Understanding Patterns for Smartphone Addiction: Age, Sleep Duration, Social Network Use and Fear of Missing Out[*]

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Abstract

The aim of this study is to examine high school students and uncover the relationships between Smartphone Addiction levels and certain factors such as (a) Fear of Missing Out (FoMO) (b) Social Networking Site (SNS) usage habits (using smartphones), (c) age, d) sleep duration and (e) duration of smartphone ownership. The study group consists of 161 students from two public high schools in Turkey. Two different scales were employed for data collection; namely, the Smartphone Addiction Scale and FoMO Scale. Based on a cross-sectional research method, this qualitative study makes use of Pearson Correlation and Stepwise Multiple Regression statistical tests. Findings have shown positive correlations interpreted as Smartphone Addiction increasing with greater student age, daily duration of SNS use on smartphones, duration of smartphone ownership, and Fear of Missing Out. In addition, there exists negative-correlation between smartphone addiction and sleep duration, as well as frequency of SNS use on smartphones. Last but not least, it has been shown that FoMO, daily duration of SNSs use on smartphone and duration of smartphone ownership predict smartphone addiction, with the FoMO variable being the strongest predictor.

Keywords: Fear of missing out, high school students, lack of sleep, smartphone addiction, social networking sites.

1. Introduction

For well over a decade, smartphones have been enabling individuals to communicate with one another and access information, anywhere and anytime. Today, it can be said that these electronic devices have become an extension to the minds and bodies of more than a few people. According to the report titled 'We Are Social' published by Kemp (2017) more than half of the world's population is using smartphones, and the number is still increasing. In Turkey alone, 89.9% of the population -which accounts for 70.91 million people, are mobile device users and 75% of these devices fall into the category of smartphones. The same report shows that 2017 will be a year of significant increase in Internet use, and again predicts a rapid increase in the use of mobile devices. The Research Report on the Use of Information Technologies conducted by the Turkish Statistical Institute (TUIK [Turkish Statistical Institute], 2016) supports Kemp's findings, by conveying that 96.9% of Turkish people own mobile phones or smartphones.

However, it was quickly understood that the convenience brought about by the widespread use of smartphones also causes some problems for the individual. Problematic use of smartphones; such as excessive use, i.e. spending more time on smartphones than planned (Caplan & High, 2006), are considered to be the reason for this situation. Examples of problems caused by an uncontrollable urge for smartphone use include (a) the phenomenon of "texting while driving", which has been associated with many traffic accidents and risks (Cazzulino, Burke, Muller, Arbogast, & Upperman, 2014; Haigney & Westerman, 2001; McEvoy et al., 2005; Thompson, Baldock, Mathias, & Wundersitz, 2013), (b) manual, spinal and cervical health problems (Shan et al., 2013; Xie, Szeto, Dai, & Madeleine, 2016), (c) psychological stress and depression (Elhai, Dvorak, Levine, & Hall, 2017; Samaha & Hawi, 2016; Thomée, Härenstam, & Hagberg, 2011), (d) poor sleep quality (Li, Lepp, & Barkley, 2015; Soni, Upadhyay, & Jain, 2017), and (e) low academic performance (Alosaimi, Alyahya, Alshahwan, Al Mahyijari, & Shaik, 2016; Hawi & Samaha, 2016; Junco & Cotton, 2012; Lepp, Barkley, & Karpinski, 2015; Samaha & Hawi, 2016). In particular, adolescents and young adults spend a great portion of their day using their smartphones (Kumcagiz & Gunduz, 2016) as an intense and passionate means of communicating with their friends; transferring their experiences as well as following the "daily progress" of others in social media posts. Most teens are actively engaged in SNSs (Facebook, Instagram, WhatsApp etc.) use on their smartphones (Gezgin & Çakır, 2016) and as Sterling (2017) suggests, around 80% of social media activities are carried out over smart mobile devices. However, it is also reported that the problematic and excessive use of smartphones, especially due to binging on SNS, leads to an increase in psychological problems worldwide, mainly among young people (Bianchi & Phillips, 2005; Biglu & Ghavami, 2016). Scientific literature refers to these phenomena as "problematic mobile phone use" (Beranuy, Oberst, Carbonell, & Chamarro, 2009; Billieux, Schimmenti, Khazaal, Maurage, & Heeren, 2015) and "smartphone addiction" (Kwon, Kim, Cho, & Yang, 2013; Lin et al., 2014; Oulasvirta, Rattenbury, Ma, & Raita, 2012). For the purpose of clarification, it should be noted that this study combines these two reported phenomena and collectively refers to both of them under the name of 'Smartphone Addiction'.

