



EXAMINING THE RELATIONSHIP BETWEEN SMARTPHONE ADDICTION AND DEPRESSION, SLEEP, QUALITY OF LIFE, AND PAIN AMONG UNIVERSITY STUDENTS DURING THE COVID-19 PANDEMIC

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Abstract: This study aims to examine the relationship between smartphone addiction and depression, sleep quality, quality of life, fear of contracting COVID-19 and increased pain in university students during the COVID-19 pandemic. In Türkiye, 350 students studying at universities were included in the study. Smartphone addiction levels of students were measured with the Smartphone Addiction Scale-Short Version (SAS-SV), and sleep quality and disorders were measured with the Pittsburgh Sleep Quality Index (PSQI). Beck Depression Inventory (BDI) was used to measure depression status, and Short Form 36 (SF-36) was used to measure quality of life. A positive and low-level significant relationship was found between smartphone addiction and sleep quality and depression level ($P < 0.05$). A significant negative correlation was found between smartphone addiction and many parameters of the SF-36 Quality of Life Scale ($P < 0.01$). It was revealed that those with high smartphone addiction increased their pain more during the pandemic period ($P < 0.05$). It was determined that those who were afraid of contracting COVID-19 had higher smartphone addiction ($P < 0.05$). It was found that the increase in smartphone addiction during the COVID-19 pandemic period negatively affected the depression level, pain level, sleep quality, and quality of life of university students. It was also found that university students who are afraid of contracting COVID-19 have higher smartphone addictions. Our study raises awareness about the consequences of increasing smartphone addiction among university students during the COVID-19 pandemic period.

Keywords: Smartphone addiction, COVID-19, Depression, Sleep quality, Quality of life, Pain

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1. Introduction

Severe acute respiratory syndrome coronavirus (SARS-CoV-2), which is in the same family as SARS-CoV and Middle East Respiratory Syndrome coronavirus, has spread worldwide, and the World Health Organization (WHO) has declared the disease a pandemic (Pascarella et al., 2020). Many governments around the world have issued quarantine measures to prevent the spread of this new virus and minimize its potential harm (Simpson and Katsanis, 2020). Both domestically and internationally, 'stay-at-home' orders have been issued mandating students to learn online and people working in non-essential workplaces to work from home. Public health interventions to control the COVID-19 pandemic have caused widespread and unprecedented social disruption (Garfin, 2020).

Having caused 150 countries around the world to close

universities and other educational institutions, the pandemic has affected more than 80% of the world's student population (Sahu, 2020). University students have become one of the groups most affected by the pandemic as a result of the closure of universities due to the transition to distance education due to the measures (DUMAN, 2020). University students are in great need of information from the media to make sense of the situation and protect their health during the pandemic period. Their information-seeking behavior can reduce anxiety caused by uncertainty during a disease outbreak or disaster (Lachlan et al., 2009). The use of social media can help to rapidly disseminate important new information, share diagnosis, treatment, and follow-up protocols, and adapt different approaches from other parts of the world to their own cases by comparing them. However, it creates new problems due to the fact that the



information students receive from social media is not up-to-date, not peer-reviewed, and spreads invalid and incorrect information (González-Padilla and Tortolero-Blanco, 2020). Furthermore, the increase in the use of social media increases smartphone addiction (Işık and Kaptangil, 2018).

The increase in the use of smartphones, which is the primary means of obtaining information by students, may also affect the quality of life (Islam et al., 2021). The infodemic, which is rapidly spreading through smartphones and is defined as "false information epidemics", has the potential to affect the mental health and well-being of university students (Chao et al., 2020). As a result of the quarantine experienced during the pandemic period, individuals can be dragged into loneliness, anxiety, and depression by restricting their access to family, friends and other social environments (Zhou et al., 2020). Sedentary lifestyles, excessive screen exposure, and inappropriate sleep habits result in deterioration of physical and cognitive health among individuals (Dutta et al., 2019). Use of social media and digital devices helps improve social isolation, but negatively impacts sleep among young adults when used close to bedtime (Majumdar et al., 2020). In the light of all this information, this study aims to examine the relationship between smartphone addiction and sleep quality, depression, quality of life, fear of contracting COVID-19, and increased pain in university students during the COVID-19 pandemic period.

2. Materials and Methods

2.1. Research Design

Study data were collected through the Google Forms web survey platform (Google LLC, Mountain View, CA, United States), a rapid and broad cross-section online survey platform.

2.2. Participants

The population of the study consisted of men and women aged 18 and over who were studying at universities in Türkiye. The study group included 350 volunteer participants who agreed to fill out the online questionnaires. Individuals under the age of 18 and those with chronic psychological diseases were not included in the study.

