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The Impact Of Smartphone Addiction On Sleep Quality Among High School Students In Makkah, Saudi Arabia

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Abstract

Background

Smartphones are internet-accessible devices that everyone can use in any setting. The popularity of cell phones is growing. The pervasiveness of smartphone technology raises concerns about its addiction among adolescents and its association with sleep quality and mental and physical health issues.

Objectives

This study aimed to determine the effect of smartphone addiction on sleep quality among secondary high schools in Makkah, Saudi Arabia.

Methods

The study was conducted on high school students in Makkah, Saudi Arabia, by a cross-sectional analytic design from Janu[1]ary 2023 to August 2023. The study used a multistage stratified random sampling technique to select participants. The data was collected from an online self- administrated survey and analyzed using SPSS.

Results

This study included 373 respondents. Among those, males represented two-thirds of the study population (66%) while females were (34%). The mean age of participants was 15.8 ± 5.56 years. Our results showed that the average number of hours spent on mobile was 6.9 ± 4.45 per day. Furthermore, our findings revealed that the mean of the SAS-SV score was 38.5 ± 10.8 out of 60, and the average Global PSQI score was 6.63 ± 3.03 out of 21. The results showed that study participants had problems using smartphones longer than they intended, constantly checking them and missing planned work due to smartphone use. There is a positive correlation between smartphone addiction and sleep quality ($r = 0.261$, $p < 0.001$), indicating that the respondents had worse sleep quality when smartphone addiction increased and the Global PSQI increased.

Conclusion

Our study concluded that high school students in the Makkah region in Saudi Arabia had high smartphone addiction. Moreover, higher smartphone addiction is significantly associated with poor sleep quality. This study can help with the development of measures to improve better sleep quality among high school students.

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Introduction

Smartphones are technological devices that significantly impact people's daily lives, changing their habits and behaviors. The utilities and capabilities of these devices are increasing, and the foresight is that this tendency will grow in the following years. However, the problematic use of smartphones has increased dangerously [1]. Many studies in the literature demonstrate that smartphone addiction impairs sleep quality [2]. However, the number of studies on Saudi adolescents could be much higher. Indigent darkness of in adolescents and young adults can result in longer-term sleep problems, which may impact them into adulthood [3]. Young adults today have grown up with smartphones as an evident part of their daily lives. The reason would be that the usage of smartphones goes beyond routine calls, allowing one to enjoy games, online shopping, various social interacting activities, and administrative work anytime, anywhere, and has brought us a convenient life [4, 5]. Smartphones have also proved helpful for students as a potential tool to "learn anywhere" [6].

Despite the benefits, Smartphone overdependence among adolescents is derived from their developmental characteristics and causes severe psychological, mental, and social problems [7, 8]. The overuse of electronic gadgets has been significantly associated with sleeplessness as adolescents spend most of their evening time watching or using electronic media.

Sleep is a crucial predictor of general health and well-being, and getting a decent night's sleep is critical for a person's consistent good physical and mental well-being. The ideal amount of sleep that adolescents 10- 19 years need is 9 hours and 15 minutes, which does not change from 10 to 17 years old [9]. However, children in secondary schools only sleep for a short time. It reported [10] that about 80% of children 0-18 years old watch television before sleep. Adolescents 10-19 years today are growing up immersed in digital media, which has both beneficial and harmful implications for their healthy development [11].

Knowing that Saudi Arabia ranked the first country in the Gulf Region Cooperation Council regarding the proportion of smartphone users [7], this study aims to examine the effects of smartphone addiction on sleep quality among high school students.

Rational

Today more than ever, there is a need to recognize better the effect of smartphone addiction on sleep quality, especially in the most critical age. The rapid development during adolescence indicates that adolescence may be a critical or sensitive period for later health and disease [12].

Materials And Methods

Study design, setting, and sampling

A cross-sectional analytical study among high school students in Makkah City aimed to find the impact of smartphone addiction on sleep quality.

According to the national ministry of Education, the population size of the secondary schools in Makkah is 30000. Using Epi info7 from CDC to calculate the sample size from the cross-sectional study, knowing that the expected frequency is 58.7% [2]. With a confidence level of 95% and an error percentage of 5%. The ideal sample size was 368; however, we included an additional 15% to account for the clustered design effect and

missing data.

