



Investigation of Problematic Mobile Phones Use and Fear of Missing Out (FoMO) Level in Adolescents

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Abstract

The aim of the study is to define problematic mobile phone use (PMPU) and level of fear of missing out developments in social media (FoMO) in adolescents. The study sample consisted of 1630 students. The data were collected using fear of missing out scale (FoMOS), and scale for problematic mobile phone use (PU). Statistically significant differences were found the mean scores on PU according to gender, age, and academic success. The students' mean scores on PU and FoMOS were found to significant difference depending on frequency of social media and phone use. A significant relationship was found between the mean scores for FoMOS and PU. The regression analyses showed that the independent variables predict 27.5% of PMPU.

Keywords Problematic mobile phone use · Fear of missing out · Social network · Addiction · Adolescence

Introduction

Today, technology has been integrated in every aspect of life and in parallel with this, computer games, mobile/smartphones and social media use have rapidly become widespread among adolescents in recent years. (Tekin et al. 2014; Sapacz et al. 2016; Zhitomirsky-Geffet and Blau 2016). In the literature, Far Eastern countries are placed near the top in problematic mobile phone use (PMPU) (Çam and Nur 2015; Darcin et al. 2016; Seo et al. 2016), two in every three people use smartphones in the United States (Elhai et al. 2017a), about 70% of teenagers use social networks with high potential for addiction (Tanga and Kohb 2017). According to 2017 Turkish statistical data, the internet use ratio is 66.8%, mobile phone use ratio is 98%, smartphone use ratio 77% and active social media use ratio is 51% and the number of Facebook users is reported to be 51 million (Turkish Statistical Institute report 2017; “We are social in western Asia” report 2018). As technology use has become widespread, its personal and social negative effects besides

benefits are being searched (Darcin et al. 2016; Elhai et al. 2017b; Hormes et al. 2014; Lopez-Fernandez 2017; Seo et al. 2016; Tekin et al. 2014; Zhitomirsky-Geffet and Blau 2016). Especially smartphones are personalized computers that fit the world inside a palm with internet connection rather than communication; therefore, the term problematic smartphone use instead of PMPU is becoming widespread in the literature (Long et al. 2016; Wolniewicz et al. 2018). However, smartphones are digital devices with multiple purposes, such as computer games, internet, and social media, which complicate definition and naming of problem (Elhai et al. 2017a). In the literature, besides those who argue for behavioral addictions as diagnosis, there are also those who take the issue as a control problem rather than addiction diagnosis. The issue is discussed in ICD 11 under the heading of behavioral addiction disorders; besides, in American Psychiatric Diagnostic Classification (DSM-V), only computer game addiction is taken into consideration (Foerster and Rössli 2017).

Problematic smartphone use is defined as “inability to regulate one’s use of the smartphone, which eventually involves negative consequences in daily life” (Long et al. 2016). In problematic mobile/smartphone use, a behavioral addiction where mostly cognitive and emotional effects take part is mentioned and its symptoms are regarded similar to internet addiction (Jiang and Zhao 2017; Young 2015; Wang et al. 2015). Disruption in work and labor, excessive

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duration of use and its irreducibility, individual's lack of control over mobile/smartphone use behavior and deprivation are defined as major symptoms (Chen et al. 2017). In the studies conducted, it is stated that peers influence each other through social shares (Groth et al. 2017), and it is also stated that PMPU risk is higher for those who have external locus of control, low self-esteem and impulse control problem (Li et al. 2015; Wang et al. 2015; Young 2015; Jiang and Zhao 2017; Yang et al. 2010). It is also stated that intensive social media use causes PMPU (Runcan 2015; Oberst et al. 2017; Tanga and Kohb 2017). Today, individuals use internet and social media networks via smartphones for purposes such as searching for old friends, making new friends, establishing communication, becoming organized, sharing photos and videos, disseminating information, reducing emotional stress and having fun (Banyai et al. 2017; Groth et al. 2017; Elhai et al. 2017b; Harwood et al. 2014; Kırıklı et al. 2015; Lee and Leeb 2017; Samaha and Hawi 2016; Tanga and Kohb 2017). As a result of intensive use of mobile/smartphones and social networks, development, behavior and academic success of adolescents can be negatively affected (Ögel 2014; Seo et al. 2016). According to the literature, daily life is negatively affected as a result of constantly being online/desire for notification control, self-control failure, inability to plan time, sleep disorder, attention deficit, memory problems, uneasiness, aggression, depression, anxiety and loneliness (Balyai et al. 2017; Darcin et al. 2016; Elhai et al. 2017a; Harwood et al. 2014; Li and Lepp 2015; Lopez-Fernandez 2017; Kırıklı et al. 2015; Tekin et al. 2014; Wood et al. 2016; Tanga and Kohb 2017), in addition to mental effects, sight, muscular and skeletal problems (Elhai et al. 2017a; Lee and Leeb 2017). On the other hand, it mentions that social media oriented smartphone use will make some positive contributions to problems such as loneliness.

