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THE RELATIONSHIP BETWEEN SMARTPHONE ADDICTION LEVELS AND PSYCHOLOGICAL SYMPTOMS AND SLEEP QUALITY AMONG MEDICAL STUDENTS

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Abstract

Objectives: In this study, it was aimed to determine the level of smartphone addiction in medical students and its relation to some psychological symptoms and sleep quality.

Materials and Methods: The research data were composed of four parts. A sociodemographic data form consisting of 30 questions was prepared by the researcher, including the Smartphone Addiction Scale-Short Version (SAS-SV), the Brief Symptom Inventory (BSI), and the Pittsburgh Sleep Quality Index (PSQI).

Results: According to the evaluation made by considering the cut-off points of the SAS-SV, 34.41% of the students were found to be at risk of smartphone addiction. SAS-SV scores were highest in those who used their smartphones for eight hours or more daily and those who checked their smartphones 51 times or more in a day. The highest risk of smartphone addiction was found among those who left their phones in bed or under the pillow at night, those who checked their phones within one minute after waking up in the morning, and those who charged their smartphones more than once daily. Students' BSI three global indices and median scores of all sub-dimensions were higher in those at risk of smartphone addiction. In addition, significant positive correlations were found between the SAS-SV scores and the PSQI total scores.

Conclusion: The results indicate that psychological symptoms and sleep quality are associated with smartphone addiction. This may lead to depression and/or anxiety, which can consecutively result in sleep problems. Responsible use of smartphones may have a positive effect on students' mental health and sleep.

Keywords: Smartphone, addiction, psychological symptoms, sleep quality.

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Introduction

Today, the smartphone has become a ubiquitous device for everyone because it serves much more than just as a communication tool. Although a smartphone is very small in size, it is designed on a mobile computing platform with more advanced computing capability and connectivity. It serves as a media player, digital camera, GPS navigator, games, and much more. Since smartphones are extremely portable, they provide very convenient and instant access to the internet. They offer multitasking functions like computers, which could promote dependence to a greater degree.[1] The above-mentioned features of smartphones make them a center of attraction for every individual around us.

Over the past few years, there has been a noticeable increase in the proportion of people owning and using smartphones in developed and developing countries. As in almost every country in the world, an uninterrupted and rapid increase in smartphone ownership is observed in our country. As of 2020, the number of smartphone users worldwide is approximately six billion. The number of mobile cellular subscriptions is expected to exceed seven billion worldwide by the end of 2024.[2]

Smartphone addiction is defined as the lack of control over using the smartphone despite all the negative effects on its users, including financial, psychological, physical, and socially harmful consequences.[3] In the literature, researchers have variously named these behaviors as “smartphone addiction”, “problematic smartphone use,” and “excessive smartphone use,” and referred to the use of mobile phones other than smartphones.

Although smartphone addiction is not currently recognized as an official clinical disorder in the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) or the International Classification of Diseases (ICD-10), many aspects of this behavior seem to share similarities with other behavioral addictions.[4] Smartphone addiction consists of four main components: obsessive use, tolerance, feelings of withdrawal or agitation when there is no phone, and functional impairment that interferes with other life activities and harms social relationships.[5]

There are numerous adverse effects associated with excessive smartphone use. It can lead to an attention deficit as well as other mental disorders such as social anxiety, depression, impulsivity, and loneliness. It has been found that anxiety is more common in adolescents who use their smartphones in a problematic way due to device interaction or distraction.[6]

Depression is a common mental disorder worldwide. It is characterized by persistent sadness and a lack of interest or pleasure in previously rewarding or enjoyable activities. Fatigue and poor concentration are common, and they can also disturb sleep and appetite. Depression is a leading cause of disability around the world and contributes greatly to the global burden of disease.[7]

