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Investigation of the relationship between smart phone addiction and physical activity in university students

Authors' Contribution:
A Study Design
B Data Collection
C Statistical Analysis
D Data Interpretation
E Manuscript Preparation
F Literature Search
G Funds Collection

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abstract

Background: The purpose of this research was to determine the university students' characteristics regarding smartphone usage and physical activity and to investigate the relationship between smart phone addiction and the physical activity levels.

Material and methods: A total of 288 (female = 159 and male = 129) students were involved in this observational study. Smartphone usage characteristics of the participants were recorded. The short form of the Smartphone Addiction Scale was used to assess their smartphone addiction, and the short form of the International Physical Activity Questionnaire (IPAQ) was used to assess their physical activity levels.

Results: It was found that 37.7% of the females and 27.9% of the males were at risk of smartphone addiction. There was no difference between the males and females in terms of smartphone addiction ($p>0.05$). There was no difference in the physical activity levels of the participants regardless of smartphone addiction ($p > 0.05$). A weak negative correlation was found between smartphone addiction and moderate physical activity score ($r = -0.126$, $p = 0.047$).

Conclusions: According to this study, the university students showed inadequate levels of physical activity and were at risk of smartphone addiction. Considering the negative correlation between smartphone addiction and moderate physical activity, access to physical activity facilities in universities should be facilitated, and awareness on this issue should be increased.

Key words: addictive behavior, physical activity, smart phone, students, university.

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INTRODUCTION

With the development of technology, computers, the internet, mobile phones and smartphones have entered our lives [1]. While mobile phones are tools used only for communicating, smartphones have features that make everyday life easier, such as accessing bank accounts, face-to-face video calling, taking notes, audio recording, finding addresses, saving and reading a variety of files, creating event calendars and health data, shopping and sharing information. However, the excessive use of smartphones causes addiction which can negatively affect interpersonal relationships as well as physical and mental health [2].

Even though no clear definition has yet been made, smartphone addiction is reported to be a type of addiction that develops based on the amount of time spent using smartphones and falls into the category of behavioral addiction [3, 4]. Smartphone addiction leads to symptoms such as the inability to stay away from one's smartphone, frequently checking the phone, insomnia due to excessive use and deterioration of sleep quality [3].

Wrist problems, neck muscle involvement, headaches, redness, fatigue and burning sensation in the eyes and watering of the eyes are among the negative effects of smartphone addiction which have been reported to cause physical activity limitations [3, 5–8].

It has been stated that 87% of students who use smartphones use them while sitting [9]. Writing text messages, making phone calls, spending time on social networking sites, all of which are frequently carried out on smartphones, are defined as sedentary behaviors [10]. A sedentary lifestyle, which results from insufficient physical activity, is a public health problem [11]. The World Health Organization (WHO) recommends at least 150 minutes per week of moderate physical activity (or at least 75 minutes of vigorous physical activity or an equivalent combination of both) for adults aged between 18 and 64 [12]. Physical activity carried out when youth is of great importance in the protection against diseases that may occur in later years [13]. However, it has been reported that the frequency with which physical activity recommendations can be achieved has decreased among university students aged between 18 and 24 [14, 15]. The excessive usage of smartphones or the smartphone addiction may have also contributed negatively to this situation. There is a limited number of studies in the literature on how smartphone use affects physical activity levels. Studies conducted in Korea and the USA have shown that smartphone use reduces physical activity levels, is associated with an increase in body fat mass and may reduce cardio-vascular fitness [7, 16].

The correlation between smartphone addiction and physical activity may differ from one country to another due to reasons such as access to technology, internet services and cultural differences. The aim of the present study was to reveal the characteristics of university students regarding smartphone use and physical activity and to examine the relationship between smartphone addiction and physical activity levels.

MATERIAL AND METHODS

Design

This study was designed as a descriptive and cross-sectional study. All data was collected between 01 January 2019 and 01 June 2019.