Adolescences use social networks much more due to needs like being in communication with peers, belonging, self-assertion, popularity and social support. Social media applications, on the other hand, target the users to be constantly online. Intensive use of social networks become a source of stress, consequently Fear of Missing Out (FoMO) may develop in time (Beyens et al. 2016; Elhai et al. 2017b; Tams et al. 2018). FoMO is referred as “fear of missing out developments in social media.” It is a problem that cause individuals to spend quite long times in social media for fear that they miss out developments in social networks and cannot be informed about developments regarding others and experience fear of social exclusion. Especially problematic mobile/smartphone use and social media addiction are being associated, and it is stated that social media is an important motivation source. (Alt 2015; Elhai et al. 2017a; Gökler et al. 2016; Przybylski et al. 2013; Oberst et al. 2017; Wolniewicz et al. 2018). In parallel with social media use, FoMO increases among adolescents whose social and

psychological needs are not adequately satisfied, who have anxiety and depression, and low self-confidence (Oberst et al. 2017).

Behavioral addictions related to technology pose risks for youths' mental health. But, in technological behavioral addictions, complete avoidance of the relevant object is not expected as it is in chemical addictions treatment (Ögel 2014). Behavioral addictions are preventable through self-control, and curable through cognitive behavioral methods (Ögel 2014; Xu et al. 2015). However, it is envisaged that accelerating digital technology will also change humanity and problems related to behavioral addiction will take shape and increase in time. Therefore, adolescents should be considered as risky and priority group. This study departs from the idea that social media is an important factor in mobile/smartphone use among adolescents at a problematic level. The aim of the study is to define PMPU and level of FoMO in high school students, to examine correlated independent variables and to analyze the correlation between PMPU and FoMO. The research questions are as follows:

- What are the characteristics of students' social media/internet use?
- What are PU and FoMOS scores according to socio-demographic characteristics of students?
- What are PU scores with regard to mobile/smartphone use characteristics of students?
- What are FoMOS scores with regard to mobile/smartphone use characteristics of students?
- How is the correlation between PU and FoMOS scores of students?

Materials and Methods

For the study in which correlational screening model is used, firstly permission (16/145) from Mugla Sıtkı Kocman University Scientific Ethics Committee and written permission from authorized National Education Directorate have been obtained.

Participants

This research was done in Fethiye district of Muğla. The study was carried out in 11 high schools in the city center in 2017 and a total of 4460 high school students formed the universe. We aimed to reach the entire universe but most of the senior class students did not accept to participate in the study due to the intensity of their examination process. The sample was composed of 1630 students who agreed to participate in the study. The minimum student representation rate from schools is 30%. Therefore, we can say that sample represent the universe and the results can be generalized.

Measurements

Research data was obtained by using “Information Form”, “Fear of Missing Out Scale”, “Scale for Problematic Mobile Phone Use”. The necessary permission for the use of Turkish version of the scales was obtained from the researchers.

Information Form

It is developed by the researchers to obtain information about the socio-demographic situation of students. This form contains information about socio-demographic characteristics of the participants such as age, gender, education level of parents, family attitude and descriptive information like mobile/smartphone use frequency and duration, and social media use.

Fear of Missing Out Scale (FoMOS)

Fear of missing out developments in social media scale was consisted 10-question with 5 point likert that developed by Przybylski et al. (2013). Each item in the scale is graded between 1 and 5, the score of the scale varies between 10 and 50, individual's FoMO probability increases with the increase in score. The validity and reliability study of the Turkish version of the scale is done by Gökler et al. Cronbach's alfa coefficient is calculated as 0.81 (Gökler et al. 2016).

Scale for Problematic Mobile Phone Use (PU)

Developed by Augner and Hacker, the scale measures excessive use of mobile phone, the correlation between mobile phone and some mental variables and the possible negative effects of prolonged use of mobile phone. Four point likert scale PU consists of three sub-dimensions, which are ‘addiction’, ‘social relations’ and ‘consequences’, and 20 questions. Sub-dimensions and scale total score is calculated in the scale. High point shows the person uses mobile/smartphone at a problematic level. The validity and reliability study of the Turkish version of the scale is done by Tekin et al. (2014). Cronbach's alfa values of scale are found to be 0.72 for ‘addiction’, 0.60 for ‘social relations’, 0.84 for ‘consequences’ and 0.85 for total scale (Tekin et al. 2014).

