

Smartphone Addiction and Its Relationship with Depression in University Students: A Cross-Sectional Study

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Original Research / Orijinal Araştırma

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ABSTRACT

Aim: This study was aimed to determine the risk factors and at-risk prevalence for smartphone addiction, and also investigate the relationship between smartphone addiction and depression in Necmettin Erbakan University students.

Methods: This cross-sectional study was conducted on 509 students who were enrolled in Necmettin Erbakan University, between March 1 and June 15, 2017. Together with the questionnaire form which was prepared by researchers after literature review, Smartphone Addiction Scale-Short Version and Beck Depression Inventory were applied to the participants under supervision.

Results: At-risk prevalence for smartphone addiction in the participants was 46.4%. There were statistically significant differences between the at-risk prevalence for smartphone addiction and gender, age, class they attended, daily smartphone use time, to use or not to use social network sites on smartphone, most used social network sites on smartphone, place of residence and most frequently purpose of smartphone usage. Of the participants, 31.4% were at risk for depression. There was a statistically significant positive correlation between the at-risk prevalences for smartphone addiction and depression at a weak level.

Conclusion: This study results showed that there are considerable numbers of university students who are at risk for smartphone addiction and depression. For more accurate results about smartphone addiction and depression relationship further clinical researches should be done.

Keywords: addiction, depression, mobile phone, students, universities

Üniversite Öğrencilerinde Akıllı Telefon Bağımlılığı ve Depresyonla İlişkisi: Kesitsel Bir Çalışma

ÖZ

Amaç: Bu çalışmada, Necmettin Erbakan Üniversitesi öğrencilerinde akıllı telefon bağımlılığı riski bulunanların prevalansı ve bununla ilgili risk faktörlerinin saptanması ve ayrıca akıllı telefon bağımlılığı ve depresyon arasındaki ilişkinin araştırılması amaçlanmıştır.

Yöntem: Kesitsel tipteki bu çalışma, Necmettin Erbakan Üniversitesi'ne kayıtlı 509 öğrenci üzerinde 1 Mart-15 Haziran 2017 tarihleri arasında gerçekleştirilmiştir. Araştırmacı tarafından literatür taraması sonucu oluşturulmuş anket formu ile birlikte Akıllı Telefon Bağımlılığı Ölçeği-Kısa Form ve Beck Depresyon Envanteri katılımcılara gözetim altında uygulanmıştır.

Bulgular: Akıllı telefon bağımlılığı riski bulunan katılımcı prevalansı %46,4 olarak saptamıştır. Cinsiyet, yaş, devam edilen sınıf, günlük akıllı telefon kullanım süresi, akıllı telefonda sosyal ağ sitelerinin kullanılıp kullanılmaması, akıllı telefonda en sık kullanılan sosyal ağ siteleri, ikamet yeri ve akıllı telefonu en sık kullanım amacı ile akıllı telefon bağımlılığı riski bulunan katılımcı prevalansı açısından istatistiki olarak anlamlı fark görülmüştür. Katılımcıların %31,4'ünde depresyon riski bulunmuştur. Akıllı telefon bağımlılığı riski bulunanlar ile depresyon riski bulunanların prevalansları arasında pozitif yönde, zayıf düzeyde ve istatistiki olarak anlamlı bir ilişki tespit edilmiştir.

Sonuç: Bu çalışma sonuçları, akıllı telefon bağımlılığı ve depresyon açısından risk altında bulunan üniversite öğrencisi sayılarının dikkate değer boyutlarda olduğunu göstermiştir. Akıllı telefon bağımlılığı ve depresyon ilişkisine ait daha kesin bulgular için ileri düzeyde klinik araştırmalar yapılmalıdır.

Anahtar kelimeler: bağımlılık, depresyon, mobil telefon, öğrenciler, üniversiteler

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Introduction

Addiction defined as “a process whereby a behavior, that can function both to produce pleasure and to provide relief from internal discomfort, is employed in a pattern characterized by recurrent failure to control the behavior and continuation of the behavior despite significant negative consequences” by Goodman (1).

The diagnostic category that is used as "substance use related disorders" in the past versions of the Diagnostic and Statistical Manual of Mental Disorders (DSM) was changed to "substance-related and addictive disorders" in fifth edition of Diagnostic and Statistical Manual of Mental Disorders (DSM-V), which is the latest published version of this manual (2). Thus, the term of addiction, which was used only for the substance-related disorders in the past, can be used also for the non-substance related behaviors now by this change (3).

The first mobile phone did not have any technical features except that providing to make voice calls. By the development in the technology mobile phones have evolved to smartphones. Nowadays these devices offer many advantages, without being limited to entertainment, with their constantly evolving features and diverse applications adapted to everyday life. This situation awakened the need to have a smartphone in the vast majority of the population. Our relationship with smartphones has started to affect our personal and social life considerably. So we have a fairly new phenomenon called “smartphone addiction (SPA)” now.

