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ORIGINAL ARTICLE

The Effect of Smartphone Addiction on Emotion Regulation and Problem Solving in University Students

Üniversite Öğrencilerinde Akıllı Telefon Bağımlılık Riskinin Duygu Düzenleme ve Problem Çözme Üzerine Etkisi

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ABSTRACT

Aim: This study aims to investigate the impact of smartphone addiction risk on emotional dysregulation and problem-solving in university students.
Methods: This descriptive-correlational study included 354 students at the university. Data were collected using the information form, Smartphone Addiction Scale-short form (SAS), Problem Solving Inventory (PSI), and Difficulties in Emotion Regulation Scale-brief form (DERS-16). Frequency, percentage, mean, Pearson correlation and linear regression, independent groups t-test, one-way analysis of variance (ANOVA), and Post Hoc (Tukey, LSD) were used in data analysis.
Results: The mean scores of the students were 36.40±12.71, 99.52±24.12, and 25.69±14.14 for SAS, PSI, and DERS-16, respectively. In the linear regression analysis performed to determine the cause-and-effect relationship between SAS and PSI, and DERS-16, those at risk of smartphone addiction increased the level of decrease in problem-solving skills (ß=0.331) and difficulties in emotion regulation skills (ß=0.172). In our study, an increased risk of smartphone addiction was found to cause a decrease in emotion regulation difficulties and problem-solving skills.
Conclusions: This result reveals the problems caused by the risk of smartphone addiction in action plans for combating addiction and provides important data for reducing this risk. It is recommended that courses related to smartphone addiction should be added to the course curricula.

Keywords: Smartphone, Addiction, Problem solving, Emotion regulation skills

ÖZ

Amaç: Bu çalışma, akıllı telefon bağımlılığı riskinin üniversite öğrencilerinde duygusal düzensizlik ve problem çözme üzerindeki etkisini araştırmayı amaçlamaktadır.
Gereç ve Yöntemler: Tanımlayıcı-ilişki arayıcı olarak gerçekleştirilen bu çalışmaya üniversitede öğrenim gören 354 öğrenci katılmıştır. Veriler bilgi formu, Akıllı Telefon Bağımlılığı Ölçeği-kısa form (ATBÖ), Problem Çözme Envanteri (PÇE) ve Duygu Düzenleme Güçlüğü Ölçeği-kısa form (DDGÖ-16) kullanılarak toplanmıştır. Verilerin analizinde frekans, yüzde, ortalama, Pearseon korelasyon ve doğrusal regresyon, bağımsız gruplar t -testi, tek yönlü varyans analizi (ANOVA) ve post hoc (Tukey, LSD) kullanılmıştır
Bulgular: Öğrencilerin ATBÖ, PÇE ve DDGÖ puan ortalamaları sırasıyla 36,40±12,71, 99,52±24,12, 25,69±14,14'dır. ATBÖ ile PÇÖ ve DDGÖ arasında neden sonuç ilişkisini belirlemek üzere yapılan lineer regresyon analizinde akıllı telefon bağımlılığı riski bulunanların, problem çözme becerilerinde azalma (ß=0,331) ve duygu düzenleme becerilerinde güçlükler düzeyini arttırmaktadır (ß=0,172). Çalışmamızda, akıllı telefon bağımlılığı riskinin artmasının duygu düzenleme güçlüklerinde ve problem çözme becerilerinde azalmaya neden olduğu bulunmuştur.
Sonuçlar: Bu sonuç, bağımlılıkla mücadele eylem planlarında akıllı telefon bağımlılığı riskinin yol açtığı sorunları ortaya koymakta ve bu riskin azaltılması için önemli veriler sağlamaktadır. Ders müfredatlarına akıllı telefon bağımlılığı ile ilgili derslerin eklenmesi önerilmektedir.

Anahtar Kelimeler: Akıllı telefon, Bağımlılık, Problem çözme, Duygu düzenleme becerileri

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INTRODUCTION

Technology is a variety of technical mechanisms and tools that affect people's lives in many ways, making it easier to find solutions to problems and save time. Smartphones, one of the technological developments, are replacing devices such as cameras, calculators, MP3 players, navigators, pedometers, alarm clocks, and even organizers and credit cards. Smartphone use has been increasing in the last decade, and about half or more of the global population uses them (1,2). The smartphone can encourage social interaction (e.g., social media), productivity (e.g., email), expand entertainment options, and provide access to information and services (e.g., online banking) (3). Smartphones have become an integral part of daily life, and studies indicate that some individuals develop a strong attachment to their devices, experiencing anxiety when separated from them (4). While smartphones offer numerous advantages, their use can sometimes become "excessive" or "compulsive," a behavior now referred to as "smartphone addiction (SA) (3).