Procedure and Analysis

In data collection stage, directors of schools were informed and information about the study was provided at times that deemed appropriate by the directors. Data collection tools were applied to the students who accepted voluntary participation. Data obtained was evaluated with SPSS 22.0 software package in computer. With regard to Kurtosis

and Skewness values, the data showed the normal distribution. Variables was evaluated with Independent sample *t* test, One-way ANOVA test and One sample Kolmogorov–Smirnov *Z* test. Correlation and regression analysis was applied to determine the correlation between the scale scores.

Results

Analysis of Socio-demographic Characteristics of Students

Of students, 55% (n=896) were girls, 45% (n=734) were boys, 58.7% (n=956) were between 15 and 16 years old, and 41.3% (n=674) were between 17 and 18 years old. While 9.4% (n=154) of the students were only one child, 54.5% (n=889) have one sibling, 36% (n=587) have two and more siblings. Of mothers, 38.2% (n=623) were primary school graduates, 25.0% were secondary school (n=407) graduates and of fathers 31.3% (n=510) were primary school graduates and 24.7% were high school (n=402) graduates. Of students, 15.8% (n=258) perceived family attitudes as authoritarian/domineering, 15.5% (n=253) as overprotective, 12.5% (n=203) as overly relaxed, 42.3% (n=689) as democratic. While 5.3% (n=86) of students stated that their school success was bad, 44.6% stated as “average” (n=727), 39.4% as “good” (n=643), 10.7% (n=142) as “very good”.

Analysis of Mobile/Smartphone Use Characteristics of Students

A great majority of students (87.5%) use smartphone for connecting to internet and social networks and all of them have at least one social media account. Of students, 18.3% (n=299) stated that they spent less than 1 h/day, 38.7% (n=631) spent 1–2 h/day, 26.3% (n=428) spent 3–4 h/day, 16.7% (n=272) spent more than 5 h/day with phone. Of students, 19.1% (n=312) stated that they used social networks “very frequently”, 38.6% (n=629) used “frequently”, 28.7% (n=467) used “sometimes”, 13.6% (n=222) used “rarely”. To the question “Do you spend enough time with your family?”, 18.2% (n=297) of students answered “no”, 31.7% (n=517) said “sometimes”, 24.4% (n=397) responded “frequently” and 25.7% (n=419) answered “considerably”. When their frequency of checking phone/social media account without any notifications or calls was asked, 24.8% (n=405) of students answered once in every 10–15 min, 22.5% (n=366) said once in every 20–30 min, 23.1% (n=376) answered once in every 1 h, 19.5% (n=318) answered a few times a day, and 10.2% (n=165) answered very rarely. Additionally, of students, 83.9% were Whatsapp users, 83.7% were Facebook users, 67.8% were Twitter users

and 62.1% were Instagram users (multiple answers were given).

Analysis of PU and FoMOS Scores According to Socio-demographic Characteristics of Students

The mean score of the students was found to be 36.11 (*SD* 14.99) for the total PU. It is 12.41 (*SD* 5.99) for addiction sub-dimension, 9.64 (*SD* 3.98) for social relations sub-dimension, 14.05 (*SD* 7.87) for consequences sub-dimension. The socio-demographic characteristics and PU scores of the students are shown in Table 1. Significant statistical difference ($p < .05$) was determined regarding PU total score and all sub-dimension mean scores according to students' gender. Scale sub-dimension scores and PU total mean scores of female students were higher than the male students. Significant statistical difference ($p < .05$) was determined in PU social relations sub-dimension according to students' ages and mean score of students in 15–16 age group was higher than students in 17–18 age group. There were statistically significant differences ($p < .05$) in addiction and social relations sub-dimensions of the scale and total mean scores according to the number of siblings. According to the mother's education and school success status of the students, significant statistical differences were determined ($p < .05$) in total and all sub-dimension scores of the scale and it was found out that those with low mother's education level and high school success have lower scale scores than others. Moreover, the mean score of the students was found to be $X = 24.09$ (*SD* 7.48) for the total FoMOS score. When FoMOS score of students' socio-demographic characteristics were compared, statistically significant difference was found out for the education level of mother and family attitude ($p < .05$). It was determined that students with domineering/authoritarian families had a higher scale score while students with indifferent/distanced families had a lower scale score (Table 1). Higher scale score is also the case with those students whose mothers are university graduates.