Participants

The participants of this study were selected among the students of Sivas Cumhuriyet University, Hafik Kamer Örnek Vocational School and Zara Ahmet Çuhadaroğlu Vocational

School. Participation in the study was voluntary, and written consent was obtained from all participants. The study sample was composed of males and females (female=159, male=129), aged between 17 and 25 who used smartphones. Those who did not use smartphones and those who had any musculoskeletal problems or cardiovascular problems that prevented physical activity were excluded from the study.

The age, gender, height, body weight, mobile phone/smartphone usage status and characteristics, musculoskeletal system and cardiovascular problems of each participant were recorded.

The study was approved by the Ethics Committee of the Non-invasive Clinical Trials of Sivas Cumhuriyet University (Decision number: 2018-06/19).

Procedures

The Turkish translation of the 10-question Smart Phone Addiction Scale-Short Form (SAS) was used in order to evaluate the participants' smartphone dependence [1, 17, 18]. The SAS is a scale prepared by Kwon et al. [18] that consists of 33 questions and is used to assess smartphone addiction. The validity and reliability of the scale was tested on university students. However, as this scale was very detailed, the results of the scale were not consistent and the cut-off scores could not be revealed. Thus, a short form of this scale, namely SAS-SF, consisting of 10 questions that could be completed in a shorter time and that would reveal the cut-off scores was created [17, 18]. The questions of the survey are evaluated with a six-point Likert rating. The scale scores ranged from 10 to 60, with the higher scores indicating the increased risk of addiction. The cut-off score in a study conducted in Korea was determined as 31 for men and 33 for women. The Cronbach alpha coefficient of the internal consistency and simultaneous validity of the SAS is 0.91 [17]. The reliability of the Turkish form of the SAS-SF was determined by Noyan et al. [1] with Cronbach alpha coefficient being 0.867.

Four questions were compiled from the questions that Haug [19] and Noyan [1] used in their studies to question smartphone use. These questions are listed below.
(1) How many hours do you attend to your smartphone on a typical day?
(2) How many times, on average, do you check your smartphone on a typical day?
(3) How much time passes between the moment you wake up in the morning and the first time you use your smartphone (use of alarm function excluded)?
(4) What function do you use your smartphone for the most?

The participants' physical activity levels were evaluated with the Turkish translation of the short form of the International Physical Activity Questionnaire (IPAQ-SF) [20, 21]. The short form consists of seven questions about time spent on walking, moderate and vigorous activities and the frequency of activities over the last seven days. Time spent sitting is considered as a separate question. The durations are multiplied by the metabolic equivalents (MET) present on the scale per activity, and the average of the results of all levels gives the overall physical activity score. Physical activity levels are classified as physically inactive (<600 MET-min/week), low physical activity levels (600–3000 MET-min/week), adequate physical activity levels (>3000 MET-min/week) [20].

Statistical analysis

The study data was evaluated using the Windows-based SPSS (Statistical Package for the Social Sciences, version 22, IBM Corporation, Armonk, NY, USA) analysis program. The descriptive data were presented as minimum, maximum, number, percentage, mean and standard deviation. The normality of the data was evaluated using the Kolmogorov-Smirnov Test. Nonparametric analyses were applied to the data as they did not show normal distribution. Mann Whitney U test and Chi Square test were used to compare the

groups created for gender (female/male) and smartphone addiction (with/without). The Spearman rank correlation coefficient was used to determine the relationship between smartphone addiction and physical activity levels. The rho values obtained from the Spearman correlation analysis were interpreted as 0.00–0.25 very weak, 0.26–0.49 weak, 0.50–0.69 medium, 0.70–0.89 high and 0.90–1.00 very high [22], while the error level was taken as 0.05.

RESULTS

A total of 333 individuals volunteered to participate in the study. Forty individuals were not included in the study because of the missing data in their questionnaires, and five individuals were not included because they had been diagnosed with a condition that could affect physical activity. Of the 288 individuals included in the study, 159 were female while 129 were male (Presented in the Figure 1).