Although SA is not classified as a disorder in the "Diagnostic and Statistical Manual of Mental Disorders (DSM-5)", it shares common features with addiction, such as loss of control, difficulty in regulating emotions, and excessive preoccupation (5,6).

It is emphasized that when emotions are not compatible with the current situation or when they are intense, individuals lose functionality and experience problems when they last too long (7). On the other hand, emotion regulation consists of internal and external response processes used in monitoring, evaluating, and changing emotional reactions that are intense and non-permanent, especially for the individual, in realizing the individual's goals (8). The effect of SA on emotion regulation is undeniable. Studies have reported that excessive use of smartphones decreases academic achievement, negatively affects social relationships, prevents focusing at school or work (9-10), and leads to interpersonal relationships and communication (10, 11).

In a study conducted by Arslan et al. (12) it was found that aggression levels increased as aggression and negative approach to the problem, insecure approach and not taking responsibility increased While several studies have explored aggression and its relationship with various psychological factors, no research has specifically addressed the combination of these factors (aggression, negative approach, insecure approach, and lack of responsibility) concerning individual emotional and behavioral regulation. Additionally, the research results will provide evidence to support the integration of courses focused on addiction, emotion regulation, and problem-solving skills into the curriculum, aiming to foster healthier emotional and behavioral patterns in individuals.

Research Questions

- How does the risk of SA correlate with effective problem-solving skills among university students?

- How does the risk of SA among university students relate to their ability to regulate emotions?

MATERIALS and METHODS

The study was conducted as a descriptive-correlational study to investigate the impact of smartphone addiction risk on emotional dysregulation and problem-solving in university students.

Place of Research

The research was conducted at a foundation university located in one of the metropolitan cities. The university where the research took place has departments related to health and technology: Four graduate education, two health sciences, pharmacy (Turkish and English departments), dentistry (Turkish and English departments), social and humanities (psychology), two engineering and natural sciences departments, and 17 departments affiliated to the Vocational School.

Population and Sample of the Study

The study population consists of 3505 students enrolled in associate, undergraduate, and graduate programs studying in Turkish departments at the university in the 2022-2023 academic year.

For the sample of the study, the convenience sampling method was used to ensure effective time utilization and a high participation rate. In the survey research model, the convenience sampling method can be preferred to ensure a high survey return rate (13). As stated by Fraenkel et al. (14) in survey studies, at least 10% of the universe should be reached for the sample volume to reflect the universe. Based on this recommendation, it was sufficient to reach 351 students, which is 10% of the total number of students in the 2022-2023 academic year of the university where the study was conducted, but 354 students who returned the questionnaire constituted the sample.

Data Collection Method

Participants were recruited via Google form, and data were collected through an online survey in the ongoing education and training with a hybrid system (face-to-face and online) due to the earthquake that affected Turkey between May and June 2023. Individuals who agreed to participate were asked to fill out the questionnaire from the social media (Twitter, Instagram, and Facebook) accounts of the university and by sending Google form links to the e-mails of students with university addresses. In addition, a poster was organized for their participation in the study, a link and a QR code for the Google form were created on the poster, hung on the boards in visible places of the university, and students were invited to participate in the study.

Data Collection Tools

Data Collection Form on Students' Descriptive Characteristics

This form, which was prepared by the researchers by reviewing the literature (2,6,12) consists of 10 questions (multiple choice, open-ended) about some socio-demographic characteristics of the students and their parents (age, gender, marital status, current place of residence, family type, duration of cell phone use, and taking a course on addiction).

Smartphone Addiction Scale-Short Version (SAS-SV)

The SAS-SF, created by Kwon et al.(6), is a tool designed to assess the likelihood of SA in adolescents. It includes 10 questions that are rated using a six-point Likert scale, with scores ranging from 1 to 6 for each item. The total possible score is between 10 and 60, where a higher total score indicates a greater risk of addiction. The scale consists of a single factor, with no subscales. The Turkish version of the scale demonstrated strong internal consistency, with a Cronbach's alpha of 0.91 (15). In our research, the reliability was confirmed with a Cronbach's alpha of 0.910.