Analysis of PU Scores According to Mobile/Smartphone Use Characteristics of Students

There were significant differences between the students' PU total score and all sub-dimension means ($p < .001$) according to frequency to use social media accounts and daily mobile/smartphone use durations. PU scores were higher for those who used social media account more frequently and who had longer daily mobile/smartphone use duration. Students who connected to social networks through smartphone had higher addiction, social relations sub-dimensions and PU total mean scores and significant difference ($p < .05$) compared to those students who connected to social networks through tablets/computers. Moreover, according to frequency to

check mobile/smartphone and social media account without notification/call, PU all sub-dimensions and total score found a significant difference ($p < .001$); those who checked frequently had higher scale scores. According to students' spending effective time with their families, significant differences were determined regarding PU social relations, consequences sub-dimensions and total mean scores ($p < .001$); PU scores of students who spent more time with families were lower (Table 2).

Analysis of FoMOS Scores According to Mobile/Smartphone Use Characteristics of Students

FoMOS scores of students according to social media and mobile/smartphone use characteristics were compared in Table 2. According to social network connection tools, frequency to check social media accounts and visit social networks, daily phone use durations, and situation of spending effective time with families, statistically significant differences were determined between students' FoMOS mean scores ($p < .05$). Students who used social networks and mobile/smartphone more, checked social media account and phone frequently without notification, and spent less time with family had higher FoMOS score (Table 2).

Correlation Between PU and FoMOS Scores of Students

When the correlation between students' FoMOS and PU mean scores was examined, low level and significant correlation was determined in addiction, social relations, consequences sub-dimensions and total mean scores ($p < .001$). As the students' FoMOS scores increased, PU sub-dimensions and total scores also increased (Table 3). As a result of regression analysis, it was determined that variables within the scope of the study had medium level ($R = 0.524$) and significant interaction with students' PU mean scores. These variables explain 27.5% of the PMPU of students. According to standardized regression coefficient (β), independent variables, such as gender, mother's education level, school success, daily mobile/smartphone use duration, frequency of social media visits and checks, social media connection tool, and FoMOS scores significantly ($p < .05$) effected PU mean scores (Table 4).

Discussion

In our study, a great majority of students are connected to internet and social media through their smartphones. In a similar study conducted in Korea, 90% of students had smartphone use (Lee and Leeb 2017). In another study, 97% of adolescents between 12 and 19 ages who used phones

Table 1 Comparison of average scores of PU and FoMoS according to students' sociodemographic characteristics