A multistage stratified random sampling technique was adopted with three stages.
First stage: Makkah region has four Internal Education Offices; each education office includes several numbers of schools. Two regions were selected randomly by using simple random sample techniques. Second stage: Two secondary schools were randomly selected in each region using simple random sample techniques.
Third stage: In each school, one class was selected randomly in each education grade using simple random sample techniques.

Data collection

The data collection technique was an Online self-administrated form filled out by students using the following tools: Socio-demographic questions, including Confounding factors that affect sleep quality, Smartphone Addiction Scale-Short Version (SAS-SV), and Pittsburgh Sleep Quality Index (PSQI)

Smartphone Addiction Scale-Short Version (SAS-SV): A valid and reliable Arabic tool[13]. It contains ten items rated on a dimensional scale (1"strongly disagree" to 6 "strongly agree"). The total score ranges from 10 to 60, with the highest score being the maximum presence of "Smartphone addiction" in the past year.

Pittsburgh Sleep Quality Index (PSQI): A valid Arabic translation of the PSQI questionnaire[14]. The PSQI consisted of 24 questions or items to be rated relating to the past month (from zero to three for 20 items, while four were open-ended). It was not only developed to quantify sleep quality [15], and PSQI can be considered an accepted reference or gold standard for self-perceived sleep quality. In addition, it is the most widely used sleep health assessment tool in both clinical and non-clinical populations [16].

Inclusion Criteria: All Saudi and non-Saudi students at governmental and private secondary school who has a smartphone and live in Makkah, Saudi Arabia

Exclusion Criteria: Students with special needs, such as blindness, any participants with medical issues that affect sleep, and any participants on medication can interfere with sleeping, such as first-generation antihistamines.

Ethical issues

Inform consent was taken from each participant to know the purpose, benefits, and risks behind the study before they agreed to join.
We considered anonymity and confidentiality, and the participants can be in or out of the study at anytime. No physical, social, psychological, and all other types of harm.

Statistical analysis

The data were collected, coded, and cleaned. Data analysis was carried out using SPSS Version 23.0 (IBM Corp., Armonk, N.Y., USA). Descriptive statistics (i.e., percentage, mean, and stander deviation) were used to summarize the data. Moreover, analytic statistics using the Pearson correlation was applied with p-values
<0.05 were considered statistically significant.

Results

Characteristics of the participants

A total of 373 subjects were included in this study. About two-thirds of the study participants were males (66%), and female respondents were 127 (34%). The mean age of participants was 15.8 ± 5.56 years. Our results revealed that the average number of hours spent on mobile was 6.9 ± 4.45 per day. Regarding the educational level of students, we

found that most of them were in the second year (41%), while 119 (31.9%) were in the first year, and 101 (27.1%) were in the third year. Moreover, we found that most students belonged to governmental schools (86.9%), and only 43 (11.5%) studied in private schools. In addition, the majority of students followed the general educational path (81.5%), 23 (6.2%) followed the course system, 13 (3.5%) were in the standard first year, and 10 (2.7%) followed the computer science & engineering educational path. When we asked about the marital status of respondents, we found that most of them were single (98.1%), and 7 (1.9%) were married. Most of them live with their parents (85.5%), and 43 (11.5%) live with one of their parents. 179 (48%) had a monthly income of less than 5,000, 98 (26.3%) had income of more than 10,000 SAR, and 96 (25.7%) had income of 5,000 to 10,000 SAR. Only 65 (17.4%) of students had a chronic disease, and 105 (28.2%) had a psychiatric disease. When we assessed the caffeine intake, we reported that 178 (47.7%) respondents consumed caffeine less than 6 hours before bedtime. Only 105 (28.2%) had performed regular sporting activities.