Smartphones could have some negative effects on human health when used extensively and improperly. As well as health problems like blurred vision, wrist, neck and shoulder pain, traffic accidents may occur especially due to distraction of attention of drivers and pedestrians. Beside such physical problems also psycho-social problems like incompatible behaviors, problems in school and work life, reduction in relationships with the real life social environment, decrease in academic achievement, and problems in interpersonal relationships can be seen (4-6). Like substance addiction, SPA has also addiction symptoms

such as tolerance, craving, deprivation and impairment in functioning (7).

By the end of 2017, Turkey's population was 80 million 810 thousand 525 people and the 15-24 age group accounted for 16.1% of the total population (8). Smartphone user ratio among young population (18-34 years old) was 81% (9). Young population seems to be a risky group for SPA because of widespread use of smartphones. So university students are an important target population for the researchers on this study topic.

It is known that behavioral addictions may associate with other mental disorders (10-12). Also in the particular studies about SPA and depression, a relationship has been found between these two disorders (13).

Depression is the one of the most common psychiatric disorders in young people that lead to serious impairments in psychosocial and academic functions and prevent overcoming developmental problems. The youth period is a period of contradictions. In this time period the individual experiences social and physical changes, and emotional, behavioral, sexual, economic, academic and social conflicts. With psychosocial and sexual maturity, the effort of finding an identity increases. The mental health of university youth who are in such a critical period of life is one of the important components of public health (14).

Recently, the global increase in smartphone usage has prompted the researchers to study the effects of these devices on interpersonal relationship, physical and mental health, and general functionality (15). This study was aimed to determine the risk factors and at-risk prevalence for SPA, and also investigate the relationship between SPA and depression in Necmettin Erbakan University students.

Methods

This cross-sectional study's target population was 27313 students who were enrolled in faculties, junior college and vocational schools affiliated to Necmettin Erbakan University during the 2016-2017 academic year. Sample size was calculated as 509 participants

by G-Power 3.1.9.2 (16) software program based on an expected at-risk prevalence for SPA of 22% (3) with a confidence level of 95% ($\alpha=0.05$), an absolute precision of 5% and a test power of 80%. We used stratified sampling method according to registered student numbers of schools and determined the number of the participants that will be included in the study from each school. Then participants were selected by simple random sampling method from each school's student list. Participants were enrolled in 11 faculties, 1 junior college and 1 vocational school in Konya province, 1 faculty and 1 vocational school in Seydisehir province, 1 faculty and 1 vocational school in Eregli province.

After receiving necessary permission from Necmettin Erbakan University Rectorate and getting approval from the Ethics Committee of Necmettin Erbakan University, Meram Faculty of Medicine (Date:30/09/2016, No: 2016/677), we visited participants in their schools between March 1 and June 15, 2017. Our study's data collection instruments were questionnaire form, Smartphone Addiction Scale-Short Version (SAS-SV) and Beck Depression Inventory (BDI). Before start of data collection, researchers gave information about study and data collection instruments to participants. Thereafter, participants gave their written consent to participate in study. We applied data collection instruments to participant groups under supervision in appropriate classrooms. All of selected 509 participants filled data collection instruments validly and they were included in data analysis.

The questionnaire form was prepared by the researchers after literature review and consisted of 18 questions. The first 8 questions were about sociodemographic characteristics, 9th and 10th questions were about cigarette and alcohol usage status, 11th question was about mobile phone bill payment type, 12th question was about mobile phone monthly bill and 13th to 18th questions were about smartphone usage durations and usage habits.

Smartphone Addiction Scale-Short Version (SAS-SV) was developed by Kwon et al. (17) to determine the risk of smartphone addiction. This 10 items scale

uses a 6-point Likert rating (1 = strongly disagree, 6 = strongly agree). The first 3 items are about "daily life functioning", 4th to 7th items are about "deprivation", and other items are about "virtual environment relationship", "overuse", and "tolerance" respectively. Scale scores ranged from 10 to 60. It is estimated that as the score increases, the risk for addiction increases. The cut-off score was 31 for men and 33 for women. Turkish validity and reliability study for university students was done by Noyan et al. (3). The Cronbach alpha coefficient of Turkish version was 0.867. The original scale's Cronbach alfa coefficient was 0.911. In Turkish validity reliability study there was no clinical examination on smartphone addiction so no cut-off scores were determined. Because of this, we used cut-off scores of the original scale. Male participants who scored 31 points and above and female participants who scored 33 points and above were accepted as at risk for SPA.

Beck Depression Inventory (BDI) was developed by Beck et al. (18). It consists of 15 psychological and 6 somatic, totally 21 items. Each item has 4 options that identify a behavioral pattern of depression and a score between 0 and 3. The score "0" refers the absence of the depression symptom questioned in that item. The scores "1", "2" and "3" indicate that the symptoms are more intense as the score increases. Scale scores calculated by summing of the scores of all items and ranged from 0 to 63. Turkish validity and reliability study for university students was done by Hisli (19). The Cronbach alpha coefficient of the Turkish version was 0.8 and the cut-off score was 17. Participants scored 17 points and above were evaluated as at risk for depression.