1.1. Smartphone Addiction

Smartphones meet the functional and emotional needs of their users with built-in features such as the conventional telephony function and SMS messaging features; as well as with their extraneous software applications (mobile *apps*). Having grown up in an environment surrounded by various forms of next-generation, cutting-edge technologies; young people are especially open-minded about and quick to adopt new tools that bring about peculiar modes of communication and entertainment, such as smartphones (Aktas & Yılmaz, 2017). It can thus be said that, at this point in history, young people are more susceptible to the negative effects of smartphones than their senior counterparts. Being one of the most threatening problem pertaining to smartphone use, smartphone addiction can be defined as a negative and pathological concept that is evaluated through a system of subjective, behavioural, physiological symptoms such as preoccupation, loss of control, and even withdrawal symptoms (Bian & Leung, 2015; Kwon et al., 2013; Lee, Chang, Lin, & Cheng, 2014; Park & Lee, 2014). Although Smartphone addiction is largely a new phenomenon, there have been studies published in Turkish (Aktas & Yılmaz, 2017; Çakır & Oğuz, 2017; Demirci, Orhan, Demirdas, Akpinar, & Sert, 2014; Şar, Tuncay, & Horzum, 2015) and international (Ching et al.,2015; Lee et al. 2014; Lin et al. 2014; Kwon et al. 2013; Mok et al.,2014) academic literature on smartphone addiction, most especially covering efforts on the development of measurement scales for levels of addiction, as well as determining the predictors of the phenomenon.

1.2. Smartphone Addiction, Age and Lack of Sleep

The relationship between smartphone dependency and age has been examined in recent studies. Divan, Kheifets, Obel, and Olsen (2012), have found that children using mobile phones are more likely to display behavioural problems such as nervousness, bad temperament, mental distraction and indolence and that; these problems worsen if the child begins using the mobile phone at an earlier age. A study by Pearson and Hussain (2016) of 17-68 year olds found a negative relationship between age and smartphone addiction. Their results showed that younger individuals are more prone to

smartphone addiction. Moreover, earlier research also found that problematic smartphone use in general is predicted by younger age (Lu et al., 2011; van Deursen, Bolle, Hegner, & Kommers, 2015). Additionally, Whereas Demirci et al. (2014) found a statistically non-significant negative correlation (r=-0.086, p=0.13) between age and smartphone addiction scores among Turkish university students; a similar study conducted on university students by Demirci, Akgönül, and Akpinar (2015) also found that smartphone addiction negatively correlated with age (r=-0.189, p=0.003).

Young often tend to use their smartphones even while in bed, before going to sleep (Akıllı & Gezgin, 2016). This leads to the sleep duration for young people, who spend time at night using smartphones, to be reduced (Kamibeppu & Sugiura, 2005); leading to impaired sleep quality. Another report suggests that excessive electronic media use at night is a risk factor for both adolescents' sleep disturbance and depression (Lemola, Perkinson-Gloor, Brand et al., 2015). In a study with 362 adolescents aged 12-17, the adolescents who owned smartphones and consumed electronic media more frequently before bedtime; especially for the purpose of texting; spent more time online compared to adolescents who have traditional mobile phones. Even controlling for sleep disturbance and depression, smartphone use was also associated with sleeping at later hours in the night. Sleep disturbance is mediated in part by the relationship between the use of electronic media before sleep and depression statements. Electronic media use was negatively associated with sleep and sleep duration disturbance, which was also associated with depressive symptoms (Lemola, Perkinson-Gloor, Brand et al., 2015). Similarly, in another study conducted by Soni et al. (2017), the authors came to the conclusion that young people have developed significant sleep and behaviour problems due to the overuse of smartphones. Finally, Demirci et al. (2015) stated that depression, anxiety, and sleep quality may be associated with smartphone overuse.