Problem Solving Inventory (PSI)

Created by Heppner and Peterson (16), PSI was adapted into Turkish, with its validity and reliability evaluated by Taylan (17). The Cronbach alpha reliability coefficient of the scale was found to be 0.82. In our study, Cronbach's Alpha=0.921 was found to be high. The scale consists of 35 items in a 6-point Likert-type type, and for each item, people are asked how often they behave as described in the item. The items in the scale consist of positive and negative judgments about problem-solving and are randomly ordered. A lower score, with 32 as the minimum, indicates greater effectiveness in problem-solving abilities, as well as behaviors and attitudes conducive to successfully resolving problems. A high score (with 192 as the maximum) indicates difficulty in finding effective solutions to problems.

Difficulties in Emotion Regulation Scale-Brief Form (DERS-16)

The Difficulties in Emotion Regulation Scale (DERS) was created by Gratz and Roemer (18) as a 36-item, 5-point Likert-type instrument designed to assess difficulties in regulating emotions. Yiğit and Yiğit (19) later adapted the scale into Turkish. The DERS-16, a shortened version with 16 items, also uses a 5-point Likert scale (ranging from 0=seldom to 4=almost always) and covers five sub-dimensions. None of the items are reverse-scored, and there is no established cut-off score; higher scores reflect greater challenges in emotion regulation. Our research calculated Cronbach's Alpha as 0.938, indicating strong internal consistency.

Data Analysis

The data collected in the research were processed and analyzed utilizing the Statistical Package for Social Sciences (SPSS) for Windows, version 22.0 statistical software. Frequency and percentage analyses were utilized to assess the descriptive characteristics of the students, whereas the scale was analyzed through mean and standard deviation calculations. To assess the normality of the research variables, skewness and kurtosis values were computed (see Table 2). Based on the literature, the kurtosis and skewness values falling between +1.5 and -1.5, as well as +2.0 and -2.0 (20), are considered indicative of a normal distribution. The analysis confirmed that the variables followed a normal distribution. Therefore, parametric methods were employed for data analysis. Pearson's correlation was used to examine the relationship between the dimensions determining the scale levels of the students. Linear regression analysis was used to determine the cause-and-effect relationship between smartphone addiction and problem-solving and emotion regulation. Independent samples t-tests, one-way ANOVA, and post hoc tests (Tukey, LSD) were utilized to analyze variations in scale scores based on students' demographic characteristics.

Compliance with Ethical Statement

This research was conducted following approval from the Kocaeli Health and Technology University Non-Interventional Clinical Research Ethics Committee (Approval Number: 2023-27). The study was conducted under the principles of the Declaration of Helsinki. Additionally, informed consent was obtained from all university students participating in the study.

RESULTS

The mean "age" of the students was 21.83±4.16 (min=18; max=49), 74.3% were female, and 92.7% were single. According

to family type, 302 (85.3%) of the students were from nuclear families, 34 (9.6%) were from extended families, and 18 (5.1%) were from fragmented families. Currently, 69.8% of the students live with their families. 12.1% of the students stated that they took courses/ training on technology addiction (Table 1).

The students' SAS, DERS-16, and PSI scores did not differ significantly according to gender, grade, department, and family type (p>0.05). The SA scores of single students (x=35.893) were lower than married students (x=42.88) (t=-2.72; p=0.007<0.05; d=0.555; n2=0.02). The students' SAS and DERS-16 scores did not differ significantly according to where they lived (p>0.05), but the students' PSI scores of those who lived with their families were higher than those who lived with friends (F=2.89; p<0.05; n2=0.02). The PSI scores of those living in dormitories were higher than the PSI scores of those living with friends (p<0.05).

The SAS scores (x=32.30) of those taking the technology addiction course/training were lower than the SAS scores (x=36.97) of those who did not take the technology addiction course/training (t=-2.27; p=0.024<0.05; d=0.37; n2=0.01). The PSI scores of those who took the course on technology addiction (x=21.69) were lower than the PSI scores of those who did not take the technology addiction course (x=26.24) (t=-1.98; p=0.04<0.05; d=0.32; n2=0.01). (Table 1)

When the minimum-maximum levels for the scores of SA, problem solving, and difficulties in emotion regulation were examined, the mean scores of the "Smartphone Addiction Scale" were 36.407±12.710, the mean scores of the "Problem Solving Inventory" were 99.520±24.121, and the mean scores of the "Difficulties in Emotion Regulation Scale-16" were 25.692±14.149. (Table-2)

Table 2. Mean scores of the smartphone addiction scale, problem-solving inventory, and difficulties in emotion regulation