Study data were analyzed by IBM SPSS 23.0 (IBM SPSS Statistics, Version 23.0 Armonk, NY: IBM Corp.). In descriptive analysis; we used number and percentage for frequency data and median (quartile 1 – quartile 3) for SAS-SV and BDI scores. We used chi-square test (X^2) to compare categorical data (at-risk prevalences for SPA and BDI). We evaluate normality of data by Kolmogorov Smirnov test and found that data were not normally distributed. SAS-SV and BDI scores were compared by using

Mann-Whitney U test for variables consisting of two groups and by using Kruskal-Wallis test for variables consisting of more than two groups. Dunn-Bonferroni post hoc test was used to determine which group/groups make the statistical difference. We used Spearman correlation test to evaluate relationship between SAS-SV and BDI scores, and Phi (ϕ) correlation test to evaluate relationship between the at-risk prevalences for SPA and depression. The independent variable groups having significant difference between at-risk prevalence for SPA according to chi-square analysis results were examined by logistic regression analysis for determining risk factors of SPA. Statistical significance level for all tests was $p < 0.05$.

Results

Socioeconomic features of participants were shown in Table 1.

Table 1. Socioeconomic features of the participants

		n	%
Gender	Male	225	44.2
	Female	284	55.8
Age	18-20	245	48.1
	21-23	232	45.6
	24 and older	32	6.3
Marital status	Married	10	2.0
	Single	499	98.0
Place of residence	Dorm	187	36.7
	Family home	177	34.8
	With housemates	110	21.6
	Home alone	16	3.1
	Home with spouse	9	1.8
	Relative's home	6	1.2
	Pension/hotel	4	0.8
Family monthly income	≤999 TL (≤\$284)*	57	11.2
	1.000-2999 TL (\$285-853)	268	52.7
	3000-4999 TL (\$854-1423)	140	27.5
	5000-6999 TL (\$1424-1992)	26	5.1
	7000-9999 TL (\$1993-2846)	13	2.6
	≥10000 TL (≥\$2847)	5	0.9
Monthly expenditure	≤499 TL (≤\$140)	304	59.7
	500-999 TL (\$141-284)	170	33.4
	≥1000 TL (≥\$285)	35	6.9

* TL: Turkish Lira. Calculated according to exchange rate (1 TL = \$0.28) on June 15, 2017

Distribution of the participants according to their educational program was; 19.4% junior college, and vocational school students and 80.6% faculty students. Schools with the highest number of participants were; Ahmet Kelesoglu Faculty of Education (27.3%), Faculty of Social Sciences and Humanities (12.0%) and Faculty of Theology (9.8%). Distribution of participants according to classes they attend was; preparatory class 4.1%, 1st class 26.7%, 2nd class 31.2%, 3rd class 21.8%, 4th class 13%, 5th class 1.8% and 6th class 1.4%. Cigarette smoking ratio was 31.6%, alcohol consumption ratio was 14.5%. Prepaid mobile phone bill payment type users were 52.8%. The majority (73.1%) were spending between 20 and 39 Turkish Liras (TL) (\$5.6-11) per month for mobile phone use.

We showed distribution of participants according to smartphone operating system and usage characteristics in Table 2.

Table 2. The distribution of participants according to smartphone operating system and usage characteristics

		n	%
Operating system	Android	394	77.4
	iOS	111	21.8
	Windows Phone	4	0.8
Time spent as smartphone user	<1 year	25	4.9
	1-2 years	84	16.5
	3-4 years	198	38.9
	≥5 years	202	39.7
Daily smartphone usage time	<1 hour	19	3.7
	1-2 hours	103	20.2
	3-4 hours	237	46.6
	≥5 hours	150	29.5
Social network site	User	477	93.7
	Non-user	32	6.3
The most used social network site	Instagram	322	67.5
	Facebook	97	20.3
	Twitter	58	12.2
The most frequently purpose of smartphone usage	WhatsApp	173	34.0
	Internet	129	25.3
	Social network site	104	20.4
	Phone call	56	11.0
	Other	47	9.3

Smartphone addiction

Participants' median SAS-SV score was 31.0 (22.0-39.0). According to SAS-SV scores, at-risk prevalence for SPA in the participants was 46.4%.

Median SAS-SV score of the males was 28.0 (20.0-36.5) and 41.3% were at risk for SPA. For females these results were 33.0 (23.0-41.0) and 50.4% respectively. SAS-SV scores ($U=25336.00$; $Z=-4.015$; $p<0.001$) and at-risk prevalence for SPA ($X^2=4.106$; $p=0.043$) were significantly higher in females.

Participants who are; at 18-20 age range [median SAS-SV score=32.0 (23.0-40.5), $X^2=11.138$; $df=2$; $p=0.004$, at-risk prevalence for SPA=52.2%, $X^2=7.932$; $p=0.019$], daily 5 hours or more of smartphone users [37.0 (30.0-44.0), $U=14792.00$; $Z=-8.023$; $p<0.001$, 70.7%, $X^2=50.505$; $p<0.001$], social network site (SNS) users on smartphone [31.0 (22.0-39.0), $U=5179.50$; $Z=-3.046$; $p=0.002$, 47.6%, $X^2=4.569$; $p=0.033$], and participants whose most frequently used SNS on smartphone was instagram [32.5 (24.0-40.0), $X^2=12.551$; $df=2$; $p=0.002$, 53.1%, $X^2=13.055$; $p=0.001$] had significantly higher SAS-SV scores and at-risk prevalences for SPA than participants in their comparison groups.