Variable	Categories	N (%)
Age (in years)	Mean ± SD	15.8 ± 5.56
Average no. of hours/day spend on mobile	Mean ± SD	6.9 ± 4.45
Gender	Male	246 (66)
	Female	127 (34)
Educational level	1st year	119 (31.9)
	2nd year	153 (41)
	3rd year	101 (27.1)
School type	Governmental	324 (86.9)
	Private	43 (11.5)
	Other	6 (1.6)
Educational path	Common first year	13 (3.5)
	General	304 (81.5)
	Computer science engineering	&10 (2.7)
	Health & life	9 (2.4)
	Course system	23 (6.2)
	Literary	6 (1.6)
	Scientific	8 (2.1)
Marital status	Single	366 (98.1)
	Married	7 (1.9)
Living place	With the parents	319 (85.5)
	With one of the parents	43 (11.5)
	Other	11 (2.9)
Family monthly Income (SAR)	< 5,000	179 (48)
	5,000-10,000	96 (25.7)
	> 10,000	98 (26.3)
Chronic disease	Yes	65 (17.4)
	No	308 (82.6)
Psychiatric disease	Yes	105 (28.2)
	No	268 (71.8)
Having caffeine less than 6 hours before bedtime	Yes	178 (47.7)
	No	195 (52.3)
Regular sporting activity	Yes	105 (28.2)
	No	268 (71.8)

TABLE 1: Socio-demographic data of the participants (n=373)

Smartphone Addiction

Our findings showed that the mean of the SAS-SV score was 38.5 ± 10.8 out of 60. SAS 9 (Using my smartphone longer than I had intended) and SAS 8 (Constantly checking my smartphone so as not to miss conversations between other people on Twitter or Facebook) of SAS-SV have the higher mean (M = 4.21, SD = 1.43), (M = 4.19, SD = 1.52) followed by SAS 1 (missing planned work due to smartphone use) and SAS 4 (Will not be able to stand not having a smartphone) (M = 4.05, SD = 1.48), (M = 4.04, SD = 1.68). It indicated that study participants had a problem using smartphones longer than they intended, constantly checking their smartphones, and missing planned work due to smartphone use.

	Mean	**Standard deviation**
SAS1	4.05	1.48
SAS2	3.59	1.53
SAS3	3.50	1.73
SAS4	4.04	1.68
SAS5	3.83	1.62
SAS6	3.40	1.63
SAS7	3.95	1.59
SAS8	4.19	1.52
SAS9	4.21	1.43
SAS10	3.70	1.54
Total SAS score	38.46	10.78

Sleep quality

The average Global PSQI score was 6.63 ± 3.03 out of 21. Based on Pittsburgh Sleep Quality Index, we found that the highest score in sleep quality components was observed in component 2 (Sleep disturbance) (M = 1.36, SD = 0.89) and component 7 (Sleep medication use) (M = 1.36, SD = 0.70), followed by component 5 (Sleep efficiency) (M = 1.33, SD = 0.648) and component 3 (Sleep latency) (M = 1.11, SD = 1.08). The lowest scores were achieved by component 4 (Daytime dysfunction due to sleepiness) (M = 0.24, SD = 0.638) and component 6 (Overall sleep quality) (M = 0.29, SD = 0.681).

Components	Mean	SD
C1 (Sleep duration)	0.95	0.82
C2 (Sleep disturbance)	1.36	0.89
C3 (Sleep latency)	1.11	1.08
C4 (Daytime dysfunction due to sleepiness)	0.24	0.638
C5 (Sleep efficiency)	1.33	0.648
C6 (Overall sleep quality)	0.29	0.681
C7 (Sleep medication use)	1.36	0.70
Global PSQI score	6.63	3.03

TABLE 3: Pittsburgh Sleep Quality Index (PSQI) components scores

Factors associated with smartphone addiction (SAS-SV score) and sleep quality (PSQI score)

Our results found that participants who spent a higher number of hours per day on mobile, who had a psychiatric disease, and students who had been taking caffeine less than 6 hours before bedtime, were significantly associated with higher smartphone addiction (higher SAS-SV score) (P values< 0.001, 0.002 and 0.001) and lower sleep quality (higher PSQI score) (P values< 0.001, 0.002 and < 0.001, respectively). Our results indicated that several factors were found to be significantly associated with higher smartphone addiction (higher SAS-SV score), including female respondents, students who live in other places rather than with their parents, and participants who did not perform a regular sporting activity (P values= 0.042, 0.036 and 0.003, respectively).

Additionally, respondents who had less than 5000 families' monthly income (SAR) w

ere significantly associated with lower sleep quality (higher PSQI score) (P value= 0.016). Other variables such as age, educational level, school type, educational path, and Marital status did not show any significant association with smartphone addiction or sleep quality (P value>0.05).