Scales	Mean±SD	Min-max	Kurtosis	Skewness
Smartphone Addiction Scale-Short Version	36.407±12.710	10-60	-0.792	-0.164
Problem-Solving Inventory	99.520±24.121	32-192	0.846	0.801
Difficulties in Emotion Regulation Scale-Brief Form	25.692±14.149	0-64	-0.232	0.407

When the correlation analyses between the total scores of SA, PSI, and DERS-16 were examined; r=0.33 positive low (p=0.000 <0.05) correlation was found between the total score of the problem-solving inventory and the total score of the SAS and r=0.172 positive very low (p=0.001<0.05) correlation was found between the total score of the DERS-16 and SA. (Table 3)

Table 3. Correlation analysis between smartphone addiction, problem-solving inventory, and difficulties in emotion regulation scores

Scales		Smartphone Addiction Scale-Short Version
Problem-Solving Inventory	r	0.331**
	p	0.000
Difficulties in Emotion Regulation Scale-Brief Form	r	0.172**
	p	0.001

*<0,05; **<0,01; Pearson's correlation analysis

The regression analysis conducted to determine the cause-and-effect relationship between SA and problem solving was found significant (F=43.31; p=0.000<0.05). The total change in problem-solving level was explained by SA at a rate of 10.7% (R2=0.107). A higher risk score for SA increases the PSI score (ß=0.331) (Table 4).

The regression analysis conducted to determine the cause-and-effect

Table 1. Differentiation status of smartphone addiction scale, problem-solving inventory, and difficulties in emotion regulation scale scores under descriptive characteristics

Demographic Characteristics	n	SAS-SV	PSI	DERS-16
Gender		**Mean±SD**	**Mean±SD**	**Mean±SD**
Female	263	36,544±12,502	98,741±23,035	25,597±14,282
Male	91	36,011±13,355	101,769±27,030	25,967±13,833
t=		0,344	-1,032	-0,215
p=		0,731	0,303	0,830
Education degree		**Mean±SS**	**Mean±SS**	**Mean±SS**
Associate Degree	82	35,512±13,120	98,598±27,411	22,902±13,986
License	259	36,305±12,517	99,699±23,546	26,394±13,999
Master's Degree	13	44,077±12,332	101,769±10,608	29,308±16,665
F=		2,602	0,123	2,355
p=		0,076	0,884	0,096
Section		**Mean±SD**	**Mean±SD**	**Mean±SD**
Vocational School	95	35,747±13,590	100,684±28,981	24,358±14,920
Health Science Faculty	172	35,686±12,375	97,971±23,327	24,361±13,305
Faculty of Pharmacy	20	38,950±12,275	105,200±15,161	30,150±12,692
Faculty of Engineering	13	42,769±11,447	101,385±14,728	25,077±9,349
Psychology	8	41,625±13,532	92,750±26,364	28,750±14,390
Faculty of Dentistry	39	35,590±12,156	101,615±22,481	30,872±16,295
Occupational Health And Safety	7	42,571±11,844	98,143±9,703	32,571±15,789
F=		1,345	0,506	1,971
p=		0,236	0,803	0,069
Marital Status		**Mean±SD**	**Mean±SD**	**Mean±SD**
Single	328	35,893±12,698	99,265±24,652	25,595±14,119
Married	26	42,885±11,173	102,731±15,979	26,923±14,748
t=		-2,724	-0,705	-0,460
p=		0,007	0,481	0,646
Family Type		**Mean±SD**	**Mean±SD**	**Mean±SD**
Nuclear	302	36,497±12,401	98,987±23,097	25,285±13,488
Extended	34	35,765±15,547	103,912±31,457	30,088±18,899
Fragmented	18	36,111±12,700	100,167±25,905	24,222±14,099
F=		0,056	0,642	1,873
p=		0,946	0,527	0,155
Place of Residence		**Mean±SD**	**Mean±SD**	**Mean±SD**
Family	247	37,243±12,708	101,174±22,947	25,117±14,340
Own Home	15	35,067±13,956	92,133±26,734	25,000±13,872
At Hostel	76	34,961±12,817	98,684±27,012	27,855±13,143
With Friends	16	31,625±10,072	84,875±20,248	24,938±16,287
F=		1,501	2,898	0,754
p=		0,214	0,035	0,521
PostHoc		-	1>4, 3>4 (p<0.05)	-
Status of Taking Technology Addiction Course		**Mean±SD**	**Mean±SD**	**Mean±SD**
Yes	43	32,302±14,741	103,023±36,971	21,698±14,533
No	311	36,974±12,322	99,035±21,804	26,244±14,030
t=		-2,273	1,016	-1,983
p=		0,024	0,493	0,048