There wasn't a significant difference between SAS-SV scores of participants according to their places of residence and most frequently purposes of smartphone usage (respectively; $X^2=5.880$; $df=4$; $p=0.208$, $X^2=8.759$; $df=4$; $p=0.067$). However at-risk prevalences for SPA of participants who live with housemates (32.7%) and participants who use smartphones most frequently for other purposes (except WhatsApp, internet, SNS and phone call) (25.5%) were significantly lower (respectively; $X^2=10.557$; $p=0.032$, $X^2=12.468$; $p=0.013$).

There was a significant difference between SAS-SV scores of participants according to classes they attend ($X^2=25.166$; $df=4$; $p<0.001$). The cause of difference is that SAS-SV scores of preparatory class students [40.0 (28.5-50.0)] were higher than SAS-SV scores of 1st, 3rd, and 4th class students and SAS-SV scores of 2nd class students [34.0 (25.0-42.0)] were higher than SAS-SV scores of 3rd and 4th class students. Also we found a significant difference between at-risk prevalence for SPA of participants according to classes they attend ($X^2=18.256$; $p=0.001$). Preparatory class students (71.4%) and 2nd

class students (56.6%) made the difference with higher at-risk prevalence for SPA.

There was no significant difference between participants' SAS-SV scores and at-risk prevalence for SPA according to marital status, family monthly income, monthly expenditure, educational program, school, cigarette smoking status, alcohol consumption status, mobile phone bill payment type, monthly money spent for mobile phone use, smartphone operating system, and time spent as smartphone user (Table 3).

We evaluated independent variables, which found effective on at-risk prevalence for SPA after chi-square analysis, by logistic regression analysis. Gender, age group, place of residence, class attended, daily smartphone use time, most frequently purpose of smartphone usage, and SNS use on smartphone included in logistic regression analysis (Table 4).

SPA and depression relationship

Participants' median BDI score was 12 (8-19) and at-risk prevalence for depression was 31.4%. Participants who were at risk for SPA had significantly higher median BDI score [16 (10-22), $U=19620.50$; $Z=-7.617$; $p<0.001$] and at-risk prevalence for depression (45.0%, $X^2=39.472$; $p<0.001$) than non-risky participants [10 (6-15), 19.4%]. There was a positive, weak/moderate level, and significant correlation between SAS-SV and BDI scores ($rs=0.353$; $p<0.001$) (Figure 1). Also we found a positive, weak level, and significant correlation between at-risk prevalence for SPA and depression ($\phi=0.278$; $p<0.001$).

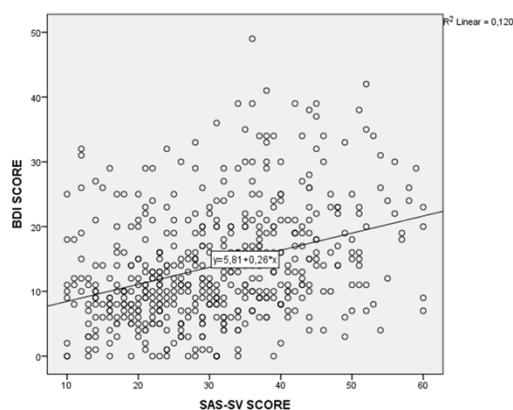


Figure 1. Scatter-plot graph of the correlation between SAS-SV score and BDI score

Table 3. SAS-SV score and at-risk prevalence comparison of variables that have non-significant results