Variables	Categories	Scale for problematic mobile phone use (PU)										FoMoS total	
		Addiction		Social relationships		Consequences		PU total		X	SD	X	SD
		X	SD	X	SD	X	SD	X	SD				
Gender	Woman (n: 896)	12.55	5.87	10.00	3.90	14.55	7.93	14.72	14.72	24.11	7.80	24.11	7.80
	Men (n: 734)	11.84	6.11	9.02	4.00	13.27	7.76	15.21	15.21	23.81	7.32	23.81	7.32
Age	t/p	4.14/0.000**		5.33/0.000**		3.35/0.001**		4.80/0.000**		1.80/0.072		1.80/0.072	
	15–16 (n: 956)	12.22	6.11	9.76	3.95	14.09	7.79	15.02	15.02	23.81	7.56	23.81	7.56
	17–18 (n: 674)	12.17	5.84	9.20	4.00	13.72	7.98	15.03	15.03	24.18	7.59	24.18	7.59
Number of sibling	t/p	-0.008/0.994		2.02/0.044*		0.20/0.837		0.65/0.512		-0.72/0.471		-0.72/0.471	
	One child (n: 154)	11.28	6.42	9.11	4.23	13.38	8.00	16.26	16.26	23.87	6.62	23.87	6.62
Mother education	One sibling (n:889)	12.56	5.89	9.78	3.77	14.14	7.83	14.68	14.68	24.04	7.46	24.04	7.46
	Two sibling (n:438)	12.72	6.17	10.01	3.97	14.56	8.11	15.32	15.32	24.36	7.63	24.36	7.63
	Three and above (n: 149)	11.77	6.06	8.20	4.02	12.68	7.15	13.82	13.82	23.80	8.01	23.80	8.01
	F/p	2.92/0.033**		0.48/0.000**		2.52/0.056		4.89/0.002**		0.31/0.813		0.31/0.813	
	Uneducated (n: 67)	10.65	5.91	8.01	4.33	16.10	8.24	15.45	15.45	22.23	7.16	22.23	7.16
Family attitude	Primary school (n: 623)	12.40	5.58	9.67	3.80	14.05	7.45	13.80	13.80	23.61	7.21	23.61	7.21
	Secondary school (n: 407)	13.04	6.20	10.15	3.93	14.78	7.72	14.91	14.91	25.03	7.76	25.03	7.76
	High school (n: 318)	11.83	6.44	9.38	4.00	13.27	8.28	16.28	16.28	23.82	7.39	23.82	7.39
	University (n: 215)	12.65	6.32	9.46	3.87	13.13	8.44	16.02	16.02	24.70	7.73	24.70	7.73
School success degree	F/p	3.33/0.010**		5.12/0.000**		3.53/0.007**		2.78/0.025*		3.76/0.005**		3.76/0.005**	
	Authoritarian/domineering (n: 258)	12.73	6.16	9.84	4.00	14.87	8.12	15.25	15.25	24.70	8.40	24.70	8.40
	Over protective (n: 253)	12.65	5.47	9.86	4.00	13.72	7.40	14.40	14.40	25.17	7.36	25.17	7.36
	Overly relaxed (n: 203)	12.36	6.49	9.01	4.52	14.15	8.79	16.82	16.82	22.23	7.48	22.23	7.48
	Democratic/indulgent (n: 689)	12.13	6.00	9.59	3.60	13.65	7.54	14.35	14.35	23.89	7.04	23.89	7.04
	Neglectful/distant (n: 45)	13.13	6.51	9.62	4.70	15.97	7.75	16.43	16.43	25.13	7.09	25.13	7.09
	Other (n: 153)	12.55	6.20	9.90	3.91	14.21	8.27	15.22	15.22	24.29	7.48	24.29	7.48
	F/p	0.67/0.645		1.51/0.182		1.56/0.167		1.10/0.357		4.23/0.001**		4.23/0.001**	
	Bad (n: 86)	15.16	5.94	10.41	4.82	16.15	9.45	17.57	17.57	24.12	7.99	24.12	7.99
	Average (n: 727)	13.06	5.77	9.93	3.81	14.73	7.62	14.28	14.28	24.34	7.19	24.34	7.19
Very good (n: 174)	Good (n: 643)	11.75	6.09	9.39	3.74	13.23	7.63	14.53	14.53	23.83	7.72	23.83	7.72
	F/p	15.72/0.000**		5.14/0.002**		6.89/0.000**		12.63/0.000**		0.55/0.646		0.55/0.646	
	Very good (n: 174)	10.79	6.29	8.94	4.37	13.18	8.54	16.64	16.64	23.99	7.50	23.99	7.50

*p < .05, **p < .01

Table 2 Comparison of average scores of PU and FoMoS according to social media & internet using characteristics

Variables	Categories	Scale for problematic mobile phone use (PU)						FoMoS total			
		Addiction		Social relationships		Consequences		PU total			
		X	SD	X	SD	X	SD	X	SD		
Frequent of social media using	Very frequently (n: 312)	15.40	6.62	10.80	4.59	16.75	8.85	42.95	17.52	26.92	7.86
	Frequently (n:628)	13.14	5.34	10.01	3.49	14.69	7.46	37.87	13.07	24.73	7.30
	Sometimes (n: 467)	11.01	5.77	8.96	3.70	12.31	7.27	32.29	13.95	22.22	6.77
	Rarely (n: 222)	9.07	5.18	8.38	3.94	12.10	7.48	29.55	13.42	22.25	7.34
	F/p	66.43/0.000**		24.10/0.000**		26.92/0.000**		53.40/0.000**		32.37/0.000**	
Devices of Internet using	Smartphone (n: 1321)	12.71	5.92	9.76	3.84	14.17	7.78	36.65	14.65	24.37	7.47
	Tablet/PC (n: 203)	10.59	6.56	9.02	4.38	13.32	8.40	32.93	16.95	22.16	7.52
	All devices (n: 106)	12.14	5.92	9.31	4.00	13.86	8.03	35.48	14.50	24.28	7.04
	F/p	11.10/0.000**		3.51/0.030*		1.07/0.342		5.53/0.004**		7.77/0.000**	
Daily hours of using mobile/smartphone	Less 1 h (n: 299)	9.89	6.14	8.84	4.46	12.06	7.84	30.80	15.23	22.36	6.95
	1–2 h (n: 631)	11.66	5.51	8.96	3.45	12.83	7.25	33.45	13.48	23.38	7.25
	3–4 h (n: 428)	13.61	5.55	10.22	3.59	15.40	7.57	39.25	13.61	25.10	7.59
	5 h and over (n: 272)	15.01	6.45	11.15	4.25	16.92	8.59	43.18	16.38	26.04	7.77
	F/p	46.34/0.000**		28.26/0.000**		29.13/0.000**		49.43/0.000**		6.36/0.000**	
Effective time with family	Considerably (n: 419)	11.90	6.35	8.95	3.96	12.63	7.93	33.52	15.45	22.61	7.54
	Frequently (n: 397)	12.52	5.94	9.60	3.68	14.03	7.32	36.15	14.02	24.02	7.53
	Sometimes (n: 517)	12.50	5.60	10.05	3.81	14.49	7.55	37.05	14.11	24.54	7.01
	No (n: 297)	12.81	6.46	9.93	4.25	15.29	8.75	38.06	16.57	25.47	7.80
	F/p	1.51/0.209		6.85/0.000**		7.63/0.000**		6.56/0.000**		9.58/0.000**	
Daily frequency of checking to account without notification	10–15 min (n: 405)	14.79	6.45	10.98	4.24	16.77	8.53	42.59	16.19	25.33	8.05
	20–30 min (n: 367)	13.52	5.65	9.73	3.59	15.15	7.43	38.41	13.51	24.12	7.05
	1 h (n: 376)	11.99	5.26	9.49	3.46	13.69	6.91	35.18	12.81	24.45	7.11
	A few times (n: 318)	10.44	5.84	8.99	3.95	11.55	7.58	30.98	14.47	23.12	7.19
	Very rarely (n: 164)	8.89	4.81	7.73	3.66	10.53	6.931	27.16	12.31	22.02	7.75
F/p	46.01/0.000**		25.21/0.000**		32.54/0.000**		50.82/0.000**		7.59/0.000**		