F: Anova Test; t: Independent Groups T-Test; Post Hoc: Tukey, LSD

relationship between SA and difficulties in emotion regulation was found significant (F=10.68; p=0.001<0.05). The total change in the level of DERS-16 was explained by SA at a rate of 2.7% (R2=0.027). SA increases the level of difficulties in emotion regulation (ß=0.172). (Table 4)

DISCUSSION

This study aimed to investigate the impact of smartphone addiction risk on emotional dysregulation and problem-solving in university students. According to the results, no significant difference was found in the SA risk levels of university students according to variables such as gender, class, department, and family type. However, it is seen that this situation varies in the literature. For example, in a study conducted on undergraduate students at Wannan Medical School in China, it was found that male students were more prone to SA by using game applications more, whereas female students were more prone to addiction by using social media applications more (21). On the other hand, according to data from the Turkish Statistical Institute (22), when the most used social media and messaging applications by gender were analyzed, it was determined that males used Facebook with 61.5%, YouTube with 70.8% and WhatsApp with 85.9%, while females used Instagram with 55.9%, YouTube with 63.7% and WhatsApp with 78.1%. Aljomaa et al. (23) found that the duration of phone use by male students was higher than that of female students. However, De Silva et al. (24) found that the risk level of SA was higher in female students. Similar to our study, Kumcağız et al. (25) found no significant difference between genders. These differences are thought to be due to cultural and educational factors.

In our study, it was found that the SA risk level of singles was lower than that of married people. In the literature, it is stated that the addiction level of married people is lower compared to singles (22-24). It is thought that this difference may be due to the low proportion of married participants in our study, and that married students use smartphones more without fulfilling their commitments related to work, family, and social duties.

Table 4. The effect of smartphone addiction on problem-solving

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t	p	95% CI	
	B	SE	ß			Lower	Upper
Fixed	76.649	3.680		20.827	0.000	69.411	83.887
Smartphone Addiction*	0.628	0.095	0.331	6.581	0.000	0.440	0.816
Fixed	18.736	2.254		8.313	0.000	14.303	23.168
Smartphone Addiction**	0.191	0.058	0.172	3.269	0.001	0.076	0.306

*Dependent Variable=Problem Solving Inventory Total, R=0.331; R2=0.107; F=43.311; p=0.000; Durbin Watson Value=1.621

** Dependent Variable=Difficulties in Emotion Regulation Scale Total, R=0.172; R2=0.027; F=10.684; p=0.001; Durbin Watson Value=1.762

CI: Confidence interval, SE: Standard error

Taking courses on technology addiction reduces the risk of SA and increases problem-solving and emotion regulation skills. This finding reveals the importance of including courses on technology addiction in curricula.

It was found that the scores of students' SA and DERS-16 showed no significant difference according to where they lived. This shows that students' emotion regulation skills and smartphone use are at a similar level regardless of their living area. The fact that the student's scores in these two scales were not affected by the place of residence may be because the general living conditions of university students are similar to each other (26)

On the other hand, the PSI scores of the students show a significant difference according to where they live. The reason for this difference is that the PSI scores of students living with their families are higher than those of students living with friends. Similarly, the PSI scores of students living in dormitories were higher than those of students living with friends. These findings suggest that students living with their families or in dormitories may have more developed problem-solving skills because they are in a more structured and supportive environment. Students living with their families can develop their problem-solving skills more effectively with the guidance and support of their families (27). Students living in dormitories may be more experienced in adapting to dormitory rules and coping with various difficulties (28).

When the cause-and-effect relationship between SA and difficulties in problem solving and emotion regulation is examined, a high-risk score for SA increases the problem-solving inventory score and the level of difficulties in emotion regulation. In addition to the problems brought by life, SA also makes it difficult for the individual to regulate their mood and psychosocial life (29).

CONCLUSION

In our study, an increased risk of SA was found to lead to an increase in emotion dysregulation and a decrease in problem-solving skills. Although it is debated whether these effects can be evaluated under the concept of addiction, it is suggested that strategies to reduce the risk of SA (such as adding courses to the curriculum) should be implemented to reduce the effects. In addition, our study draws attention to the problems caused by the risk of SA and provides important data for anti-addiction action plans organized by universities. To reduce the risk of SA, it is recommended that courses on SA should be added to the curricula, psychoeducation activities should be conducted against unconscious and problematic smartphone use, and university clubs should organize activities on this subject.

Conflict of interest: None of the authors reported any conflict of interest

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