	SAS-SV score Median (Q1-Q3)	At-risk prevalence for SPA (%)
Marital status		
Married	27,5 (19,0-41,0)	40.0
Single	31.0 (22.0-39.0)	46.5
	U=2285.50; Z=-0.455; p=0.649	X ² =0,166; p=0,758
Educational program		
Junior college/Vocational school	30.0 (23-38)	46.5
Faculty	31.0 (21-39)	46.3
	U=19880.00; Z=-0.316; p=0.752	X ² <0,001; p=0,982
Cigarette smoking		
Yes	30.0 (21.0-39.0)	44.7
No	31.0 (22.0-39.0)	47.1
	U=27067.50; Z=-0,614; p=0,539	X ² =0.256; p=0.613
Alcohol consumption		
Yes	30.0 (22.0-41.0)	44.6
No	31.0 (22.0-39.0)	46.7
	U=15966.50; Z=-0.110; p=0.912	X ² =0.109; p=0.741
Smartphone operating system		
Android	30.0 (22.0-39.0)	45.7
Others	31.0 (21.0-38.0)	48.7
	U=22138.50; Z=-0.372; p=0.710	X ² =0.324; p=0.569
School		
Ahmet Kelesoglu Faculty of Education	31.0 (21.0-40.0)	46.0
Faculty of Social Sciences and Humanities	33.0 (21.0-42.5)	52.5
Faculty of Theology	30.5 (22.5-39.0)	50.0
Others	30.5 (22.5-39.0)	44.4
	X ² =1.814; df=3; p=0.612	X ² =1.584; p=0.663
Family monthly income		
≤999 TL (≤\$284)*	28.0 (21.0-37.0)	42,1
1.000-2999 TL (\$285-853)	30.0 (22.0-40.0)	45,9
3000-4999 TL (\$854-1423)	31.0 (23.0-39.0)	49,3
≥ 5.000 TL (≥\$1424)	30.5 (20.0-39.0)	45.5
	X ² =4.138; df=3; p=0.247	X ² =0.935; p=0.817
Monthly expenditure		
≤499 TL (≤\$140)	31.0 (22.0-39.0)	47.7
500-999 TL (\$141-284)	31.0 (22.0-40.0)	44.7
≥1000 TL (≥\$285)	28.0 (17.0-37.0)	42.9
	X ² =0.888; df=2; p=0.641	X ² =0.578; p=0.749
Monthly money spent for mobile phone use		
≤19 TL (≤\$5.5)	28.0 (20.0-37.0)	42.6
20-29 TL (\$5.6-8.1)	29.0 (21.0-39.0)	44.9
30-39 TL (\$8.2-10.9)	31.0 (23.0-39.5)	49.7
40-49 TL (\$11.0-13.7)	30.5 (23.0-41.0)	42.9
≥50 TL (≥\$13.8)	31.5 (21.5-38.0)	47.9
	X ² =4.274; df=4; p=0.370	X ² =1.438; p=0.838
Time spent as smartphone user		
<1 year	22.0 (18.0-35.5)	32.0
1-2 years	30.0 (22.0-39.0)	45.2
3-4 years	31.0 (22.0-39.0)	47.0
≥5 years	31.0 (22.0-38.0)	48.0
	X ² =4.492; df=3; p=0.213	X ² =2,369; p=0.499

* TL: Turkish Lira. Calculated according to exchange rate (1 TL = \$0.28) on June 15, 2017

Table 4. Logistic regression results of the factors effective on SPA

Risk factors		B	p	OR	95% CI
Gender	Female			1	
	Male	-0.04	0.851	0.96	0.63-1.46
Age groups	18-20			1	
	21-23	-0.39	0.164	0.67	0.39-1.17
	24 and older	-0.76	0.135	0.46	0.17-1.27
Place of residence	Other			1	
	Family home	0.02	0.978	1.02	0.36-2.88
	Home alone	0.01	0.989	1.01	0.23-4.51
	With housemates	-0.99	0.079	0.37	0.12-1.11
	Dorm	-0.26	0.631	0.77	0.27-2.22
Class attended	Preparatory			1	
	1 st class	0.67	0.302	1.96	0.55-6.00
	2 nd class	-0.50	0.234	0.61	0.27-1.38
	3 rd class	0.44	0.226	1.55	0.76-3.13
	4 th class and above	0.04	0.900	1.05	0.53-2.08
Daily smartphone use time	<5 hours			1	
	≥5 hours	1.56	<0.001	4.75	2.99-7.56
Most frequently purpose of smartphone usage	Other			1	
	Phone call	1.11	0.022	3.05	1.18-7.88
	WhatsApp	1.35	0.001	3.84	1.71-8.60
	Internet	1.60	<0.001	4.94	2.14-11.37
	Social network site	1.38	0.002	3.96	1.69-9.30
Social network site use on smartphone	Non users			1	
	Facebook	0.62	0.209	1.86	0.71-4.87
	Twitter	-0.02	0.968	0.98	0.34-2.84
	Instagram	0.10	0.030	2.71	1.01-6.68

OR: Odds Ratio, CI: Confidence Interval

Discussion

At-risk prevalence for SPA among university students is found as 6.0% in Italy, 38.0% in Spain, 18.8% in Japan, 28.7% in Holland, 27.4% in Hong Kong, 25.0% in USA, 44.0% in India, 25.8% in Jordan and 67.0% in United Arab Emirates in some similar studies (20). There were some significant differences between prevalence found in our study and the prevalences found in these studies abroad. This may be due to socio-cultural structures that vary from country to country. When compared to study conducted in our country by Noyan et al. (3) a higher prevalence was found in our study (respectively; 22.0%, 46.4%). In youth population, that constituted samples of these two studies, number of smartphone users and daily smartphone use time may be increased during time period between the studies. So this may have caused to get a higher prevalence in our study which is more current.

According to current literature, we can say that it is difficult to make right inferences about relationship between gender and SPA. Beside studies indicating

that there is no significant difference between male and female at-risk prevalences for SPA (3,21,22), also there are studies indicating that males (23,24) or as in our study, females (17,25-30) have higher at-risk prevalence for SPA. The result in our study may be due to different using habits of smartphone in males and females. For example, females may be more at risk for SPA because of spending more time with smartphone due to more using of SNS.

Negative correlation between age and SPA has indicated earlier. In a sample with a mean age of 18.2±3.6 years in Switzerland, SPA was significantly higher in 15-16 age group than other age groups (17-18, 19-20, 21 years and older) (27). These results support our findings and may be due to decreasing interest to technological devices as age gets older.