The main feature of anxiety disorder is excessive worry about a series of events or activities. The intensity, duration, or frequency of anxiety is not proportional to the actual probability or impact of the anticipated event. The individual finds it difficult to control his anxiety and prevent the worrying thoughts from paying attention to the tasks at hand. Adults with generalized anxiety disorder often worry about everyday, routine life situations, such as job responsibilities, health, finances, the health of family members, or other minor issues. Anxiety is accompanied by at least three of the following additional symptoms: restlessness or nervousness, easy fatiguability, difficulty concentrating, irritability, muscle tension, and insomnia.[7]

Sleep is one of the basic requirements to lead a quality and healthy life. Therefore, quality sleep is very important. It has positive effects on physical and mental health. Poor sleep quality is believed to be widespread in modern society, and about one-third of adults complain of poor sleep quality, though in most studies, prevalence estimates are based upon insomnia-related symptoms.[8] Sleep deprivation has both short- and long-term effects on individuals. In the short term, it causes a decrease in concentration, a deterioration in the quality of life, a decrease in productivity, and an increase in domestic accidents; in the long term, it can lead to increased morbidity and mortality, traffic accidents, problems with memory, and depression.[9]

Materials and Methods

Participants

This study was planned as a cross-sectional descriptive study. The population of the research consisted of students studying at Selcuk University Faculty of Medicine during the 2020-2021 academic year. It was aimed to include all (1423) students from the 1st to the 6th grades. However, after taking into consideration the statistical analyses, it was planned to reach 80 percent of the targeted audience since students could not come to university due to the COVID-19 pandemic lockdowns. As a result, the study sample consisted of 1,177 participants, including 667 female and 510 male medical students.

Measures

The data in the study was collected using a sociodemographic data form, the Smartphone Addiction Scale-Short Version (SAS-SV), the Brief Symptom Inventory (BSI) and the Pittsburgh Sleep Quality Index (PSQI). A sociodemographic data form consisting of 30 questions was developed by the researcher to collect information from the participants regarding their age, gender, class year, and other sociodemographic characteristics of the students, the frequency of smartphone use, sleep habits, and the conditions which are thought to affect the purpose of the research.

Smartphone Addiction Scale-Short Version (SAS-SV)

The Smartphone Addiction Scale-Short Version (SAS-SV) is a self-report scale that measures smartphone addiction level consisting of 10 six-point Likert-type items that were developed by Kwon et al.[10] The test is valid and reliable in Turkish.[11] The total score obtained from the scale varies between 10 and 60. It is considered that the higher the score obtained from the scale, the higher the risk of addiction. In the Korean sample, the cut-off points were 31 for men and 33 for women.

Brief Symptom Inventory (BSI)

The Brief Symptom Inventory (BSI) is a scale composed of 53 items developed by Derogatis to catch psychiatric problems in various medical cases.[12] The inventory is valid and reliable for Turkish youth.[13] The scale has a nine-factor structure and three global indices of distress: the Global Severity Index, the Positive Symptom Distress Index, and the Positive Symptom Total. The factors are somatization, obsession-compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism.

Pittsburgh Sleep Quality Index (PSQI)

The Pittsburgh Sleep Quality Index (PSQI) is a self-report scale developed by Buysse et al.[14,] which measures the quality of sleep and provides information on the type and severity of sleep disorders for the previous month. The test is valid and reliable in Turkish.[15] The total index score above five indicates poor sleep quality.

Procedure

Due to the pandemic, the study was conducted online as an e-survey. Whatsapp groups were reached via the student representative of each class. The participants were asked to fill in the survey questions and scales by sending reminder messages from time to time. After reaching all the students, the data were evaluated.

While e-survey applications offer several advantages, they also have negative aspects that could impact the study's results. Some of the problems that might be encountered when working with e-surveys are the inability to connect with people from remote areas, sampling issues, response bias and delay, survey fatigue and dropout, increase in errors, and high chances of survey fraud.