Variable	Categories	SAS-SV score	P value	PSQI score	P value
Age (in years)	Spearman's rho	0.024	0.649	-0.002	0.970
Average no. of hours/day spend on mobile	Spearman's rho	0.331	< 0.001	0.239	< 0.001
		Mean ± SD		Mean ± SD	
Gender	Male	37.6 ± 10.9	0.042	5.9 ± 3.1	0.056
	Female	40.0 ± 10.3		6.5 ± 2.7	
Educational level	1st year	39.7 ± 10.6	0.211	5.8 ± 2.8	0.531
	2nd year	37.4 ± 10.6		6.3 ± 3.2	
	3rd year	38.5 ± 11.2		6.1 ± 2.7	
School type	Governmental	38.9 ± 10.6	0.097	6.1 ± 2.9	0.170
	Private	35.1 ± 2.0		5.8 ± 3.4	
	Other	38.0 ± 5.3		7.6 ± 0.9	
Educational path	Common first year	39.6 ± 10.4	0.231	6.7 ± 3.4	0.425
	General	38.7 ± 10.5		6.0 ± 2.9	
	Computer science & engineering	32.4 ± 9.7		6.7 ± 3.9	
	Health & life	36.3 ± 12.4		5.8 ± 3.3	
	Course system	38.4 ± 13.0		7.5 ± 3.3	
	Literary	43.7 ± 13.4		7.3 ± 2.4	
	Scientific	32.0 ± 9.4		5.6 1.1	
Marital status	Single	38.4 ± 10.7	0.834	6.1 ± 2.9	0.068
	Married	39.3 ± 14.2		4.0 ± 1.4	
Living place	With the parents	37.9 ± 11.0	0.036	6.0 ± 2.9	0.252
	With one of the parents	41.9 ± 7.8		6.9 ± 3.4	
	Other	42.2 ± 12.2		5.5 ± 2.1	
Family monthly Income (SAR)	< 5,000	38.8 ± 10.6	0.341	6.5 ± 2.8	0.016
	5,000-10,000	39.2 ± 10.5		5.8 ± 3.0	
	> 10,000	37.1 ± 11.3		5.6 ± 3.1	
Chronic disease	Yes	40.2 ± 11.7	0.150	6.8 ± 3.2	0.058
	No	38.1 ± 10.6		6.0 ± 2.9	

Psychiatric disease	Yes	41.2	± 11.0	0.002	7.5 ± 2.7	< 0.001
	No	37.4	± 10.5		5.6 ± 2.8	
Having caffeine less than 6 hours before bedtime	Yes	40.4	± 10.2	0.001	6.8 ± 2.9	< 0.001
	No	36.6	± 11.0		5.5 ± 2.8	
Regular sporting activity	Yes	35.8	± 10.8	0.003	5.7 ± 2.8	0.134
	No	39.5	± 10.6		6.2 ± 2.9	

TABLE 4: Factors associated with smartphone addiction (SAS-SV score) and sleep quality (PSQI score)

* Higher SAS-SV score indicates higher Smartphone addiction; a higher PSQI score indicates lower sleep quality.

Predictors of sleep quality among studied students

According to multivariate regression analysis, we observed that students who had a psychiatric disease, respondents who had been taken caffeine less than 6 hours before bedtime, and participants who had higher SAS-SV scores were significantly associated with poor sleep quality (P values < 0.001, 0.001, and 0.001, respectively). Other factors did not significantly affect sleep quality (P value> 0.05).

Variable	B	Std. Error	95% Confidence Interval for B		P value
			Lower	Upper	
Age	-0.032	0.033	-0.096	0.032	0.331
Gender	0.214	0.334	-0.442	0.871	0.521
Educational level	0.121	0.230	-0.333	0.574	0.601
School type	0.085	0.386	-0.675	0.845	0.826
Educational path	0.162	0.144	-0.122	0.446	0.263
Marital status	-1.688	1.467	-4.575	1.199	0.251
Living place	0.089	0.384	-0.667	0.846	0.816
Family monthly Income	-0.353	0.190	-0.726	0.021	0.064
Chronic disease	0.078	0.411	-0.730	0.886	0.850
Psychiatric disease	1.378	0.363	0.664	2.092	< 0.001
Having caffeine less than 6 hours before bedtime	1.055	0.309	0.448	1.663	0.001
Regular sporting activity	0.021	0.341	-0.649	0.691	0.951
SAS-SV Score	0.053	0.016	0.022	0.085	0.001
Average No of hours per day spend on mobile	0.040	0.040	-0.037	0.118	0.308