Van Deursen et al. (31) reported that those who use their smartphones for more socialization are more likely to be addicted to smartphones. In current literature we didn't find any data about relationship between place of residence and SPA. Housemates generally live in intimate environments and develop

close friendships. These conditions can provide housemates to spend more active time in real social life and use smartphones lesser. As a result SPA risk may be decreased. So this may explain our study result in this topic.

In a study conducted on 1519 young people in Switzerland, while the majority of participants (64.1%) were using smartphones for 1-4 hours per day, in 19.9% of them daily use time was 5 hours or more. Also it is reported that SPA risk increases as daily use time increases (27). Our study findings were similar. In order to get away from real world or to bring out a good feeling, spending much time on a certain behavior and repeating this behavior may lead to behavioral addiction. After behavioral addiction occurs, withdrawal symptoms such as difficulty in controlling behavior, tension and restlessness when behavior is prevented, lead to more repetition of behavior. As behavior recurs, tolerance towards behavior develops, and so the person continues to perform the behavior with which he/she is addicted with increasing time and frequency (32). So findings in our study may be result of such a situation.

Similar to our study findings, most of studies report that there is no significant change in at-risk prevalence for SPA due to smoking and alcohol use (17, 27). However, there are some studies indicating that SPA risks are significantly higher in smokers and alcohol users (23, 30).

In a review by Al-Barashdi et al. (33) stated that findings of studies conducted on university students about relationship between family monthly income level and SPA were not consistent. Also in our country different findings have been revealed. Kuyucu (34) reported that as family income level increases, the risk of SPA also increases. However we didn't find a significant relationship between family monthly income and SPA.

In a study conducted on high school students in South Korea, it was found that smartphone addicts made a significantly higher monthly expenditure than non-addicts (35). But, similarly to our study, it was observed that there was no significant difference between SPA levels of participants according to their

monthly expenditure, in a study conducted on university students in our country (34).

According to results of a study conducted on medical faculty students in Turkey, most frequently purposes of smartphone usage were making phone calls (40.2%), internet surfing (29.2%) and connecting to SNS (15.6%) (25). In a study conducted on 1236 university students in South Korea, connecting to SNS and internet surfing were most frequently purposes of smartphone usage. Also SPA levels were higher in these groups (28). In a study conducted on 2418 young adults by Montag et al. (36) in Germany, 20% of the daily average smartphone use time of the participants was consisted by WhatsApp usage. We found compatible results with the literature above.

In a study conducted on 367 university students in Turkey, it was stated that 94.8% of participants had at least one social network account. Although social network account owners had higher SPA levels, there was no significant difference between owners and non-owners (37). On the other hand, in a study conducted on university students in USA, in accordance with our study, it was stated that use of SNS in smartphones was a significant positive predictive factor for SPA and comparing SNS used on smartphone, Instagram was found more risky for SPA than Facebook and Twitter (29).

Logistic regression analysis results of studies investigated the risks factors for SPA similar to those in our study are as follows: Haug et al. (27) stated that according to less than 1 hour daily smartphone users SPA risk was 2.32 times higher in 1-2 hours users, 5.79 times higher in 3-4 hours users, 10.78 times higher in 5-6 hours users, and 10.98 times higher in 6 hours or above users. Kim et al. (38) found SPA risk was 1.46 times higher in females. Chen et al. (21) identified different risk factors in males and females; SPA risk was 2.27 times higher in males whose most frequently purpose of smartphone usage is game playing, and 2.63 times higher in females whose most frequently purpose of smartphone usage is connecting to SNS.

In a review about the recent researches on psychiatric disorders in our country by Binbay et al. (39), the prevalence of depression among university

students ranged between 20.6% and 35.2%, in accordance with our study.

It has been reported in previous studies that excessive use of smartphones or being addicted to smartphones may cause some mental illnesses (17,40). In a study conducted by Hwang et al. (41) on university students in South Korea, anxiety and depression prevalence found higher in the group of smartphone excessive users. In another study conducted on 353 university students in South Korea, a statistically significant positive correlation was found between problematic smartphone use and depression ($r=0.383$; $p<0.001$) (42). In a study conducted on university students in Turkey, depression levels was significantly higher in the group of participants at risk for SPA; and a positive correlation was found between the scores of Smartphone Addiction Scale and BDI ($r= 0.267$; $p<0.001$) (26). Our study results about SPA and depression relationship were in accordance with literature above.

Elhai et al. (43) reported that there are three different explanations for cause-effect relationship between SPA and depression in literature;

1) SPA causes depression. Although there are not enough studies about how smartphone addiction leads to depression, there are studies stating that sleep

irregularity resulting from the use of a smartphone until late at night plays a role in this (44).

2) Depression causes SPA. Kim et al. (42) stated that depressed individuals see their smartphones as an escape from their negative feelings and to cope with them they begin to use smartphones in longer times. So, this leads to SPA.

3) There is a two-way cause-effect relationship between SPA and depression. For example, a depressed person who starts to use smartphone excessively to deal with negative emotions can become smartphone addict. Because of being addicted, using smartphone until late at night may cause disturbance in sleep patterns and consequently aggravation of the individual's depressive state. Thus, this can continue as a vicious circle (42).