*p < .05, **p < .01

Table 3 The relationships between PU and FoMOS average scores

	PU Total		Dependence		Social relationships		Consequences	
	r	p	r	p	r	p	r	p
FoMOS total	0.379	0.000**	0.3626	0.000**	0.300	0.000**	0.294	0.000**

*p < .05, **p < .01

Table 4 Multiple regression analysis of variables effecting to PU

	B	Standard error	Standard beta (β)		
Gender	-2.413	0.663	-0.080	-3.637	0.000
Age	-0.222	0.657	-0.007	-0.338	0.736
Number of siblings	-0.532	0.421	-0.028	-1.264	0.206
Mother education level	-0.750	0.359	-0.058	-2.086	0.037
Father education level	0.085	0.346	0.007	0.245	0.807
Family attitude	-0.101	0.216	-0.010	-0.470	0.639
School Success level	-2.176	0.437	-0.109	-4.982	0.000
Daily hours of using mobilephone/internet	1.827	0.380	0.118	4.812	0.000
Frequency of social media using	-0.995	0.407	-0.062	-2.444	0.015
Effective/enough time with family	0.360	0.310	0.025	1.162	0.245
Frequency of checking to social media	-2.498	0.273	-0.218	-9.152	0.000
Devices of social media using	-1.101	0.546	-0.043	-2.015	0.044
FoMOS total score	0.620	0.044	0.309	14.015	0.000

R = 0.524, R² = 0.275, F = 46.963, p = 0.000

were smartphone users (Foerster and Rösli 2017). Therefore, smartphone use has become very widespread especially among adolescents in the world and in Turkey, and this is evaluated as compatible with the accelerating technological development. Also, although more than half of the students in our study indicated their daily mobile/smartphone use as 2 h and less, it has to be taken into consideration that they might have perceived the time they spent less than it actually was. The ratio of students who used mobile/smartphone 5 h or more was approximately 1/6 and these students could be evaluated as risky level of use. In Korea, 90% of 12–19 age group adolescence use intensive technology and social media through smartphone (Seo et al. 2016). In a study conducted in China, the ratio of problematic mobile/smartphone use was reported to be 21.3% (Long et al. 2016). Moreover, most of the students were using social media frequently and approximately half of them checked their social media accounts in less than every 30 min. Despite restrictions regarding phone use at schools, notification control time period is frequent and it is understood that social media plays an important role in phone use for approximately half of the students; moreover, approximately half of the students use mobile/smartphone as the way to make use of their spare time. In a study conducted in the USA in 2015, it was determined that users spent about 1.7 h per day in social media, in Britain it was 1.5 h, in Philippines it was 3.7 h at most (Groth et al. 2017). Also, it was stated that mobile/smartphone use durations were long in class, before sleep, at

