



(RESEARCH ARTICLE)



## Exploring the relationship between smartphone addiction and respiratory health in college students: A correlational study

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### Abstract

**Background:** Smartphone addiction (SA) is "mainly described as excessive or poorly controlled preoccupations, utilization or behaviour regarding smartphone use; to the extent that people neglect different facets of life." SA has become a significant global issue for university students. The use of smartphones in poor posture may lead to forward head position (Forward Head Posture- FHP). FHP significantly impairs the respiratory system by weakening the respiratory muscles. The Smartphone Addiction Scale short version (SAS-SV) was created to measure smartphone addiction in a simplified manner.

**Objective:** The purpose of this study is to look into the relationship between smartphone addiction and respiratory function in college students. PFT and SAS-SV were used to assess the relationship between head-forward postural deviation and ventilatory function.

**Aim of study:** The intention behind the study was to determine the influence of addiction of smartphone on respiratory performance in college students, as well as to identify the association between forward head posture, SAS-SV, and target wall tests.

**Method:** The subjects were selected according to selective criteria between 18 and 24 years old. Written consent was taken. The tragus-to-wall distance and SAS-SV were taken to evaluate correlation. A spirometer is used to assess FVC, FEV1, and PEFR.

**Result:** The result of the study was statistically non-significant with the FVC (P value 0.072), FEV1(P value 0.736), and PEFR (P value 0.491,) which means there was no effect of smartphone addiction on respiratory function, but there was statistically significant difference in FHP (P value 0.002)

**Conclusion:** The study concluded that while smartphone use does not affect respiratory function, it may contribute to changes in forward head posture.

**Keywords:** Smartphone Addiction; Smartphone Addiction Scale – Short Version; Forward Head Posture; Respiratory Function; Capacity

### 1. Introduction

Addiction includes not only substance or drug abuse, but also gambling, the internet, video games, and even smartphones <sup>[1]</sup>. Addiction of Smartphones (SA) " mainly described as excessive or poorly controlled preoccupations,

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utilisation or behaviour regarding smartphone use; to the extent that people neglect different facets of life." [2]. According to statistics of 2022, over eight in ten individuals, or over six billion people, have access to a smartphone, and among them, the young individuals were found to be frequent users [2]. A significant worldwide issue that impacts people of all ages, especially college students, is smartphone addiction [3]. There are two types of symptoms associated with smartphone addiction. On one hand, there are physiological disorders like migraines, carpal tunnel syndrome, dry eyes, and disorders of the muscles and skeleton. On the other side, there are psychosocial disorders like issues sleeping, aggressive or depressed symptoms, school dropouts, and antisocial personality disorder. Musculoskeletal problems are most prevalent in the digits, hands, and cervical region due to the fact that these regions are the ones most impacted by prolonged smartphone use [4]. The person using a smartphone has to hold their gadget in front of them and keep their head lowered for extended periods [Fig. 1].

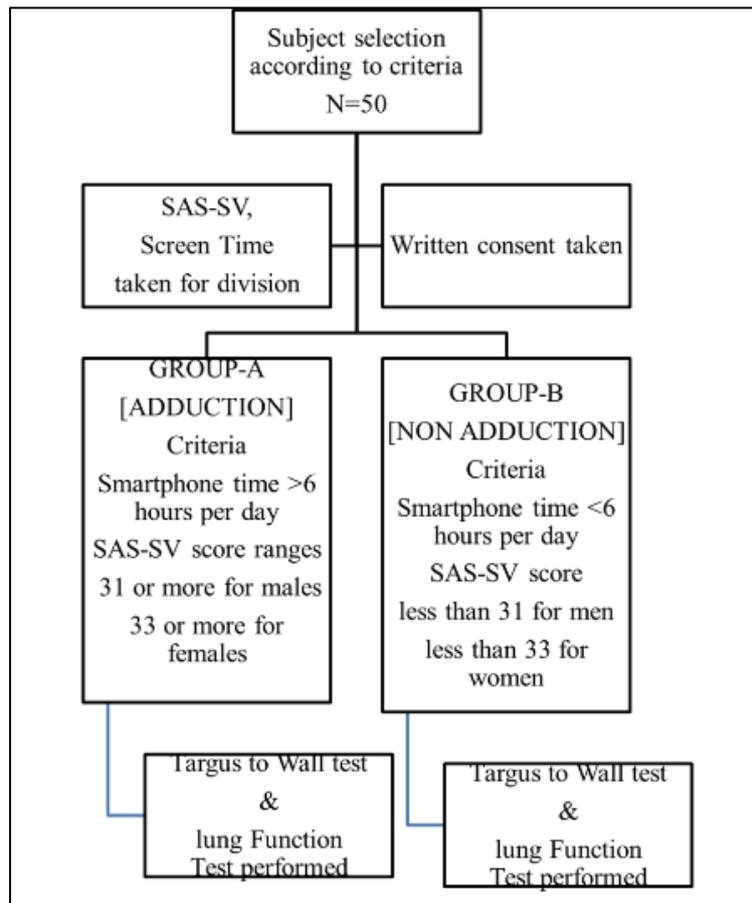


**Figure 1** Smartphone use position

This alignment moves the head into forward postural deviation and flattens the forward curvature of the cervical spine. This can lead to neck pain and forward head posture [3]. The smartphone addiction scale SAS-SV, created and verified by Kwon et al., is a 33-item, 6-point self-report measure of smartphone addiction that aims to address the limitations of previous assessments.