Statistical Analysis

All statistical analyses were performed using IBM SPSS 22 package software. Descriptive statistics for the data were presented as mean±standard deviation, median (minimum – maximum) or median (distance between

quartiles) for numerical variables, and numbers (n) and percent (%) for categorical variables. The reliability of the obtained sample was checked with the Cronbach Alpha coefficient. While evaluating the scales, total scores were taken as a basis. The normality of data was checked with Q-Q plots and the Anderson-Darling normality test. Comparisons between groups of variables showing a normal distribution were performed using Student-t, and comparisons of variables not showing a normal distribution were performed using Mann-Whitney U and Kruskal Wallis tests. Multiple comparisons of the groups found to be significant with the Kruskal-Wallis test were made with the Dunn test and Bonferroni correction. Spearman's rho correlation analyses were performed to determine the relationship between numerical variables. Relationships between categorical variables were examined using Chi-square analysis and Yates continuity correction or Fisher's exact test, according to appropriate situations. Logistic regression models were used to determine the factors affecting smartphone addiction. Statistical tests were performed at the 5% significance level.

Results

The study included 1177 students, 56.67% of whom were female (n=667) and 43.33% of whom were male (n=510). Whereas 464 participants (39.42%) were between the ages of 18 and 20, 533 (45.28%) were between the ages of 21 and 23, and 180 (15.29%) were 24 years of age or older. The median age was 21 years old.

The mean score of the students from the SAS-SV was 28.42±10.37. According to gender, the mean SAS-SV score for females was 29.70±10.36 and for males was 26.80±10.16. Females had a higher mean score than males, and a statistical difference was found between them ($p<0.001$). According to our evaluation based on the cut-off values of the scale (33 points for females and 31 points and above for males), 34.41% of the students included in the study were at risk of smartphone addiction.

The SAS-SV mean score was statistically significantly higher in the group in which students used their smartphones for eight hours or more daily than those who used them less. Additionally, the SAS-SV mean score was statistically significantly lower in the group in which students checked their smartphones 20 times or less than in groups that checked their phones 21 times or more ($p<0.001$) (Table 1). There was a statistically significant higher smartphone addiction risk in students who left their phones in the bed or under the pillow, those who checked their phones within one minute after waking up in the morning, those who charged their phones more than once daily, those who carried portable chargers (power banks) continuously, those who changed their phones every two years or less, and those who evaluated themselves as smartphone-addicted individuals compared to students in other groups of each category (Table 2).

Table 1. Smartphone Addiction Risk According to Students' Smartphone and Internet Usage Characteristics and Multiple Comparison Analyses Between Groups

Characteristic	SAS-SV M ± SD	Mdn (Min-Max)	Z/X^2	p	Multiple Comparison
Age of First Use of Smartphone			-0.692*	0.489	
Under the age of 15	28.6 ± 10.4	28.0 (10-60)			
15 years and older	28.2 ± 10.3	27.0 (10-60)			
Smartphone Usage Time Per Day (hours)			89.682**	**<0.001**	
0-4 hours (a)	25.9 ± 9.4	25.0 (10-56)			**p_1 <0.001**
5-7 hours (b)	30.7 ± 10.3	30.0 (10-60)			**p_2 <0.001**
8 hours and above (c)	34.4 ± 11.6	36.0 (10-60)			**p_3= 0.008**
Internet Usage Time Per Day (hours)			51.551**	**<0.001**	
0-4 hours (a)	25.7 ± 9.4	25.0 (10-56)			**p_1 <0.001**
5-7 hours (b)	30.0 ± 10.4	29.0 (10-60)			**p_2 <0.001**
8 hours and above (c)	30.7 ± 10.9	30.0 (10-60)			p_3= 0.781
Frequency of Checking Smartphone Per Day			60.310**	**<0.001**	
20 times and below (a)	26.5 ± 9.4	25.0 (10-60)			**p_1 <0.001**
21-50 times (b)	31.6 ± 10.9	31.0 (10-58)			**p_2 <0.001**
51 times and above (c)	31.8 ± 11.4	29.0 (10-60)			p_3= 0.992