friend get-togethers and while walking (Darcin et al. 2016). In another study conducted with adolescents in Switzerland, average daily mobile phone use was determined as 3 calls, 45 messages and 85 min long use in traffic, and more intensive use than country average was stated (Roser et al. 2016). In the sample, high ratio of mobile/smartphone and social media use is compatible with the literature, and it can be associated with excessive technology use of X generation teenagers and with priority given to social interaction with peers in adolescence (Seo et al. 2016). In the sample, while it is determined that social media and sharing sites/networks such as WhatsApp, Facebook, Twitter, Instagram are used at most, it is also frequently stated in the literature that similar sites are being used (Kırıklı et al. 2015). As it is indicated in 2018 “We are social in western Asia” report, these social networks took place near the top in Turkey sample. According to a recent report conveyed, Facebook came first in the world among the young social media users, 71% of adolescents used more than one social networks and 24% of adolescents were constantly online owing to the fact that smartphone use had become widespread (Banyai et al. 2017). Those social networks with widely used chat features were being placed near the top for students and this emphasized the importance of interaction among adolescents.

The mean score of the students was found to be 36.11 (*SD* 14.99) for the total PU. It is 12.41 (*SD* 5.99) for the addiction sub-dimension, 9.64 (*SD* 3.98) for the social relations sub-dimension, 14.05 (*SD* 7.87) for the consequences

sub-dimension. In Tekin et al.'s study (2014) in the student sample of 18–20 age group; while scale total PU score was $X = 32.05$ ($SD 11.02$), addiction sub-dimension score was $X = 12.56$ ($SD 4.78$), social relations sub-dimension was $X = 8.10$ ($SD 3.72$) and consequences sub-dimension score was $X = 8.15$ ($SD 6.17$), it is seen that our sample's scores were higher. It is thought that spread of smartphone and social media use within years are effective in this different result. In the literature it is stated that the most intensive social media use is in 15–17 age group (Kırıklı et al. 2015). Moreover, in our sample, students at 15–16 age groups had higher mean score for social relations sub-dimension of the scale. Social interaction in virtual environment has differences with face-to-face interaction and in adolescence where social interaction is important, smartphone and social media use at a problematic level might affect social relations of adolescents much more negatively (Seo et al. 2016). In our study it was seen that female students had more PU score than male students, and they were more effected by the consequences of mobile/smartphone use. In the studies of Kırıklı et al. (2015) and Long et al. (2016), difference according to gender was not determined. In the studies of Tekin et al. (2014), Augner and Hacker (2012), Roser et al. (2016) and Wolniewicz et al. (2018) females, in the study of Şar (2013) males had more PMPU. Females, however, had especially more texting and social media use for reasons such as need for social interaction and social approval and social anxiety (Chen et al. 2017; Seo et al. 2016). In conservative societies, females might incline to use social media more because of restrictions in peer relations.

In our study, mean of PU sub-dimensions and total scores were significantly high in students with poor school success. While school success demonstrated significant difference ($p < .01$) according to daily mobile/smartphone use and study durations, students with less study hours and more phone use had lower school success. In the literature, it is stated that PMPU decreases level of academic performance; as social media use increases, academic performance declines (Samaha and Hawi 2016; Roser et al. 2016). In another study, it is emphasized that emotional and behavioral changes stemmed from mobile/smartphone use effect academic success indirectly (Seo et al. 2016). Students with low school motivation spend time with phone instead of studying and it can be said that these variables influenced each other. However, if mobile/smartphone phone is considered more as a tool, motivation to use it has to be taken into consideration with priority.

In the study, PU addiction and social relations sub-dimension mean scores were higher for students with two/three siblings than those have no sibling. Although those who were only one child might live feeling of loneliness more and be more inclined to addictions related to technology, scores of the group with multiple siblings were higher in this

study. Together with this, parents' education level in students with multiple siblings was found out to be lower. This result can be associated with decrease in family's attention and control in case of multiple siblings. Likewise, Roser et al.'s study (2016) emphasized that families with high PMPU level had low education level, and good family relations and functionality was stated to be the protective factor from addictive behavior. In the sample, PU scores of those who did not spend enough time with family were higher than other students. Moreover, the family attitude of students who spent enough time with family was mainly "democratic" while those who did not spend enough time with family had mainly "authoritarian" family attitude. While loneliness was an important factor in the etiology of social media use, Şar's study (2013) determined that decrease in loneliness score is related with increase in social media use. Therefore, existence of problems in inter-family relations and inadequate time spent by family members together might lead to feeling of loneliness among adolescents and cause them turn to virtual environment. On the other hand, teenagers in adolescence period become distant from families, an expected periodical characteristic, and tend to mobile/smartphone and social media use more in order to be in interaction with peers; therefore, with the increase in mobile/smartphone use because of social media they may become more distant from family. Likewise, the literature states that PMPU negatively effects face-to-face interaction with peers and family relations (Roser et al. 2016).