It is anticipated that the short-version scale created for this study will assess smartphone addiction in a straightforward, time-efficient, and less costly manner [1]. Male and female participants have different cut-off values for addiction (31 and 33, respectively), while the overall score on the Short-version scale for smartphone addiction varies between 10 and 60 [2]. Reduced respiratory function is a direct result of forward head posture (FHP), which impairs the muscles that control breathing. According to previous research by Han et al., the accessory respiratory muscle activity, forced vital capacity (FVC), and forced expiratory volume in one second (FEV1) were all significantly lower in the FHP group compared to the normal group. [5]. It is well-known that FHP significantly impacts respiratory function by reducing the capacity of the respiratory muscles. FHP reduces respiratory function by weakening critical accessory ventilatory muscles involved in inspiration, including the Sternomastoid (SCM), scalene, Upper Trapezius (UT), Pectoralis Major (PM), and thoracolumbar Erector Spinae (ES) muscles [6]. A spirometer is used to evaluate pulmonary function. The resulting measurement items were FEV, FEV1, and Peak Expiratory Flow Rate (PEFR) [7].

## 2. Methods

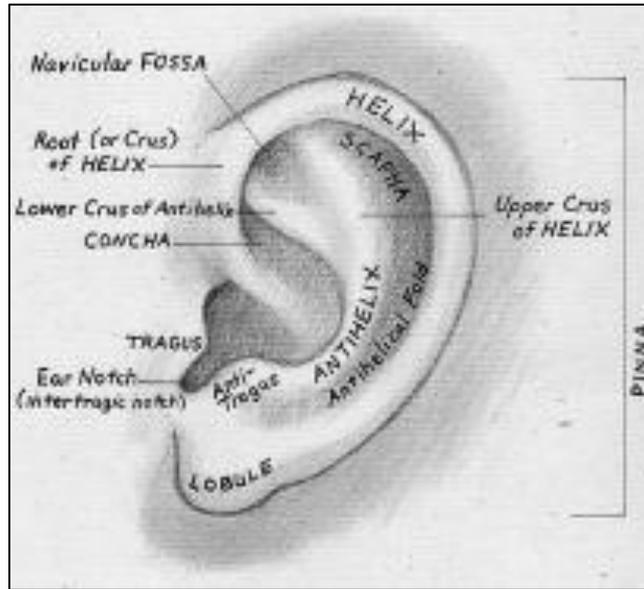


**Figure 2** Study of Methodology

This study was conducted in and around Rajkot, and ethical approval was obtained from the departmental ethical committee [Ref No.- MUEC/2024/43] 50 subjects were chosen who met the selection criteria. The criteria for selection were: Inclusion criteria: 18–24 years<sup>[8]</sup> male and female both, having spent more than six months using smartphones<sup>[9]</sup>, and exclusion criteria were People who had neurological, cardiovascular, respiratory, or musculoskeletal injuries were not included<sup>[8]</sup>. Drug use that may result in pulmonary and spinal bone abnormalities, current smoker or history of smoking<sup>[10]</sup>. Participants in this study were asked to authorize through a signed consent form after being properly informed about the study's purpose and procedure. Participant selection was done using purposive sampling. All subjects were split into two groups: ADDICTED [GROUP-A] and NON-ADDICTED [GROUP-B]. The division of group accrue according to SAS-SV score and smartphone use time if SAS-SV score ranges 31 or more for males and 33 or more for females or used smartphones for more than 6 months for more than 6 hours per day that comes under addiction or non-addiction SAS-SV score is less than 31 for men and less than 33 for women, and they have used smartphones for more than 6 months or less than 6 hours per day. The Targus to Wall Test measured forward head posture, while the Pulmonary Function Test measured respiratory capacity.

### 2.1. Targus to Wall Test<sup>[11]</sup>

Recommended methods for determining the distance from the tragus to the wall in each stand.



**Figure 3** Tragus point in ear

Feet are separated by the person's foot length.

The heels are positioned 10cm away from the wall

The thoracic region and buttocks were in contact with the wall.

- Cranium

Maintain a neutral head position.

Level reference between the nostrils and tragus

- Assessment

Measure the gap from the back of the tragus with a ruler. (Fig. 2).

The mean of both sides

## 2.2. Pulmonary Function Test <sup>[12]</sup>

The spirometer (Spiro Tech CMSP-01) was used to measure FEV1, FVC, and PEF. Sitting was the default position for the exam. Three measurements that were 95% compatible were combined to get the best result.

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## 3. Result

According to the need of our study to find the relationship between smartphone addiction and respiratory health in college students, in outcome measures of PFT, SAS-SV, and FHP were taken for analysis. The datasets of the research article are available at the end of the article [Table 7].