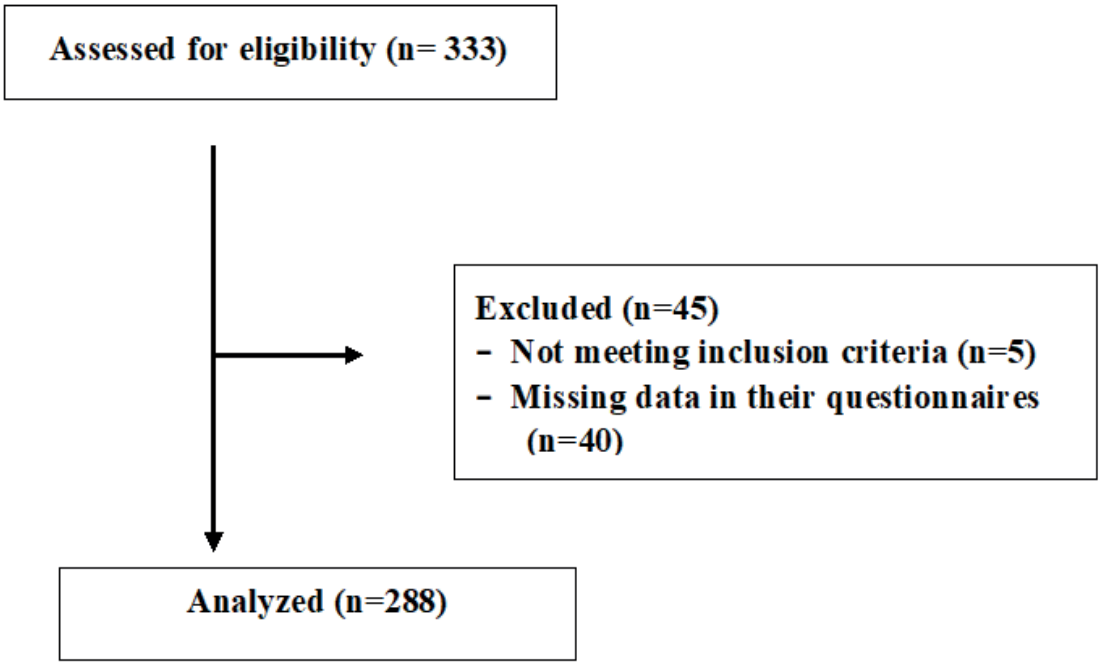

Fig. 1. Flow diagram

The mean age of the females was 19.97 ±1.43 years and the mean age of the males was 20.44 ±1.67 years. According to the IPAQ-SF classification, 118 students (41%) were considered to be inactive, 120 students (41.7%) had low levels of physical activity and 50 students (17.4%) had sufficient levels of physical activity. The vigorous physical activity levels and total physical activity levels of the males were higher than of the females ($p = 0.001$ and $p < 0.001$, respectively). There was no difference between the males and females in terms of smartphone addiction ($p > 0.05$). The demographic characteristics and evaluation results of the males and females are presented in Table 1.

It was determined that 45.2% of the females and 46.9% of the males used smartphones for five hours or more per day. Regarding the use of smartphones to read e-mails and play games, it was determined that, compared to the females, the males used smartphones for these purposes more often ($p = 0.02$ and $p = 0.006$, respectively). The characteristics of both males and females regarding smartphone use are presented in Table 2.

It was found that 37.7% of the females and 27.9% of the males were at risk of smartphone addiction. There was a difference between smartphone addicts and non-smartphone addicts in terms of smartphone usage times, smartphone control frequency, and the amount of time that passed after waking up before using smartphone ($p < 0.001$, $p < 0.001$, $p = 0.040$, respectively). It was seen that those who were classified as smartphone addicts mostly used their phones to navigate social networks. There was no difference in the physical activity levels of those who were addicts and those who were not ($p > 0.05$). The findings related to the comparison of smartphone use and physical activity levels of the individuals who were addicts and those who were not are presented in Table 3.