Conclusion

These explanations also show that the cause-effect relationship between SPA and depression has not yet been fully clarified. Longitudinal studies and further clinical researches on this topic will be useful in clarifying this relationship.

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References

1. Goodman A. Addiction: definition and implications. *Br J Addict* 1990;85(11):1403-8.
2. American Psychiatric Association. Diagnostic and statistical manual of mental disorders fifth ed. (DSM-5). Washington DC: American Psychiatric Pub, 2013. 991 p.
3. Noyan CO, Darçın AE, Nurmedov S, Yılmaz O, Dilbaz N. Validity and reliability of the Turkish version of the Smartphone Addiction Scale-Short Version among university students. *Anadolu Psikiyatri Derg* 2015;16(Suppl 1):73-81.
4. Schwebel DC, Stavrinou D, Byington KW, Davis T, O'Neal EE, de Jong D. Distraction and pedestrian safety: how talking on the phone, texting, and listening to music impact crossing the street. *Accid Anal Prev* 2012;45:266-71. doi: 10.1016/j.aap.2011.07.011
5. Shan Z, Deng G, Li J, Li Y, Zhang Y, Zhao Q. Correlational analysis of neck/shoulder pain and low back pain with the use of digital products, physical activity and psychological status among adolescents in Shanghai. *PLoS One* 2013;8(10):e78109. doi: 10.1371/journal.pone.0078109.

6. Mok JY, Choi SW, Kim DJ, Choi JS, Lee J, Ahn H, et al. Latent class analysis on internet and smartphone addiction in college students. *Neuropsychiatr Dis Treat* 2014;10:817-28. doi: 10.2147/NDT.S59293
7. Billieux J, Philippot P, Schmid C, Maurage P, De Mol J, Van der Linden M. Is dysfunctional use of the mobile phone a behavioural addiction? confronting symptom-based versus process-based approaches. *Clin Psychol Psychother* 2015;22(5):460-8.
8. Turkish Statistical Institute [internet]. The results of address based population registration system, 2017 [cited 2018 Nov 12]. Available from: <http://web.turkstat.gov.tr/PreHaberBultenleri.do?id=27587>
9. Pew Research Center [internet]. Smartphone ownership and internet usage continues to climb in emerging economies [cited 2018 Nov 12]. Available from: <https://www.pewresearch.org/global/2016/02/22/smartphon-e-ownership-and-internet-usage-continues-to-climb-in-emerging-economies/>.
10. Oliveira MP, Silveira DX, Silva MTA. Pathological gambling and its consequences for public health. *Rev Saude Publica* 2008;42(3):1-7.
11. Karim R, Chaudhri P. Behavioral addictions: an overview. *J Psychoactive Drugs* 2012;44(1):5-17.
12. Rosenkranz T, Muller KW, Dreier M, Beutel ME, Wolfling K. Addictive potential of internet applications and differential correlates of problematic use in internet gamers versus generalized internet users in a representative sample of adolescents. *Eur Addict Res* 2017;23(3):148-56.
13. Harwood J, Dooley J, Scott A, Joiner R. Constantly connected-the effects of smart-devices on mental health. *Comput Human Behav* 2014;34:267-72. doi: 10.1016/j.chb.2014.02.006
14. Kaya M, Genç M, Kaya B, Pehlivan E. Prevalence of depressive symptoms, ways of coping, and related factors among medical school and health services higher education students. *Turk Psikiyatri Derg* 2007;18(2):137-46.
15. Park N, Lee H. Social implications of smartphone use: Korean college students' smartphone use and psychological well-being. *Cyberpsychol Behav Soc Netw* 2012;15(9):491-7.
16. Faul F, Erdfelder E, Lang AG, Buchner A. G-Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behav Res Methods* 2007;39(2):175-91.
17. Kwon M, Kim DJ, Cho H, Yang S. The smartphone addiction scale: development and validation of a short version for adolescents. *PLoS One* 2013;8(12):e83558. doi: 10.1371/journal.pone.0083558.
18. Beck AT, Ward CH, Mendelson M, Mock J, Erbaugh J. An inventory for measuring depression. *Arch Gen Psychiatry* 1961;4(6):561-71.
19. Hisli N. A reliability and validity study of Beck Depression Inventory in a university student sample. *Psikoloji Dergisi* 1989;7(23):3-13.
20. Khoury JM, de Freitas AAC, Roque MAV, Albuquerque MR, das Neves MCL, Garcia FD. Assessment of the accuracy of a new tool for the screening of smartphone addiction. *PLoS One* 2017;12(5):e0176924. doi: 10.1371/journal.pone.0176924.
21. Chen B, Liu F, Ding S, Ying X, Wang L, Wen Y. Gender differences in factors associated with smartphone addiction: a cross-sectional study among medical college students. *BMC Psychiatry* 2017;17(341):1-9.
22. Kwon M, Lee JY, Won WY, Park JW, Min JA, Hahn C, et al. Development and validation of a smartphone addiction scale (SAS). *PLoS*