1.3. Smartphone Addiction, FoMO and SNS Use

There have been studies that investigated the relationship between smartphone addiction and the use of social networking services on smartphones. In a study conducted among university students, smartphone addiction was found to be higher in young people with more than four hours of daily smartphone use compared to those with fewer hours of smartphone use (Aljomaa, Qudah, Albursan, Bakhiet, & Abduljabbar, 2016). It can be said that the role of SNS interaction plays a major role in smartphones use over long hours, especially in Turkey (Gezgin & Çakır, 2016).

A study by Elhai, Levine, Dvorak, & Hall (2016) revealed an association between the frequency of smartphone usage and smartphone dependency; stating that, as frequency of smartphone use increases, smartphone addiction also tends to increase (r=.34, p<0.001). Cheever, Rosen, Carrier, and Chavez (2014) conducted a study with university students, stating that the increase in daily duration of smartphone use caused anxiety levels to rise when students were separated from their smartphones. Additionally, some studies showed the use of SNS as a positive predictor of mobile phone addiction (Jeong, Kim, Yum, & Hwang, 2016; Salehan & Negahban, 2013). As smartphones are considered as convenient platforms for users to access SNSs constantly due to their portability and continuous connectivity (Jeong et al., 2016); it can be said that easy access to social network accounts can trigger excessive, uncontrollable SNS use, and can therefore contribute to smartphone dependency among young people.

To finalize this pattern, Fear of Missing Out, a concept which has been reported as a predictor of excessive use of SNS, should be considered. Przybylski, Murayama, DeHaan, and Gladwell (2013), who created the FoMO scale, concluded that individuals high in FoMO use social media sites more and are more likely to use their phones whilst driving a vehicle or sitting in a classroom. FoMO has been found to increase social media use in young people (Alt, 2015; Przybylski et al., 2013; Vaidya, Jaiganesh, & Krishnan, 2016), and some studies show that FoMO also was the variable most related to problematic smartphone usage (Alt, 2015; Clayton, Leshner, & Almond, 2015; Elhai et al., 2016; Przybylski et al., 2013). Gokler, Aydın, Ünal, and Metintaş (2016) also found a positive relationship between the increase in the frequency of social network use and FoMO. Smartphones that make social networks easier to access are thus thought to be predisposed to addiction.

Considering the findings above, the increasing use of SNSs and the need to check the information on the mobile screen can be considered as a predictor of smartphone addiction. Smartphone addiction and Social Networking Addiction may be intertwined concepts, a notion also pronounced by Kuss and Griffiths (2017). The current study examines the relationship between smartphone addiction and factors such as age, sleep duration, SNSs use and FoMO in high school students. More specifically, it aims to address the following research questions:

i. Is there a relationship between smartphone addiction and students' age?
ii. Is there a relationship between smartphone addiction and students' sleep duration?
iii. Is there a relationship between smartphone addiction and students' daily duration of SNS use?
iv. Is there a relationship between smartphone addiction and students' duration of smartphone ownership?
v. Is there a relationship between smartphone addiction and students' frequency of checking SNSs on smartphones?
vi. Is there a relationship between smartphone addiction and students' FoMO levels?
vii. Which variables among the measured ones, if any, predict smartphone addiction?

2. Method

2.1. Sampling

This cross-sectional study was based on Convenience Sampling. The study group consists of 178 high school students from two public schools in Edirne, Turkey. However, 17 students were removed from the study due to returning inadequately completed research forms. As a result, the study group comprised of 67 females (41.6%) and 94 males (58.4%), for a total of 161 high school students. The average age of the students was M=16.22 (SD=.99). Additionally, 45 of the students were studying at 9th Grade (28.0%), 68 students at 10th Grade (42.2%), 23 students at 11th Grade (14.3%), and 25 students at 12th Grade (15.5%). All students owned smartphones and used at least one SNS application on their device.