A weak negative correlation was found between smartphone addiction and moderate physical activity scores ($r = -0.126$, $p = 0.047$). The relationship between smartphone addiction and physical activity levels is presented in Table 4.

Table 1. Demographic characteristics and assessment results of females and males

		Female (N=159)		Male (n=129)		Mann-Whitney U
		Min–Max	Mean±SD	Min–Max	Mean±SD	p Ø
Age (year)		17–24	19.97±1.43	18–25	20.44±1.67	0.032*
Height (cm)		1.48–1.78	1.62±0.05	1.60–1.96	1.77±0.06	<0.001**
Body weight (kg)		39–110	56.53±12.50	50–130	74.62±13.81	<0.001**
Body mass index(kg/m²)		15.23–40.40	21.17±3.11	17.90–34.19	23.61±3.71	<0.001**
International Physical Activity Questionnaire-Short Form	Vigorous Physical Activity (minutes/week)	0–4800	63.73±460.59	0–23.520	796.14±2493.64	<0.001**
	Moderate Physical Activity (minutes/week)	0–3840	165.27±492.85	0–2880	171.20±444.21	0.656
	Walking (minutes/week)	0–9504	1287.75±1574.34	0–8316	1651.37±1804.51	0.091
	Total Physical Activity (MET-minutes/week)	0–9780	1269.52±1787.58	0–23520	2240.06±2957.10	0.001**
Smartphone Addiction Scale – Short Form		10–52	28.59±10.32	10–57	26.79±10.15	0.119
						p ^{X2}
		Number	%	Number	%	
Smartphone Addiction	Yes	99	62.3	93	72.1	0.078
	No	60	37.7	36	27.9	
Physical Activity Levels	Not physically active	74	46.5	44	34.1	<0.001**
	Low physical activity	70	44.0	50	38.8	
	Adequate physical activity	15	9.4	35	21.1	

SD: Standard deviation; Mann-Whitney U Ø; Chi Square x^2

Table 2. Comparison of the characteristics of smartphone usage of females and males

		Female		Male		p ^{x2}
		Number	Percent %	Number	Percent %	
Smartphone usage time (hours/day)	Less than 60 minutes	4	2.6	5	3.9	0.331
	1–2 hours	19	11.9	24	18.8	
	3–4 hours	64	40.3	39	30.5	
	5–6 hours	43	27	33	25.8	
Smartphone control frequency	More than 6 hours	29	18.2	27	21.1	0.055
	Smartphone control frequency	33	20.7	20	15.5	
	11–20 times a day	35	22.0	20	15.6	
	21–50 times a day	48	30.2	34	26.6	
	51–100 times a day	29	18.2	32	25	
	More than 100 times a day	14	8.8	22	17.2	
Time after waking up to smartphone use	In 5 minutes	83	52.9	56	45.2	0.079
	In 6–30 minutes	47	29.9	34	27.4	
	In 31–60 minutes	21	13.4	20	16.1	
	After 60 minutes	6	3.8	14	11.3	
Intended use of smartphone	Calling	49	30.8	52	40.6	0.084
	Texting	71	44.7	57	44.5	0.983
	Reading e-mail	8	5	16	12.5	0.02*
	Browsing social networks	85	53.5	83	64.8	0.052
	Gaming	17	10.7	29	22.7	0.006**
	Watching videos	46	28.9	48	37.5	0.124
	Listening music	62	39.0	46	35.9	0.595
	Reading News	25	15.7	25	19.5	0.398

x^2 – Chi Square

Table 3. Comparison of smartphone use and physical activity levels in individuals with and without smartphone addiction