Statistical analysis was conducted using SPSS version 23. The result of statistically non-significant with the FVC (P value 0.072) [Table 6], FEV1(P value 0.736) [Table 4] and PEF (P value 0.491) [Table 5] that means there is a smartphone addiction not effective in respiratory function but analysis suggest the is significant different in FHP (P value 0.002) [Table 3].

**Table 1** Normality test for smartphone addiction subjects

	Shapiro-Wilk		
	Statistic	df	Sig.
SCREENTIME	0.898	50	0.169
FHP	0.954	50	0.306
FVC	0.963	50	0.467
FEV1	0.949	50	0.239
PEFR	0.941	50	0.155

**Table 2** Normality test for no smartphone addiction subjects

	Shapiro-Wilk		
	Statistic	Df	Sig.
SCREENTIME	0.939	50	0.142
FHP	0.966	50	0.545
FVC	0.928	50	0.080
FEV1	0.978	50	0.844
PEFR	0.974	50	0.759

**Table 3** Correlation between Smartphone addiction and FHP

		Addiction	FHP
Addiction	Pearson Correlation	1	-0.425**
	Sig. (2-tailed)		0.002
	N	100	100
FHP	Pearson Correlation	-0.425**	1
	Sig. (2-tailed)	0.002	
	N	100	100

**Table 4** Correlation between Smartphone addiction and FEV1

		Addiction	FEV1
Addiction	Pearson Correlation	1	-0.049
	Sig. (2-tailed)		0.736
	N	100	100
FEV1	Pearson Correlation	-0.049	1
	Sig. (2-tailed)	0.736	
	N	100	100

**Table 5** Correlation between Smartphone addiction and PEFR

		<b>Addiction</b>	<b>PEFR</b>
Addiction	Pearson Correlation	1	0.100
	Sig. (2-tailed)		0.491
	N	100	100
PEFR	Pearson Correlation	0.100	1
	Sig. (2-tailed)	0.491	
	N	100	100

**Table 6** Correlation between Smartphone addiction and FVC

		<b>Addiction</b>	<b>FVC</b>
Addiction	Pearson Correlation	1	-0.257
	Sig. (2-tailed)		0.072
	N	100	100
FVC	Pearson Correlation	-0.257	1
	Sig. (2-tailed)	0.072	
	N	100	100

#### 4. Discussion

Our study concluded that while smartphone usage does not affect respiratory function, it may contribute to changes in forward head posture.

An investigation into how long smartphone use affects posture and respiratory function revealed that prolonged smartphone use may have a negative impact on both [13].

According to one study, there is little evidence linking young adults' smartphone use to their ability to function. Compared to the non-exercising group, which used smartphones slightly more and had lower functional capacity, the exercising group, which used their smartphones for a shorter period of time, had better functional capacity [8].

The impact of protracted head posture on pulmonary ventilation metrics and chest curvature, according to the study, when a person had FHP as opposed to non-FHP, their thoracic shape changed, and their respiratory function declined. According to Lee et al., assuming FHP resulted in a statistically significant drop in FVC even among participants who did not experience neck pain [5].

The study of young adults found a correlation between respiratory functions, respiratory accessory muscles, and forward head posture. It indicates that FHP can contribute to lower respiratory functions; therefore, maintaining proper head posture is necessary in order to prevent such functional reductions [10].

Research has shown a link between the use of respiratory muscles and pulmonary functioning in individuals who have a forward head position. This provided evidence that an extremely forward head position decreased forced vital capacity while increasing the activation of the muscle connecting the sternum, clavicle, and mastoid process and the scalene muscle at the front of the neck. Consequently, we need better methods of regulating forward head position that take into account the interplay between respiratory synergist muscle activity and pulmonary function [14].

Jung SI et al demonstrated how extended smartphone use impacts posture change; the impact of smartphone usage duration on respiratory function and posture, an examination was carried out using CVA and scapular index as metrics. Besides the assessment of PEF, FEV1, FEV1/FVC, and FVC as additional measures to show how long-term smartphone

use affects respiratory function, was also taken. The study's conclusions show notable variations in PEF, scapular index, and CVA. Compared to subjects who used smartphones less frequently, those who used them for longer periods of time had rounded shoulders and lower FHP. Additionally, it shows that prolonged smartphone use was associated with partially compromised respiratory function [7].

The effects of smartphone use on university scholars' Cervical and upper spine alignment, as well as their Inhalation efficiency, were examined in one study with thirty participants. According to that study, using a smartphone with bad posture may increase your risk of developing airway issues and spinal musculoskeletal challenges [15].

According to one investigation, using a smartphone led the upper torso of both sexes to shift backwards. This was observed in healthy young individuals who were also in a typical standing position. Additionally, it was discovered that females' lumbar lordosis and thoracic kyphosis deepened when using smartphones, which may be viewed as a compensating mechanism [16].

Dependence on smartphones is positively correlated with both reduced extensor endurance of muscles and altered neck postural alignment, according to an article on the connections between cervical sagittal alignment, endurance of muscles, alignment of joints, sense, range of motion, and degree of addiction to smartphones [17].

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## 5. Conclusion

The study concluded that, while smartphone use does not affect respiratory function, it may contribute to changes in forward head posture.

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

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