2.3. Data Collection

Between February 1, 2021, and December 1, 2021, participants anonymously answered 5 standard online questionnaires: Demographic Information Form, Smartphone Addiction Scale-Short Version (SAS-SV), Short Form 36 (SF-36), Beck Depression Inventory (BDI), and Pittsburgh Sleep Quality Index (PSQI).

2.4. Demographic Information

Information about age, gender, Body Mass Index (BMI), number of siblings, fear of contracting COVID-19, and increased musculoskeletal pain during the pandemic period were obtained from all participants.

2.4.1. Beck depression inventory (BDI)

It is a scale developed by Beck et al. in 1961 that includes

the most common cognitive, somatic, emotional and motivational symptoms in patients with depression symptoms (Beck, Ward, Mendelson, Mock, and Erbaugh, 1961). The aim of the scale is to objectively determine the degree of depression symptoms in patients. The BDI is a scale that focuses on the emotional and cognitive parameters of depression and gives little weight to somatic symptoms. The Turkish validity and reliability study of the scale was carried out by Tegin and Hisli. Consisting of 21 items, the BDI is a 4-point Likert-type self-assessment scale graded between 0 and 3. The scores that can be obtained from the scale range from 0 to 63. The increase in the scores obtained from the scale indicates that the depression symptoms of the patient are increasing. It is generally accepted that a score of 17 or above can be sufficient to determine depression (Hisli, 1989).

2.4.2. Smartphone addiction scale-short version (SAS-SV)

The scale was developed by Kwon et al. in 2013 to assess individuals' smartphone addiction (Kwon, Kim, Cho, and Yang, 2013). This 6-point Likert-type scale, which has a single factor structure, consists of 10 items. The lowest score that can be obtained from the scale is 10 and the highest score is 60. An increase in the score indicates an increase in smartphone addiction. Turkish validity and reliability study in university students was conducted by Noyan et al. in 2015 (Noyan, Enez Darçın, Nurmedov, Yilmaz, and Dilbaz, 2015).

2.4.3. Pittsburgh sleep quality index (PSQI)

It is a scale consisting of 24 questions, which was developed by Buysse et al. in 1989 and evaluates sleep disturbance and quality in the past month (Buysse, Reynolds III, Monk, Berman, and Kupfer, 1989). Of these 24 questions, 19 were answered by the individual themselves, and 5 were evaluated by the spouse or roommate of the individual. The items answered by the roommate or spouse of the individual are not included in the calculation while scoring. PSQI has 7 components, which are sleep latency, sleep disturbance, sleep duration, habitual sleep efficiency, subjective sleep quality, daytime dysfunction, and sleep medication use. By summing up the scores of these components, the total PSQI score ranges from 0 to 21. A total score of 5 or above indicates significantly poor sleep quality. A Turkish validity and reliability study was conducted by Ağargün et al. in 1996 (Ağargün, Kara, and Anlar, 1996).

2.4.4. Short form 36 (SF-36)

SF-36, which provides the most comprehensive measurement among the quality of life scales and has the generic scale feature, was developed by Ware et al. in 1992 (Ware, 1993). The scale consists of 36 items. In the scale, there are items that include the perception of change in the health of the individual in the last four weeks and in the last week. The Turkish validity study of the scale was conducted by Koçyiğit et al (Koçyiğit, Aydemir, Fişek, Ölmez, and Memiş, 1999).

2.5. Statistical Analysis

Statistical analyzes of the research were made using "IBM® SPSS® 24 software". Visual (histogram and probability graphs) and analytical methods (Kolmogorov-Smirnov) were used to evaluate the normal distribution of numerical variables. Standard deviation and mean were given for the descriptive statistics of normally distributed numerical variables, and percentages, and number values were given for the descriptive statistics of categorical variables. The Spearman test was used to calculate the correlation coefficients and statistical significance if at least one of the variables did not show normal distribution or was ordinal. In the interpretation of the degree of correlation according to the correlation coefficient, 0.05-0.4 was accepted as low correlation, 0.4-0.7 as moderate correlation, and 0.7-1.0 as high correlation. The Man

Whitney U test was used to compare two independent groups that did not show normal distribution, while the Kruskal Wallis test was used to compare three independent groups that did not show normal distribution. Statistical significance level was accepted as $P < 0.05$.

3. Results

Data on the descriptive characteristics of the participants are given in Table 1. This table shows that the average age of the participant individuals is 21, 75.7% of them are women, and 34% of them are first year university students. It is also seen that 48.3% of the participants are afraid of contracting COVID-19. The mean and percentage values of other sociodemographic data are also given in the Table 1.