		Not Addicted		Addicted		p ^{x2}
		Number	Percent %	Number	Percent %	
Sex	Female	99	62.3	60	37.7	0.078
	Male	93	72.1	36	27.9	
Smartphone usage time (hours / day)	Less than 60 minutes	8	4.2	1	1	<0.001
	1–2 hours	38	19.9	5	5.2	
	3–4 hours	75	39.9	28	29.2	
	5–6 hours	43	22.5	33	34.4	
	More than 6 hours	27	14.1	29	30.2	
Smartphone control frequency	Less than 10 times a day	43	22.5	10	10.4	<0.001
	11–20 times a day	44	23.0	11	11.5	
	21–50 times a day	55	28.8	27	28.1	
	51–100 times a day	33	17.3	28	29.2	
	More than 100 times a day	16	8.4	20	20.8	
Time after waking up to smartphone use	In 5 minutes	87	46.3	52	55.9	0.040
	In 6–30 minutes	54	28.7	27	29.0	
	In 31–60 minutes	28	14.9	13	14.0	
	After 60 minutes	19	10.1	1	1.1	
Intended use of smartphone	Calling	71	32.7	30	31.3	0.322
	Texting	85	44.5	43	44.8	0.963
	Reading e-mail	18	9.4	6	6.3	0.359
	Browsing social networks	101	52.9	67	69.8	0.006
	Gaming	29	15.2	17	17.7	0.582
	Watching videos	62	32.5	32	33.3	0.882
	Listening music	68	35.6	40	41.7	0.317
	Reading News	36	18.8	14	14.6	0.369
Physical activity levels	Not physically active	76	39.6	42	43.8	0.597
	Low physical activity	84	43.8	36	37.5	
	Adequate physical activity	32	16.7	18	18.8	

x^2 - Chi Square

Table 4: Relationship between smartphone addiction and physical activity

		Smartphone Addiction Scale – Short Form
Vigorous Physical Activity (minutes/week)	r	-0.051
	p	0.411
Moderate Physical Activity (minutes/week)	r	-0.126*
	p	0.047*
Walking (minutes/week)	r	-0.044
	p	0.502
Total Physical Activity (MET-minutes/week)	r	-0.112
	p	0.058

Spearman correlation analysis

DISCUSSION

This study investigated the relationship between smartphone addiction and the physical activity levels of university students and found that there was no statistical significance between those who were addicts and those who were not. However, a weak negative correlation was found between smartphone addiction and moderate physical activity levels.

In the present study, the physical activity levels of both the males and females were found to be extremely low. Only 17.4% (50 participants) of all participants were of an adequate physical activity level, while 23.6% (68 participants) of the participants had a total physical activity level of zero. The vigorous physical activity level and total physical activity level was different between both genders as the males showed higher levels of physical activity. Erdoğanoğlu and Arslan [23] also carried out a study on university students regarding smartphone usage. They found that 67.8% of the participants showed almost inactive or low levels of physical activity. They determined a significant difference between the genders in terms of physical activity levels, and it was found that the males were more active than the females and that they walked longer distances. In the study conducted by Demirtürk et al. [13], it was reported that the physical activity levels of the health sciences students were below the recommended level for healthy living. They determined that the male students' moderate and vigorous physical activity levels and total physical activity levels were higher than those of the female students. In a study carried out on university students in Spain, it was reported that the physical activity levels of the students, especially the female students, were not sufficient [24]. In this context, the data of the present study are compatible with the literature. In studies conducted with adolescents, it has been reported that the social gender difference in general physical activity levels is due to the low participation females showed in vigorous physical activities [25, 26]. The differentiating pattern of physical activity between the genders can be a result of social gender norms. In the Turkish society, girls are raised to be more home dependent, while boys are raised to be in more contact with the outside world. Therefore, it can be deduced that the physical activity levels of males who take part in social life will be higher.