In the study, while FoMOS mean score of students was $X = 24.09 \pm 7.48$, in Stead and Bibby's study (2017) sample mean score was determined as 24.55 ($SD 7.54$) and alike, also scale score for females was found to be higher. In our study, there was not significant difference according to socio-demographic characteristics such as age and gender, but there was significant difference only regarding family attitude ($p < .05$). Those with domineering and authoritarian families had relatively higher scale points. This result showed that family attitude might influence especially affection and self-esteem in adolescence; besides adolescents with troubled family relations might tend more towards peers and social media. When studies in the literature were examined, different results were found. Przybylski et al. (2013) determined in their studies that FoMOS scores were high for young males, who had low level of life satisfaction, feeling depressive, lonely and overuse social media. In a study conducted in South America, female scores were higher and likewise social anxiety, depression and loneliness were found to be important factors in prominence of social media instead of face-to-face communication. However, it was stated that FoMO again increased anxiety and created a vicious circle (Oberst et al. 2017).

PU and FoMOS scores were determined higher for students who frequently visited social media, connected to

internet via smartphone, had longer daily smartphone use duration and checked phone/social media account without notification more frequently. This result did not surprise us; because excessiveness in frequency and duration of social media use via smartphone and adolescents' being constantly online on smartphones causes phone use at a problematic level, and frequent notification check indicates PMPU and FoMO. Excessive use of social media is also associated with FoMO in the literature (Alt 2015; Banyai et al. 2017; Long et al. 2016). In the Kırıklı et al.'s study (2015), social media addiction was found to be higher among those who checked social media account frequently. In the Foerster and Rösli (2017) study, while texting and social media use ratios were high, almost half of the adolescents had high PMPU level and they did not turn off the phones at night. In the Long et al.'s study (2016), it was also observed that with the increase in duration of use, PMPU scale score also increased. As a result of a research in Turkey, social media addiction showed significant difference according to time spent per day on smartphone and frequency to use social networks per day (Kırıklı et al. 2015). Therefore, increasing and more often use increase the potential of behavioral addiction and it may be considered as a risk. However, in some studies it was emphasized that proofs about the subject were insufficient (Oberst et al. 2017).

When FoMOS mean scores of students and PU sub-dimensions and total mean scores were compared, a low level significant relationship was determined, PU scores increased with the increase in FoMOS scores. The spread of social network applications was determined as an important factor in the etiology of PMPU. In the Buglass et al.'s study (2017) use of social media, in the Wolniewicz et al. (2018) study problematic smartphone and social media use was found out to be in association with high FoMOS scores, in the Stead and Bibby's study (2017), however, being online was associated with FoMO and it was stated that individuals look for fulfillment of their social and psychological needs over the profiles created according to their desires on social networks such as Facebook. Moreover, online life was considered as a social capital, the need for arranging and checking account was associated with intensive social media use. Moreover, in our study, according to standardized regression coefficient (β), variables such as gender, mother's education level, school success level, mobile/smartphone phone use duration per day, frequency of social media visit and notification check, social media connection tool, and FoMOS score effected students' PU scores, and medium-level significant relationship was observed. Therefore, these variables that determined as correlated are in accordance with the literature discussed before and these data are guiding for us in interventions to understand and prevent adolescents' PMPU problem and motivations for use that can be effective such as social media.

Conclusions

According to the results obtained in the study, variables such as gender, family attitude, situation of spending adequate time with family, school success, smartphone use, frequency and duration to use social media display prominent correlated variables with regard to PMPU and FoMO. These results obtained from the study are also in accordance with literature and national statistics, and they are generalizable. But all variables were collected using students' self-reports and this might be caused to limitations. It can be said that excessive use of technological devices adversely affects the health and development of adolescents. But, we consider the motivation to use technological tools is to be given more emphasis than no use of technological tools. Therefore, rather than restricting use of mobile/smartphone as a tool, it is more realistic to say that reasons for its intensive use, which are social media, social network applications and online games should be controlled.

Suggestions

Factors that lead to intensive use of technological tools and their effects should be examined more comprehensively. Moreover, conducting qualitative studies with youngs and examining the problem from their point of view might be helpful. But it should be taken into consideration that in a rapidly changing technological world, data will also change very fast. In order to decrease problematic mobile/smartphone use and behavioral addiction risk, we can make suggestions such as guiding adolescents to be involved in leisure activities and join real social activities instead of using intensive social media, improve inter-family and peer relations and build projects to increase mental health and awareness of adolescents. Within this framework, families, educators, mental health professionals, media and administrators should be in cooperation.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval The article was in accordance with the ethical standards and compliance with the protection of all human rights.

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