* The Mann-Whitney U test was used
** The Kruskal-Wallis test was used
SAS-SV: Smartphone Addiction Scale-Short Version; M: mean; SD: standart deviation; Mdn: median
(p_1: a vs b; p_2: a vs c; p_3: b vs c)

Scores obtained from all "somatization, interpersonal sensitivity, depression, anxiety, etc." sub-dimensions of the BSI and the three global indices were statistically significantly higher in the group at risk of smartphone addiction than in the group with no risk (Table 3). There was a positive and statistically significant correlation between participants' SAS-SV scores with all three global indices scores of the BSI and the PSQI total score (p<0.001) (Table 4).

55.82% of the students had poor sleep quality. The sleep quality and PSQI scores of the students who participated in the study based on their risk of smartphone addiction revealed that 66.91% of the students at risk of smartphone addiction had poor sleep quality, whereas 50% of the students who had no risk of addiction had poor sleep quality. The difference between the two groups was statistically significant (p<0.001). Whereas the average PSQI score of students at risk of smartphone addiction was 7.41±3.67, the average PSQI score of students not at risk of smartphone addiction was 6.42±4.00, and the difference between these groups was determined to be statistically significant. (p<0.001) (Table 5).

Table 2. Smartphone Addiction Risk Status According to Students' Smartphone Usage Characteristics

Characteristic	Smartphone Addiction Risk				Total		X^2	*p*
	Yes		No					
	n	%	n	%	n	%		
Place of Leaving Smartphone While Going to Sleep at Night							25.324*	**<0.001**
Outside the bedroom or away from the bed	89	25.87	255	74.13	344	100.00		
Somewhere near the bed	259	35.92	462	64.08	721	100.00		
In the bed or under the pillow	57	50.89	55	49.11	112	100.00		
Time to Check the Phone After Waking Up in the Morning							56.792*	**<0.001**
As soon as waking up within 1 minute	197	46.79	224	53.21	421	100.00		
Within 1-5 minutes	148	32.39	309	67.61	457	100.00		
Within 6-15 minutes	29	21.01	109	78.99	138	100.00		
After 15 minutes	31	19.25	130	80.75	161	100.00		
Frequency of Charging the Phone							44.727*	**<0.001**
More than once per day	137	48.41	146	51.59	283	100.00		
Once daily	232	32.86	474	67.14	706	100.00		
Once every two or more days	36	19.15	152	80.85	188	100.00		
Status of Carrying a Portable Charger							16.403*	**<0.001**
Yes	63	47.73	69	52.27	132	100.00		
Sometimes	87	38.84	137	61.16	224	100.00		
No	255	31.06	566	68.94	821	100.00		
Frequency of Changing the Smartphone							9.252*	**0.010**
Every two years or less	40	48.19	43	51.81	83	100.00		
Every 3-4 years	252	34.71	474	65.29	726	100.00		
Every five years or more	113	30.71	255	69.29	368	100.00		
Self-Evaluation of Smartphone Addiction							258.173*	**<0.001**
Addicted	180	70.04	77	29.96	257	100.00		
Maybe addicted	185	36.42	323	63.58	508	100.00		
Not addicted	31	8.66	327	91.34	358	100.00		
No idea	9	16.37	45	83.33	54	100.00		
Total	405	34.41	772	65.59	1177	100.00		

*Chi-square test was used

Table 3. Distribution of Students According to Their Smartphone Addiction Status by Scores Obtained From the BSI and its Sub-Dimensions