Table 1. Data on the descriptive characteristics of the participants*

		X	SD
Age		21	2
Height		166	9
Weight		62	13
BMI		22.2	3.73
Number of siblings		5	2
Smartphone Addiction		24.7	11.16
BDI Total		14.7	10,70
Total PSQI		8.49	3.39
		n	%
Gender	Male	85	24.3
	Woman	265	75.7
Grade level	1st grade	119	34.0
	2nd grade	111	31.7
	3rd grade	73	20.9
	4th grade	47	13.4
Income status	2020 TL and below	103	29.4
	Between 2021 TL - 3500 TL	101	28.9
	3501 TL and above	146	41.7
Increasing pain status in the pandemic	Yes	151	43.1
	No	199	56.9
	Yes	169	48.3
Fear of contracting COVID-19	No	130	37.1
	Indecisive	51	14.6
Presence of chronic disease	Yes	27	7.7
	No	323	92.3

*Frequency analysis, X= mean, SD= standard deviation, VAS= visual analog scale, BDI= beck depression Inventory, PSQI= Pittsburgh sleep quality index

The relationship between the participants' smartphone addiction and quality of life, pain severity, depression and sleep quality is given in Table 2. This table shows that there is a statistically negative and low-level significant relationship between the participants' smartphone addiction and all other sub-parameters of quality of life, except for the "physical function" and "physical role difficulty" sub-parameters ($P < 0.05$). In

addition, there is a statistically positive and low-level significant relationship between the participants' smartphone addiction, sleep quality and depression level ($P < 0.05$) (Table 2).

The comparison of the smartphone addiction scores of the participants according to the increase in pain during the pandemic process is given in Table 3. This table shows that there is a statistical difference between the

increase in pain and smartphone addiction scores of the individuals included in the study during the pandemic process ($P < 0.05$). It was determined that the group who said yes to the increase in pain had statistically higher smartphone use addiction scores (Table 3).

The comparison of the smartphone addiction scores of the participants based on that their fear of contracting COVID-19 during the pandemic process is shown in Table 4. When the smartphone addiction scores of the

participants were compared according to their fear of contracting COVID-19 during the pandemic process, a statistical difference was found between the groups ($P < 0.05$). Statistical difference was determined between Yes and Undecided groups in the pairwise comparison after Bonferroni correction. It has been observed that those who have a high fear of contracting COVID-19 have statistically higher smartphone use addiction scores than those who are undecided (Table 4).

Table 2. The relationship between smartphone addiction and quality of life, pain severity, depression and sleep quality of the participants

		Smartphone Addiction	
Quality of Life	Physical Function	r	-0.084
		p	0.117
	Physical Role Difficulty	r	-0.103
		p	0.054
	Emotional Role Difficulty	r	-0.204
		p	0.000
	Vitality/Vigor	r	-0.276
		p	0.000
	Mental Health	r	-0.228
		p	0.000
	Social Functioning	r	-0.207
		p	0.000
	Pain	r	-0.187
		p	0.000
		r	-0.173
	General Health Perception	p	0.001
		r	0.315
	BDI Total	p	0.000
		r	0.298
	PSQI Total	p	0.000

r= Spearman correlation test, VAS= visual analog scale, BDI= beck depression inventory, PSQI= Pittsburgh sleep quality index

Table 3. Comparison of smartphone addictions according to the increase in pain during the pandemic process of the participants

Smartphone addiction	Status of Increased pain						p	
	Yes (n=151)		No (n=199)					
	Median	(%25-75 IQR)	Median	(%25-75 IQR)				
Smartphone addiction	23	18	34	21	15	30	0.012	

Table 4. Comparison of smartphone addictions according to the participants' fear of contracting COVID-19 during the pandemic process

Smartphone addiction	Fear of contracting COVID-19						P			
	Yes (n=169)		Indecisive (n=51)		No (n=130)					
	Median	(%25-75 IQR)	Median	(%25-75 IQR)	Median	(%25-75 IQR)				
Smartphone addiction	25	18	34	19	13	25	22	16	30	0.009

4. Discussion

This study investigated the relationship between smartphone addiction and depression, sleep, quality of life and pain in university students during the COVID-19 pandemic period. As a result of the study, it was discovered that smartphone addiction negatively affected the sleep quality and depression and pain level of students. In terms of quality of life, smartphone addiction was shown to have a negative effect on vitality, pain, emotional role difficulties, social functionality, general health perception, and mental health. In addition, it was determined that students with high smartphone addictions have a higher fear of contracting COVID-19 than those who are undecided.