In the present study, no difference was found between the males and females in terms of smartphone addiction scores. It was found that 90 (33.3%) out of 288 participants were at risk of smartphone addiction. Although there was no statistically significant difference, this rate was higher in females (37.7%) than in males (27.9%). Erdoğanoğlu and Arslan [23] determined these ratios to be closer to each other (female: 26.90% and male 25.80%). According to the study by Kuyucu [3], there was no statistically significant relationship between the gender of the participants and their smartphone addiction levels. In a study conducted in Korea, it was found that the level of smartphone addiction was significantly

different in terms of gender and that female students were more frequent smartphone users compared to male students (32.6% and 10.4%, respectively) [16]. Various studies on gender and technology have indicated that there may be differences in the way men and women use mobile phones, that women consider mobile phones as more of a social tool then men, tend to communicate in writing with mobile phones, talk longer and assimilate mobile phones as a central component of their personal assets [27, 28]. Within the scope of the present study, it was considered that, compared to men, women living in small districts tend to spend more time at home due to safety issues and community pressure thus spending more time on their smartphones and establishing emotional and social connections to their smartphones.

The present study found that the participants with smartphone addiction used their smartphones more during the day, checked their smartphones more frequently and the amount of time that passed after waking up before using smartphone was shorter. According to a study conducted in Switzerland, 256 students (16.9%) out of 1519 were found to be smartphone addicts and used their smartphones more on a daily basis. In addition, long-term smartphone usage on a typical day, shortness of time until the first smartphone in the morning, and reporting that social networking is personally the most relevant smartphone function have been reported to be associated with smartphone addiction [19]. In the present study, a significant difference was found between the participants with and without smartphone addiction in terms of smartphone usage time per day, smartphone control frequency, and the amount of time that passes after waking up before using the smartphone. Lin et al. [29] determined that the predictor of excessive smartphone usage was 4.62 hours per day. In the present study, it was found that 64.4% of the participants with smartphone addiction used their smartphones for five or more hours per day. Kim et al. [16] also reported a relationship between smartphone usage hours and smartphone addiction.

The present study found no difference between the physical activity levels of the participants with and without smartphone addiction, but a negative weak correlation between total smartphone addiction scores and moderate physical activity scores. Erdoğanoğlu and Arslan [23] also reported that there was no difference between the physical activity levels of individuals with and without smartphone addiction. In addition, they found that there was no correlation between the smartphone addiction levels of the individuals and their physical activity and exercise capacity levels. Various studies in the literature have reported that smartphone addiction is more common among those who report lower physical activity or that users who are at high risk of smartphone dependency are less physically active [7, 16, 19]. Contrary to the literature, the present study determined that there may be several reasons as to why there is no difference between the physical activity levels of individuals who are smartphone addicts and those who are not. In a study carried out in Korea, the daily smartphone usage time (10.86 ± 4.10 hours per day) of the study's participants who were determined as smartphone addicts was found to be higher than in the present study [16]. It is unlikely that individuals who spend that much time on their smartphones will perform any physical activity. The cut-off time for which daily telephone use may have a negative impact on physical activity is not yet known. In this respect, different usage amounts and frequencies determined in different studies may play a role in these results.

From another perspective, since some forms of moderate physical activity, such as standing or walking, can be carried out while using smartphones, the relationship between smartphone use and physical activity may be different from the use of traditional sedentary devices [9, 30]. This may be one of the reasons why there was no difference in the physical activity levels of individuals who are smartphone addicts and those who are not. However, it was not possible to come to a conclusion as physical activity simultaneously carried out during smartphone use was not investigated in this study.

LIMITATIONS

Within the scope of the present study, the means of transportation the students used during the day, the public transportation facilities in their city and whether they had jobs were not questioned or taken into consideration. In addition, data on the physical activity levels and smartphone addiction were collected via survey questionnaires, which may have adversely affected the accuracy of the data or caused bias. In future studies, such data should be evaluated more objectively with tools such as smartphone applications and accelerometers.

CONCLUSION

According to the results of the present study, it was found that university students have insufficient physical activity levels and face the risk of smartphone addiction that may contribute to these insufficient levels. It was determined that female students are more affected by these negative conditions. To raise young people's awareness of this issue, education curricula should include the negative effects of physical activity deficiency and smartphone addiction. Access to physical activity facilities should be increased, especially on university campuses located in small residential areas. In order to reduce the negative effects of smartphone addiction and determine effective strategies, more comprehensive studies are required to be conducted on smartphone addiction and its health effects on society.

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