BSI Sub-Dimension	Smartphone Addiction Risk	n	M ± SD	Mdn (Min-Max)	*Z**	*p*
Somatization	Yes	405	5.39 ± 5.02	4.00 (0-28)	10.450	**<0.001**
	No	772	2.77 ± 3.76	1.00 (0-25)		
OCD	Yes	405	9.96 ± 5.77	9.00 (0-24)	12.783	**<0.001**
	No	772	5.59 ± 4.56	5.00 (0-21)		
Interpersonal sensitivity	Yes	405	5.48 ± 4.32	4.00 (0-16)	9.661	**<0.001**
	No	772	3.11 ± 3.33	2.00 (0-16)		
Depression	Yes	405	8.31 ± 6.07	7.00 (0-24)	9.987	**<0.001**
	No	772	4.93 ± 5.08	3.00 (0-23)		
Anxiety	Yes	405	6.02 ± 5.20	5.00 (0-23)	10.976	**<0.001**
	No	772	3.06 ± 3.90	2.00 (0-23)		
Hostility	Yes	405	5.73 ± 4.68	5.00 (0-20)	10.934	**<0.001**
	No	772	3.00 ± 3.35	2.00 (0-20)		
Phobic anxiety	Yes	405	4.04 ± 3.85	3.00 (0-18)	8.659	**<0.001**
	No	772	2.23 ± 2.88	1.00 (0-19)		
Paranoid ideation	Yes	405	6.12 ± 4.43	5.00 (0-20)	9.662	**<0.001**
	No	772	3.67 ± 3.66	3.00 (0-19)		
Psychoticism	Yes	405	4.92 ± 4.48	4.00 (0-20)	8.880	**<0.001**
	No	772	2.76 ± 3.34	2.00 (0-18)		
Global Severity Index	Yes	405	1.14 ± 0.77	0.98 (0.02-3.74)	11.866	**<0.001**
	No	772	0.64 ± 0.59	0.49 (0.02-3.58)		
Positive Symptom Total	Yes	405	30.17 ± 13.80	31.00 (1-53)	11.205	**<0.001**
	No	772	20.03 ± 14.01	19.00 (1-53)		
Positive Symptom Distress Index	Yes	405	1.82 ± 0.67	1.72 (0-3.98)	8.469	**<0.001**
	No	772	1.50 ± 0.57	1.33 (0-4)		

*Mann-Whitney U test was used; BSI: Brief Symptom Inventory; SAS-SV: Smartphone Addiction Scale-Short Version; M: mean; SD: standart deviation; Mdn: median

Table 4. The Relationship Between the SAS-SV Scores and Global Indices Scores of the BSI and the PSQI Total Score

	SAS-SV Score	
	r_s*	*p*
Global Severity Index	0.432	**<0.001**
Positive Symptom Total	0.410	**<0.001**
Positive Symptom Distress Index	0.317	**<0.001**
PSQI Total Score	0.197	**<0.001**

*Spearman correlation test was used.
SAS-SV: Smartphone Addiction Scale-Short Version; PSQI: Pittsburgh Sleep Quality Index

Table 5. Sleep Quality of the Students According to Their Smartphone Addiction Risk Status

	Sleep Quality						PSQI Score	
	Good		Bad		Total			
Smartphone Addiction Risk	**n**	**%**	**n**	**%**	**n**	**%**	**M ± SD**	**Mdn (Min-Max)**
Yes	134	33.09	271	66.91	405	100.00	7.41 ± 3.67	7.00 (0-20)
No	386	50.00	386	50.00	772	100.00	6.42 ± 4.00	5.50 (0-21)
Total	520	44.18	657	55.82	1177	100.00	6.76 ± 3.92	6.00 (0-21)
Test statistic	X^2= 30.814* ***p* <0.001**						Z= 5.089** ***p* <0.001**	

*Chi-square test was used;
**Mann-Whitney U test was used;
PSQI: Pittsburgh Sleep Quality Index; SAS-SV: Smartphone Addiction Scale-Short Version; M: mean; SD: standard deviation; Mdn: median

Discussion

Smartphones, which we never separate from ourselves, have many functions and applications that facilitate internet access, an easy approach to information, and high functionality that makes everyday life easier. Apart from compulsory usage fields such as instant communication, accessing information, and so on, individuals can spend most of the day on the phone checking notifications from social media applications. In this context, the time spent with the smartphone increases, and smartphone addiction arises as a result of this situation.