TABLE 5: Predictors of sleep quality among

Symptoms during sleep

Our findings showed that more than half of the study population had a partner in the same room but not the same bed 217 (58.2%). Our results found that most of the respondents,

170 (73.9%), stated that their roommate or bed partner did not observe them make loud snoring during the last month, and only 28 (12.2%) noticed snoring loudly less than once a week. The vast majority of students, 188 (81.7%), did not make long pauses between breaths while asleep. Only 41 (17.8%) were observed to experience leg twitching or jerking while they were sleeping less than once a week. In addition, most participants were not noted to have episodes of disorientation, confusion, or restlessness during sleep (above 70%). 28 (12.2%) had episodes of disorientation or confusion, and 27 (11.7%) experienced restlessness less than once a week during sleep.

Variable	No bed partner or room mate	Partner/room mate in other room	Partner in same room but not same bed	Partner in same bed
Do you have a bed partner or roommate?	131 (35.1)	12 (3.2)	217 (58.2)	13 (3.5)
If you have a roommate or bed partner, ask him/her how often in the past month you have had: (n=230)	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
Loud snoring*	170 (73.9)	28 (12.2)	16 (7)	6 (2.6)
Long pauses between breaths while asleep*	188 (81.7)	21 (9.1)	4 (1.7)	4 (1.7)
Legs twitching or jerking while you sleep*	145 (63)	41 (17.8)	20 (8.7)	12 (5.2)
Episodes of disorientation or confusion during sleep*	172 (74.8)	28 (12.2)	13 (5.7)	6 (2.6)
Other restlessness while you sleep*	169 (73.5)	27 (11.7)	10 (4.3)	12 (5.2)

TABLE 6: Symptoms during sleep

Correlation between smartphone addiction and sleep quality

The results showed a positive correlation between smartphone addiction and sleep quality ($r = 0.261$, $p < 0.001$), indicating that the respondents had worse sleep quality when smartphone addiction increased and the Global PSQI increased.

	Global PSQI
SAS-SV	0.261
P value	< 0.001

TABLE 7: Pearson correlation between smartphone addiction and sleep quality

Symptoms during sleep and Global PSQI score

Our findings showed that there are significant differences in PSQI score according to the occurrence of loud snoring, legs twitching or jerking, episodes of disorientation or confusion, and other restlessness symptoms during sleep (P value = 0.046, 0.001, < 0.001, and < 0.001 respectively); occurrence of these symptoms during sleep associated with higher PSQI score. Whereas there was no significant difference in PSQI score according to having a bed partner or roommate and long pauses between breaths while asleep (P value = 0.626 and 0.068, respectively).

Variable	Categories	Global PSQI score Mean (SD)	P value
Do you have a bed partner or roommate?	No bed partner or room mate	6.75 (3.25)	0.626
	Partner/room mate in other room	5.67 (2.19)	
	Partner in same room but not same bed	6.58 (2.93)	
	Partner in same bed	7.08 (3.01)	
If you have a roommate or bed partner, ask him/her how often in the past month you have had: (n=230)			
Loud snoring*	Not during the past month	6.21 (2.87)	0.046
	< once a week	7.34 (3.16)	
	Once or twice a week	6.77 (2.76)	
	≥ three times a week	7.89 (2.26)	
Long pauses between breaths while asleep*	Not during the past month	6.31 (2.99)	0.068
	< once a week	7.22 (2.28)	
	Once or twice a week	8.50 (2.95)	
	≥ three times a week	7.50 (2.00)	
Legs twitching or jerking while you sleep*	Not during the past month	6.07 (2.87)	0.001
	< once a week	6.98 (3.07)	
	Once or twice a week	7.44 (2.79)	
	≥ three times a week	8.47 (2.46)	
Episodes of disorientation or confusion during sleep*	Not during the past month	6.05 (2.76)	< 0.001
	< once a week	6.76 (2.41)	
	Once or twice a week	9.00 (2.70)	
	≥ three times a week	10.17 (3.95)	
Other restlessness while you sleep*	Not during the past month	6.12 (2.80)	< 0.001
	< once a week	7.28 (2.74)	
	Once or twice a week	6.93 (2.06)	
	≥ three times a week	10.00 (3.76)	

TABLE 8: Differences between symptoms during sleep and Global PSQI score

Discussion

The present study aimed to determine the effect of smartphone addiction on sleep quality among secondary high schools in Makkah, Saudi Arabia. Internet addiction and smartphone addiction share many similarities. Based on how Internet addiction is defined, smartphone addiction is the excessive usage of cell phones to the point where it interferes with users' daily life [17]. There needs to be more research on smartphone addiction, particularly among high school students.