Smartphones are one of the important technological tools that provide many conveniences to the individual when used consciously and in line with their purpose. However, when used out of purpose and excessively, it can negatively affect the physiological, biological, social and psychological development of the user (Çiçek, Şahin, and Erkal, 2021). Studies have shown that the risk of smartphone addiction is especially high in university students during the pandemic period (Çiçek, Şahin, and Erkal, 2021; Hu, Liu, and Wang, 2022; Öztürk, 2021; Sülün, Yayan, and Düken, 2021). In addition, it is known that the overuse of smartphones adversely affects the emotional state, pain status, and sleep and life quality of individuals in the COVID-19 pandemic (Mahdavi and Kelishadi, 2020; Bulguroğlu et al., 2021; Kabeloğlu and Güll, 2021).

Loneliness, stress and anxiety levels of university students increase during the COVID-19 pandemic period (Fawaz and Samaha, 2021; Faisal et al., 2022). College students turn to smartphones as a refuge device to escape from daily pressure, mental stress, anxiety or loneliness. They tend to entertain themselves by playing online games and/or shopping as well as chatting on social media via smartphones (Morahan-Martin and Schumacher, 2003). This study revealed that students who are afraid of contracting COVID-19 have higher smartphone addictions. We think that university students use smart phones more to overcome their fears. However, the increase in smartphone use can cause staying awake until late and accordingly sleeplessness. In addition, students' depression levels may increase with increasing smartphone use and impaired sleep quality (Kocamaz et al., 2020). A systematic review and meta-analysis study published in 2020 showed that excessive

smartphone use significantly increases the risks of poor sleep quality, depression, and anxiety (Yang et al., 2020). Our present study revealed that with the increase in the duration of smartphone use during the COVID-19 pandemic, sleep quality deteriorated and the level of depression increased in university students.

The increase in the frequency of smartphone use also causes an increase in musculoskeletal pain (Kocamaz et al., 2020). Intense smartphone use can cause significant stress by changing the cervical spine curve, thus changing the pain threshold (Park et al., 2015). So et al. concluded that those with high muscle pain in the neck region were more likely to use smartphones (So and Woo, 2014). Another study showed that the duration of smartphone use in university students was most frequently associated with neck pain, followed by low back and shoulder pain (Alsalameh et al., 2019). In line with these, our study found that musculoskeletal pain was higher in those with high smartphone use during the COVID-19 pandemic period. We think that the increase in pain level during the pandemic period is due to the increasing smartphone addiction.

Although the researches emphasize that the frequency of smartphone use increases and affects health negatively, they do not give a complete relationship with the quality of life (Ulutaş et al., 2020). Our study revealed that the increase in smartphone addiction during the pandemic period has a negative effect on other parameters of quality of life, except for physical function and physical role difficulties. A study by Shahrestanaki et al. (2020) showed that increasing smartphone addiction reduces the quality of life in physical, mental and social aspects. A systematic review examining the impact of problematic smartphone use on the quality of life of children and adolescents highlighted the negative impact of smartphone addiction on quality of life (Fischer-Grote, Kothgassner, and Felnhofer, 2021). The findings of our study conducted on university students during the pandemic period are consistent with the literature. It can be stated that the increase in smartphone addiction has been effective in the decreasing the quality of life of university students during the COVID-19 pandemic period.

As a result, it was found that the increase in smartphone addiction during the COVID-19 pandemic period negatively affected the depression levels, pain levels, sleep quality, and quality of life of university students. In addition, it was determined that university students who

are afraid of contracting COVID-19 have a higher smartphone addiction.

As a limitation of this study, it can be said that we did not evaluate the socio-economic status of the participants. Therefore, there is a need for a study examining the effects of socio-economic status on behavioral changes in the COVID-19 pandemic. Another limitation is that the study is a cross-sectional study based on the reports of university students, rather than a study based on tracking the changes in relevant parameters before, during, and over time.

Author Contributions

The percentage of the author(s) contributions is present below. All authors reviewed and approved final version of the manuscript.

	C.T.	B.B.	F.K.	H.A.	Ö.B.
C	30	30	20	10	10
D	30	40	10	10	10
S	30	30	10	20	10
DCP	35	35	10	10	10
DAI	50			50	
L	50	50			
W	60	20		20	
CR	60	40			
SR	20	20	20	20	20
PM	20	20	20	20	20
FA	20	20	20	20	20

C=Concept, D= design, S= supervision, DCP= data collection and/or processing, DAI= data analysis and/or interpretation, L= literature search, W= writing, CR= critical review, SR= submission and revision, PM= project management, FA= funding acquisition.

Conflict of Interest

The authors declared that there is no conflict of interest.

Ethical Approval/Informed Consent

The study was approved by the Scientific Research and Publication Ethics Committee of Muş Alparslan University (Date: 25/11/2020 and No: E.13681) and performed in accordance with the Declaration of Helsinki. Surveys were shared via WhatsApp and email. Electronic informed consent was obtained from the participants before the survey, and they were informed about the right of withdrawal without giving any reason.

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