In the study conducted by Noyan et al., those who controlled their smartphones more than 40 times a day on average had a statistically significantly higher mean SAS-SV score than those who controlled them less. Likewise, those who spent five hours or more per day on their phones had a higher mean SAS-SV score, creating statistical significance compared to the groups that used their phones for a lesser amount of time.[11] In another study conducted in Switzerland, it was found that those who spent more than six hours a day with their smartphones had an 11-fold risk of addiction compared to those who spent less than 60 minutes.[16] A study done earlier found the ratio of those who checked their smartphones 40 or more times a day was significantly higher in the high-level smartphone use group than in the low-level use group.[17] These data support our study findings in terms of the association of smartphone addiction risk with high rates of daily checking and time spent on smartphones.

It can be said that keeping the phone device near all the time or even leaving it under the pillow until late at night in order to check it frequently can increase the risk of addiction, and as a result, it can negatively affect the quality of sleep and life. In this study, it was determined that the risk of smartphone addiction was found

in half of those who left their phones in bed or under the pillow before going to bed at night, and a statistically significant difference was found in this relationship in comparison to other groups. In a study conducted in Turkey, it was found that those who left their phones at an accessible distance while going to bed got significantly higher scores on the Smartphone Addiction Scale (SAS) than those who left their phones in an inaccessible place.[18] Those who leave their phones in bed or under the pillow in order not to miss important calls or messages, even if they do this with good intentions, are actually putting their own health at risk. This can seriously impair their sleep quality. Smartphones emit high levels of radiation that can cause dysfunction or imbalance in humans' biological clocks. That way, sleeping next to the phone can actually cause more nightmares and can lead to restlessness and frequent wakings during the night.

In this study, the risk of smartphone addiction was found in nearly half of those who checked their phones as soon as they woke up, and this group was found to be at a higher addiction risk than those who checked after 15 minutes of waking up. Haug et al. found that approximately two-thirds of those at risk of smartphone addiction checked their phones in the first five minutes after waking up in the morning and had the highest rate compared to those who checked them in other periods.[16] In an earlier study done with medical students in Egypt, it was found that 80% of those who checked their phones within the first five minutes after waking up had a risk of smartphone addiction. This rate was found to be statistically significantly higher than the other groups.[19] In light of this information, we can say that adolescents who use social media intensively, whose first thing to do is to look at the smartphone before going to the toilet after waking up in the morning or to check their messages and notifications before sleeping at night, increase their predisposition to smartphone addiction.

Considering the relationship between the frequency of smartphone charging and the risk of smartphone addiction in this study, the risk of smartphone addiction was found in almost half of those who charged their phones more than once a day. This addiction rate decreased significantly as the charging frequency decreased. In a qualitative study conducted with young employees in China, it was found that participants felt withdrawn when their smartphones ran out of charge, and a few young employees stated that they were very impatient in such situations. According to the participant interviews in the study, an employee stated that he charges his phone every night and never lets the battery level fall below 20%. Another employee, who seems to be a heavy smartphone addict, stated that phone battery levels below 40% were unacceptable for him.[20] In a previously conducted study, the average SAS score of students who used their phones while charging was found to be significantly higher than that of those who used them after charging a little bit and those who never used them while charging.[18] Based upon these facts, it can be said that the increase in the frequency of phone charging in adolescents, using the phones even while charging, being impatient, and exhibiting nervous behaviors when the battery is close to draining are closely related to smartphone addiction.