- One 2013;8(2):e56936. doi: 10.1371/journal.pone.0056936.
23. Pourrazavi S, Allahverdipour H, Jafarabadi MA, Matlabi H. A socio-cognitive inquiry of excessive mobile phone use. *Asian J Psychiatr* 2014;10:84-9. doi: 10.1016/j.ajp.2014.02.009
 24. Venkatesh E, Jemal MYA, Samani ASA. Smart phone usage and addiction among dental students in Saudi Arabia: a cross sectional study. *Int J Adolesc Med Health* 2017;31(1). doi: 10.1515/ijamh-2016-0133. PMID: 28384117
 25. Demirci K, Orhan H, Demirdas A, Akpınar A, Sert H. Validity and reliability of the Turkish Version of the Smartphone Addiction Scale in a younger population. *Klinik Psikofarmakol Bülteni* 2014;24(3):226-34.
 26. Demirci K, Akgonul M, Akpınar A. Relationship of smartphone use severity with sleep quality, depression, and anxiety in university students. *J Behav Addict* 2015;4(2): 85-92.
 27. Haug S, Castro RP, Kwon M, Filler A, Kowatsch T, Schaub MP. Smartphone use and smartphone addiction among young people in Switzerland. *J Behav Addict* 2015;4(4):299-307.
 28. Lee KE, Kim SH, Ha TY, Yoo YM, Han JJ, Jung JH, et al. Dependency on smartphone use and its association with anxiety in Korea. *Public Health Rep* 2016;131(3):411-9.
 29. Roberts J, Yaya L, Manolis C. The invisible addiction: cell-phone activities and addiction among male and female college students. *J Behav Addict* 2014;3(4):254-65.
 30. Tao S, Wu X, Wan Y, Zhang S, Hao J, Tao F. Interactions of problematic mobile phone use and psychopathological symptoms with unintentional injuries: a school-based sample of Chinese adolescents. *BMC Public Health* 2016;16(88):1-10.
 31. Van Deursen AJAM, Bolle CL, Hegner SM, Kommers PA. Modeling habitual and addictive smartphone behavior: the role of smartphone usage types, emotional intelligence, social stress, self-regulation, age, and gender. *Comput Human Behav* 2015;45:411-20. doi: 10.1016/j.chb.2014.12.039
 32. Grant JE, Potenza MN, Weinstein A, Gorelick DA. Introduction to behavioral addictions. *Am J Drug Alcohol Abuse* 2010;36(5):233-41.
 33. Al-Barashdi HS, Bouazza A, Jabur NH. Smartphone addiction among university undergraduates: a literature review. *J Sci Res Rep* 2015;4(3):210-25.
 34. Kuyucu M. Use of smart phone and problematic of mart phone addiction in young people: “smart phone (colic)” university youth. *Global Media Journal TR Edition* 2017;7(14):328-59.
 35. Yu MO, Ju SJ, Kim JH. A study on smartphone addiction, mental health and impulsiveness for high school students at Korea. *Journal of Digital Convergence* 2014;12(4):409-18.
 36. Montag C, Błaszczewicz K, Sariyska R, Lachmann B, Andone I, Trendafilov B, et al. Smartphone usage in the 21st century: who is active on WhatsApp? *BMC Res Notes* 2015;8(331):1-6.
 37. Darcin AE, Kose S, Noyan CO, Nurmedov S, Yilmaz O, Dilbaz N. Smartphone addiction and its relationship with social anxiety and loneliness. *Behav Inf Technol* 2016;35(7):520-5.
 38. Kim Y, Jeong JE, Cho H, Jung DJ, Kwak M, Rho MJ, et al. Personality factors predicting smartphone addiction predisposition: behavioral inhibition and activation systems, impulsivity, and self-control. *PLoS One* 2016;11(8):e0159788. doi: 10.1371/journal.pone.0159788.
 39. Binbay T, Direk N, Aker T, Akvardar Y, Alptekin K, Cimilli C, et al. Psychiatric epidemiology in Turkey: main advances in recent

- studies and future directions. *Turk Psikiyatri Derg* 2014;25(4):264-81.
40. Kuss DJ, Griffiths MD. Online social networking and addiction-a review of the psychological literature. *Int J Environ Res Public Health* 2011;8(9):3528-52.
41. Hwang KH, Yoo YS, Cho OH. Smartphone overuse and upper extremity pain, anxiety, depression, and interpersonal relationships among college students. *The Journal of the Korea Contents Association* 2012;12(10):365-75.
42. Kim JH, Seo M, David P. Alleviating depression only to become problematic mobile phone users: can face-to-face communication be the antidote? *Comput Human Behav* 2015;51:440-7. doi: 10.1016/j.chb.2015.05.030
43. Elhai JD, Dvorak RD, Levinea JC, Hall BJ. Problematic smartphone use: a conceptual overview and systematic review of relations with anxiety and depression psychopathology. *J Affect Disord* 2017;207:251-9. doi: 10.1016/j.jad.2016.08.030
44. Lemola S, Perkinson-Gloor N, Brand S, Dewald-Kaufmann JF, Grob A. Adolescents' electronic media use at night, sleep disturbance, and depressive symptoms in the smartphone age. *J Youth Adolesc* 2015;44(2):405-18.