The current study found that the average number of hours spent on mobile was 6.9 ± 4.45 per day as our study participants had a problem using smartphones longer than they intended, constantly checking their smartphones, and missing planned work due to

smartphone use. It is similar to other results in another study in Saudi Arabia; 31.4% of the participants used a smartphone for 1-5 hours, and 50% (n=156) used it for 6-8 hours [18]. Moreover, our results revealed that the mean of the SAS-SV score was 38.5 ± 10.8 out of 60. It was relatively lower than another study conducted in India, which showed that SAS mean score was 85.66 [19]. Another study in Saudi Arabia conducted among medical students showed that 54% of the participants had positive smartphone addiction [20]. Also, in our study, the lowest score was noted in the component of daytime dysfunction sleepiness, daytime sleepiness score was also found to be low in the Korean study conducted by Chung et al., which also demonstrated the link between daytime sleepiness to gender, alcohol consumption, poor-self perceived health [21]. These disparities between studies are most likely due to differences in evaluation systems and the sampled populations, as in Saudi Arabian studies, the population was university students. In this study, we found a significant positive correlation between smartphone addiction and sleep quality, indicating that the respondents had worse sleep quality when smartphone addiction increased and the Global PSQI increased. It aligns with another study from India that revealed that those who used smartphones excessively had high Global PSQI scores [19]. In addition, another study from Korea confirmed our findings and showed that higher S-Scale scores were associated with lower sleep quality [22]. The link between smartphone addiction and sleep quality was also reported in another parallel study in Turkey, in which smartphone addiction was associated with low sleep quality [23]. Moreover, prolonged and excessive smartphone use has been linked to musculoskeletal discomfort [24]; this was consistent with the findings mentioned in the other Turkish study, which found an association between smartphones addiction and musculoskeletal pain [25], low mood was also found to be significantly associated with smartphone addiction (anxiety, depression) [4]. It was also agreed on by another study conducted by Hernandez et al., in which excessive use of smartphones was linked to the presence of depressive symptoms [26]. Difficulty forming social connections [27] Similar findings were reported in the congruent Australian study[28], which may impact sleep quality directly or indirectly. An earlier study found that evening electromagnetic field exposure affects physiological aspects of sleep and the melatonin cycle, likely by affecting the pineal gland. It may also impact cerebral blood flow and brain electrical activity [29]. However, another contradictory study found that exposure to an environmental radiofrequency electromagnetic field did not interfere with the self- reported quality of sleep, and no evidence was found of adverse effects on sleep quality from exposure to the radiofrequency electromagnetic field in our everyday environment [30]. These differences in findings reported between the two studies could be attributed to different factors, including the studied samples and environmental factors.

Our study faced some limitations. The population of high schools cannot be generalized from the sample size 373. However, the sample size may differ from the general population because every participant was a student. The fact that it was designed as an online survey may have made respondents more familiar with smartphones than non-respondents, leading to biased SAS scores.

Conclusions

Our study concluded that high school students in the Makkah region in Saudi Arabia had high smartphone addiction. Moreover, higher smartphone addiction is significantly correlated with poor sleep quality. This study can help with the development of measures to improve better sleep quality among high school students.

Recommendations

It is vital to educate students about smartphone addiction and healthy sleep. In clinical applications with issues with poor sleep quality, students' use of smartphones and their addiction to them should be questioned. Identifying the causes of poor sleep quality and

raising awareness in adolescents to change negative behavioural patterns is critical.