The presence of psychiatric symptoms may lead to problematic smartphone use or the continuation of the problematic use. Likewise, in some other cases, problematic smartphone use can lead to the development of psychiatric symptoms. Additionally, an underlying genetic risk or environmental factors may lead to both the development of psychiatric symptoms and problematic smartphone use.[17] Depressed individuals use mobile phones as a coping method to cope with their depressive and negative emotions.[21] Thus, smartphone use can function as an experiential avoidance strategy to deflect disturbing emotional content; however, experiential avoidance is ineffective for this purpose and may lead to negative emotional consequences.[22]

On the other hand, there is evidence in the literature suggesting that increased levels of technology use may cause psychopathology types. For example, in a study of university students, it was found that those classified as heavy computer, social media, and cell phone users reported higher levels of long-term stress, depression, and sleep disturbance.[23] In the study conducted by Demirci et al., depression, anxiety, and PSQI daytime dysfunction scores were found to be higher in the high-risk smartphone addiction group than in the low-risk addiction group. A positive correlation was found between the SAS scores and depression, anxiety levels, and some sleep quality scale scores. The findings of the study showed that depression and/or anxiety play a mediatory role in smartphone overuse and sleep quality. It has been thought that excessive use of smartphones may cause depression and/or anxiety, which may lead to sleep problems.[24]

Similar to this study, Firat et al. evaluated the relationship between problematic smartphone use and psychiatric symptoms in adolescents who were referred to a psychiatry outpatient clinic in Turkey. The results of the study showed significant differences in somatization, interpersonal sensitivity, depression, anxiety, obsessive-compulsive, phobic anxiety, hostility, and other sub-dimensions scores of the BSI between problematic smartphone use and non-problematic smartphone use groups.[25] The results of another study conducted with undergraduate university students revealed a significant positive relationship between smartphone addiction and both anxiety and depression. It has been found that smartphone addiction has a significant effect on anxiety and is a predictor of depression.[26] This information explains the correlation between smartphone addiction and bad mental health.

Sleep disturbance is an important risk factor for adolescent mental health and affects the relationship between addictive behaviors and psychological symptoms. The results of this study indicate that higher smartphone addiction risk leads to poorer sleep quality. Several studies reported similar findings. In a study conducted among Chinese university students, significant positive correlations were found between sleep latency, short sleep duration, and poor sleep quality variables in relation to smartphone addiction. It has been found that procrastination is significantly and positively associated with smartphone addiction.[27] In another large cross-sectional study done in the United Kingdom, a statistically significant relationship was found between poor sleep quality and smartphone addiction; while 68.7% of those at risk of smartphone addiction had poor sleep

quality, 57.1% of those who were not at risk had poor sleep quality.[28] In a study conducted with medical students, there were significant correlations between mobile phone dependency with each subjective sleep quality and sleep latency domains of the PSQI, and nearly two-thirds of the participants had poor sleep quality.[29]

Based on the results of this study and the information found in the literature, it can be said that there is a relationship between smartphone addiction, poor sleep quality, and psychological symptoms. Dealing with smartphones for a long time in the evenings and not being aware of the time spent due to social media and internet use causes the eyes to be tired by the bright light. This may lead to disruption of the circadian rhythm, difficulty falling asleep, as well as delayed sleep. As a result, conditions such as decreased sleep efficiency and duration, daytime dysfunction, and negative effects on mental and physical health may occur. Therefore, this situation can lead to a decrease in academic performance and disruptions in social life.

In conclusion, psychological symptoms and sleep quality are associated with smartphone addiction. Such addiction may lead to depression, anxiety, and/or other mental issues, which can consecutively result in sleep problems. This indicates the importance of intervention to reduce smartphone addiction among medical students to improve overall sleep quality and avoid negative psychological impacts that can arise.

Ethical Considerations: The local clinical research ethics committee approved the study (Approval No. 2020/454, dated 14/10/2020).

Conflict of Interest: The authors declare no conflict of interest, ethics rule infringement or any financial support related to this study.

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