Table 1. Demographics information

	N	%
Gender		
Female	67	41.6
Male	94	58.4
School Type		
Vocational High School	85	52.8
Conventional High School	76	47.2
Grade		
9th Grade	45	28.0
10th Grade	68	42.2
11th Grade	23	14.3
12th Grade	25	15.5
Totals(N=161)	161	100.0

2.2. Data Collection Instruments

2.2.1. Smartphone Addiction Scale Short Form (SAS-SF)

The short form of the smartphone addiction scale was developed by Kwon et al. (2013) in order to measure the risk of smartphone dependency. The Turkish version of the SASS Scale was adapted by Noyan, Darçın, Nurmedov, Yılmaz, and Dilbaz (2015). The scale consists of 10 items, evaluated using six-point, Likert-type response options. Each item scores between 1 and 6 in the scale. The Cronbach's Alpha coefficient in the original reliability-validity study of the scale is 0.86 (Noyan et al.,2015). In this current study, the Cronbach's Alpha coefficient of the SASS Scale was calculated as 0.76.

3.2.1. FoMO Scale (FoMOs)

The tool was originally developed by Przybylski et al. (2013) and adapted to Turkish by Gökler et al. (2016). The FoMO Scale (FoMOs) has been used in this current study for the purposes of collecting data. A five-point, Likert-type scale was used in a single dimension with 10 items in total. Each item is given a score of 1-5 according to participants' choices (from '1=not true at all', to '5=definitely true'). The possible score outcomes for individuals range between 10 to 50 and there is no cut-off point in the scale. The higher the score, the more likely the individual in question has FoMO. The reliability coefficient using Cronbach's Alpha is 0.95 for the original scale, 0.81 for the Turkish adaptation of the scale, an 0.77 in this current study.

2.2.2. SNS Use and Bedtime Inquiry Form

The form tries to find out variables of high school students' Duration of Daily SNS Use on Smartphone, Duration of SNS Ownership, and Checking Frequency of SNS. The following questions were posed to obtain this data. 'How many years have you been using social networking services?', 'How much time (minutes/hours) do you spend on social networks with your smartphone in a day?', and 'How much time (minutes / hours) do you check your smartphone social network accounts for updates and notifications per day?'

To obtain data related to students' bedtime, the question "When do you go to sleep on weekdays?" was asked. It was assumed that students wake up at around 8 a.m. on week days to go to school so the waking up time was not asked.

2.2.3. Demographics Form

The Demographics form sought to capture variables of gender, student age, and school grade level.

2.3. Data Collection and Analysis

Permission to collect data from the high school students was obtained prior to data collection. The researcher informed the students about the purpose of the study, the research form that is going to be applied and explained that the participation is on the volunteering principle. Students were asked not to write their names on the research form in order to ensure their reliability through anonymity. Data was collected from the students during May of the 2016-2017 academic year spring term. The response time for completion of the research form lasted approximately 15 minutes. Pearson Correlation Coefficient and the order in which the variables that predict Smartphone addiction in students for the purpose of testing prediction qualities of data obtained from the research were analysed with the IBM SPSS 23.0 software package using the Stepwise Regression statistical analysis technique.

The obtained data were analysed considering age, DoS, DoSUS, DoSO, CFoS, FOMO, SAS and demographics variables and in accordance with step-wise regression statistical test. In order to carry out a reliable and valid analysis in step-wise regression, all the necessary assumptions were met: First, a linear relationship were found between the outcome variable and independent variable (see scatterplot). Second, the distribution of the obtained data (the errors between observed and predicted values) has been found to be normally distributed ($p>.05$). Third, the multicollinearity of the data was checked with Variance Inflation Factor -VIF (<10) and tolerance values ($>.02$). Fourth, independence of the residual values were tested with Durbin-Watson value (expected to be close to 2). Fifth, existence of influential cases causing bias in the model were found to be none (Cook's Distance values were all under 1). Finally, the homoscedasticity of the data has shown that variance of residuals were constant (see scatterplot). Accordingly, it was determined that the data were appropriate to perform step-wise regression analysis.