Appendices

	Items	Strongly disagree	Disagree	Weakly disagree	Weakly agree	Agree	Strongly agree
1	Missing planned work due to smartphone use	1	2	3	4	5	6
2	Having a hard time concentrating in class, while doing assignments, or while working due to smartphone use	1	2	3	4	5	6
3	Feeling pain in the wrists or at the back of the neck while using a smartphone	1	2	3	4	5	6
4	Will not be able to stand not having a smartphone	1	2	3	4	5	6
5	Feeling impatient and fretful when I am not holding my smartphone	1	2	3	4	5	6
6	Having my smartphone in my mind even when I am not using it	1	2	3	4	5	6
7	I will never give up using my smartphone even when my daily life is already greatly affected by it	1	2	3	4	5	6
8	Constantly checking my smartphone so as not to miss conversations between other people on Twitter or Facebook	1	2	3	4	5	6
9	Using my smartphone longer than I had intended	1	2	3	4	5	6
10	The people around me tell me that I use my smartphone too much	1	2	3	4	5	6

FIGURE 1: Smartphone Addiction Scale-Short Version (SAS-SV)

Adapted from "The smartphone addiction scale: Development and validation of a short version for adolescents," by M. Kwon, D- J. Kim,
H. Cho and S. Yang, 2013, PLoS ONE, 8(12), (https://doi.org/10.1371/journal.pone.0083558).

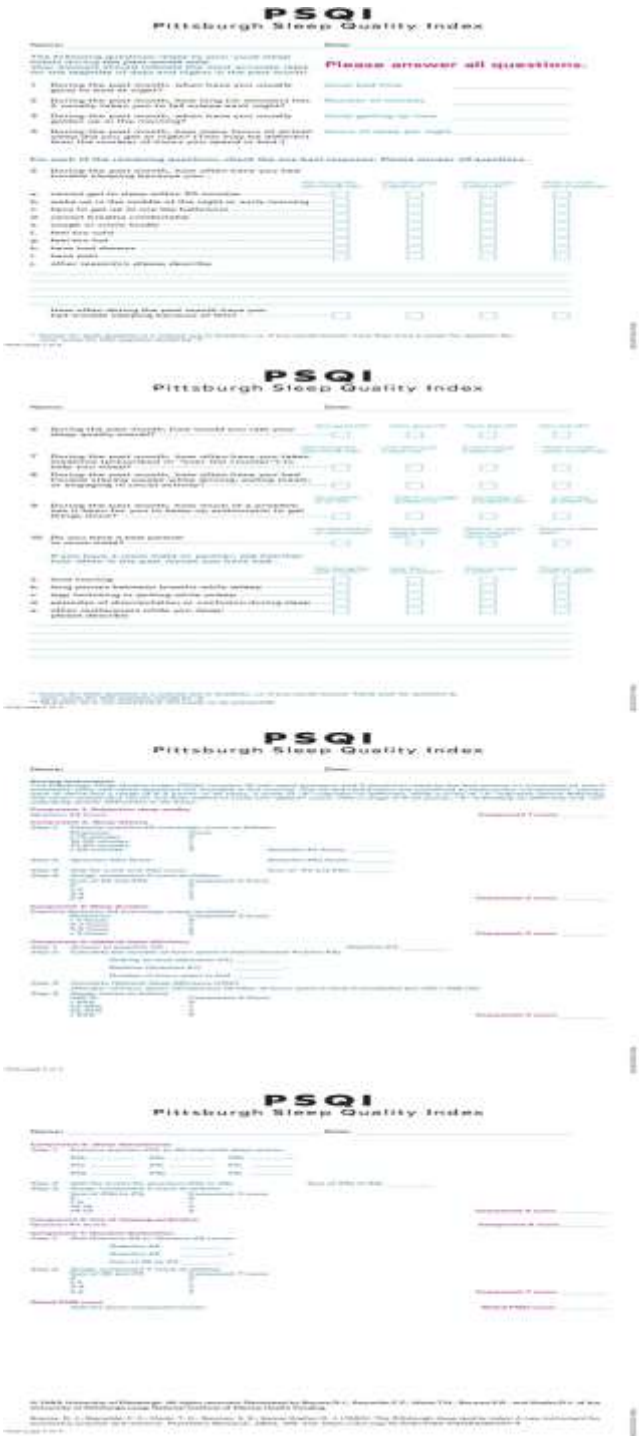

FIGURE 2: Pittsburgh Sleep Quality Index PSQI

Additional Information

Disclosures

Human subjects: Consent was obtained or waived by all participants in this study. Ministry of Health, Institutional Review Board, Makkah issued approval H-02-K-076-0123-883. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform

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