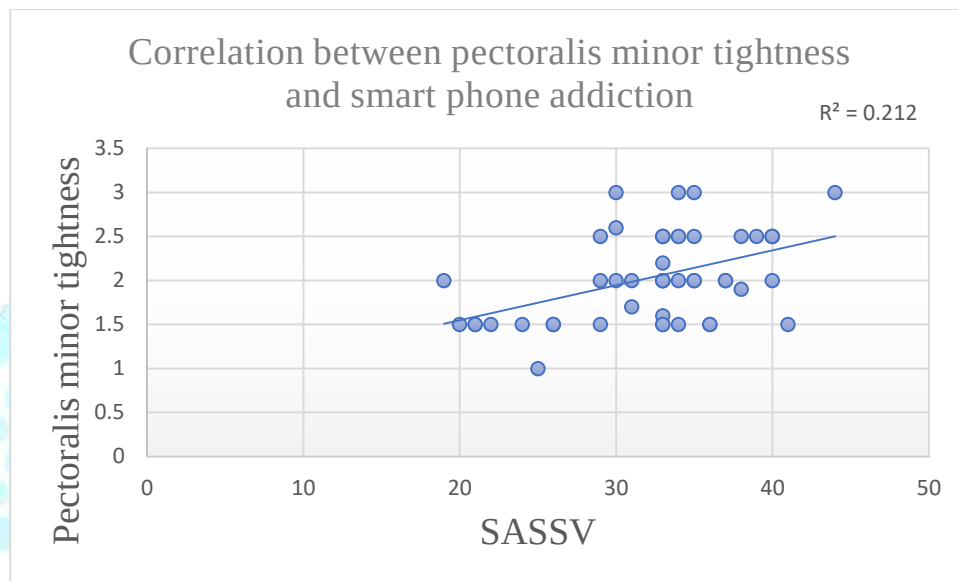


Fig - F : Correlation between pectoralis minor tightness and smartphone addiction for females

Discussion

The purpose of this study was to find the correlation between smart phone addiction and pectoralis minor tightness among the healthy asymptomatic young adults. The result of this study demonstrated that a positive weak correlation between smart phone addiction and pectoralis minor tightness among both the genders, positive weak correlation between smart phone addiction and pectoralis minor tightness among males, moderate positive correlation between smart phone addiction and pectoralis minor tightness among females. These findings corroborate with previous research by Zhang et al., which reveals that in smart phone addiction is associated with upper cross syndrome.

Several studies have revealed that smart phone addiction is associated with musculoskeletal pain and often associated with myofascial trigger points especially in cervical region.²⁶ No studies have revealed the relationship between smart phone addiction and pectoralis minor tightness on the influence of genders. This study aimed to find the how pectoralis minor tightness can impact on different genders of same age group. Study by Mustafaoglu et al., reveals that there is significant association between smart phone addiction and musculoskeletal pain among young adults due to prolonged static postures and repetitive use of handheld devices²⁷. A study by Zhang C established that there is an association between smart phone addiction and development of upper cross syndrome. Pectoralis minor tightness is a component of UCS which is characterized by a forward head posture and rounded shoulders³.

A study by Ashiyat et al., reveals that smart phone addiction is associated with reduced craniovertebral angle which indicates that there is increased forward head posture²⁸. According to Michele K. Moore, forward head posture and rounded shoulders are hallmark signs of UCS which exacerbates by prolonged smartphone use. This posture leads to adaptive shortening of the pectoralis minor muscle. Study by Anjali Suresh et al., which demonstrates that excessive use of smartphones in university students could result in neck pain and disability³⁰. The current study revealed that there is weak positive correlation between smart phone addiction and pectoralis minor tightness among males. This could be due to several factors, including differences in postural habits or varying levels of physical activity among males³¹. Males engage in other physical activities that may counteract the effects of prolonged smartphone use which can decrease the degree of muscle tightness. A study by Bhimani et al., reveals that prevalence of muscle tightness was more common in women than in men and was often accompanied by pain³².

In contrast, the moderate positive correlation found among females suggests a stronger relationship between smartphone addiction and pectoralis minor tightness. This could be due to several gender-specific factors. A study by Bergier J et al., reveals that females may engage in less physical activity that could alleviate the effects of prolonged smartphone use³¹. Additionally, a study by Davey A et al., reveals that Self-controlling behaviour was less in females than their male counterpart students which revealed that females were more addicted to Smart phone than males³³. Study by Wiguna NP et al., reveals that smart phone addiction is associated with forward head posture and rounded shoulder which could contribute more significantly to pectoralis minor tightness³⁴.

When considering both genders together the current study reveals that there is overall weak positive correlation between smart phone addiction and pectoralis minor tightness and this weak correlation may be influenced by the gender differences observed, with the stronger correlation in females being diluted by the weaker correlation in males. This finding highlights the importance of gender-specific analyses in understanding the full impact of smartphone use on musculoskeletal health.

Limitations

1. The less sample size the demographic range may not have been sufficiently broad to generalize the findings to all populations.
2. This study is cross sectional in nature which limits the ability to infer causality between smartphone addiction and pectoralis minor tightness.
3. This study didn't consider the confounding variables like overall physical activity levels, posture during smartphone use, or pre-existing musculoskeletal conditions. These factors could have influenced the results and may account for some of the observed correlations.
4. This study relied on self-reported measures of smartphone addiction, which could be subject to reporting bias. Participants may underestimate or overestimate their smartphone use, impacting the accuracy of the correlations observed.

CONCLUSION

This study concluded that there is a weak to moderate positive correlation between smartphone addiction and pectoralis minor tightness, with a more pronounced effect observed in females. These results emphasize the need for interventions to address the musculoskeletal health risks associated with smartphone addiction, particularly in populations that may be more vulnerable, such as females.

FUTURE RECOMMENDATIONS

- Objective tools can be incorporated to measure both smartphone addiction and pectoralis minor tightness that would reduce potential biases associated with self-reported data. Wearable devices, posture analysis software, and musculoskeletal assessments could provide more accurate data.
- Gender-Specific Interventions: Research should also focus on developing and testing gender-specific interventions that address the unique risks identified in this study.
- Future studies should explore how different postures, smartphone usage habits, and ergonomic factors contribute to pectoralis minor tightness.

CLINICAL IMPLICATIONS

- The findings suggest that females may be more susceptible to pectoralis minor tightness due to smartphone addiction. Clinicians should consider implementing gender-specific preventive measures, such as educating female patients on ergonomic smartphone use and encouraging posture correction exercises.
- Regular assessments of posture and musculoskeletal health in patients with high smartphone use, particularly females, could help identify early signs of muscle tightness or dysfunction. Early intervention could prevent more severe musculoskeletal issues from developing.
- For individuals exhibiting signs of pectoralis minor tightness, especially those with high smartphone use, targeted rehabilitation programs should be developed.

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