3. Results

Table 2 shows the mean and standard deviation of the scores of the participants, and the scores obtained from each of the independent variables. Table 2 also shows the correlation coefficients of the associations among Sleep Duration, Daily Duration of SNSs on smartphone, Duration of Smartphone Ownership, Checking Frequency of SNSs, FoMO, and Smartphone Addiction variables. As shown in Table 2, the correlation coefficients of the variables studied in the study ranged from r=.157 to r=.661. As can be seen from Table 2, the highest correlation is between Smartphone addiction and FoMO (r=.661, p<.01).

Table 2. Mean, standard deviations, and Correlations of model variables

Variables	1	2	3	4	5	6	7	M	SD
1. Age	1							16.22	.99
2. DoS	-.050	1						7.31	1.32
3. DoSUS	.074	-.089	1					211.75	149.73
4. DoSO	.265**	-.204**	.186*	1				5.95	2.14
5. CFoS	.157*	.099	-.199*	-.125	1			59.65	61.41
6. FoMO	.057	-.105	.438**	.246**	-.136	1		2.45	.84
7. SAS	.157*	-.167*	.551**	.339**	-.234**	.661**	1	2.92	1.31

Note. DoS=Duration of Sleep, DoSUS= Duration of SNSs Use on Smartphone, DoSO= Duration of Smartphone Ownership, CFoS= Checking Frequency of SNSs, FoMO=Fear of Missing Out, SAS=Smartphone Addiction Scale
*p<0.05, **p<0.01

Table 2 shows that there are positive correlations of SAS with student age (r=.157, p<.05), DoSUS (r=.551, p<.01), DoSO (r=.339, p<.01), and FoMO (r=.661, p<.01) variables. In addition, there are negative correlations of SAS with DoS (r=-.167, p<.05) and CFoS= (r=-.234, p<.01) variables. According to these findings; as smartphone addiction increases, FoMO, time spent daily on using smartphone, and daily frequency of checking of social media accounts also increases. Additionally; as smartphone dependency increases, it can be stated that there is a decrease in sleep duration. Finally, those who have had social media accounts for a long time and those who are older are at greater risk in terms of smartphone addiction.

The current study applied a stepwise multiple regression technique to determine if the variables in question predicted the SAS variable. Findings of the Stepwise Regression statistical test are presented in Table 3.

Table 3. Summary of Stepwise Regression Analysis for Variables Predicting Smartphone Addiction (N=161)

	Model 1			Model 2			Model 3		
Variable	B	SE B	β	B	SE B	β	B	SE B	β
FoMO	1.03	.09	.66	.81	.09	.52	.75	.09	.48
DoSUS				.03	.01	.32	.03	.01	.30
DoSO							.09	.03	.16
R2		.43			.52			.54	
F for change in R2		123.12**			27.94**			8.41**	

Note. SAS = Smartphone Addiction Scale; FoMO = Fear of Missing Out; DoSUS = Duration of SNS Use on Smartphone, DoSO = Duration of Smartphone Ownership, **p<.01

In the first model (see Tables 3), the FoMO variable is entered in the regression equation and 43% of the variance in the smartphone addiction is explained in terms of FoMO (R=.66, R^2=.43). In other words, the strongest predictor of the smartphone addiction variable is the FoMO variable.

In the second regression model, the DoSUS variable model was added after the FoMO variable, and the variance explained in the smartphone addiction score increased from 43% to 52% (R=.72, R^2=.52). In other words, a contribution of about 9% to the explained variance of the smartphone addiction variable is seen.

In the third regression model, DoSO variables were added after the FoMO and DoSUS variables, and the variance explained in the smartphone addiction score increased from 52% to 54%. Here, the contribution of the DoSO variable to the explained variance was found to be 2%.

The age, DoS, and CFoS variables after the third model were excluded from the model because they have made no meaningful contribution to the prediction of smartphone addiction in the regression model.

4. Discussion and Conclusions

This study investigated whether there were meaningful relationships between smartphone addiction of high school students and their ages, daily sleep durations, SNS usage habits, and FoMO. In the following section, the research questions stated are going to be discussed in the order given above.

4.1. Is there a relationship between smartphone addiction and students' age?

It has been reported that there is a positive correlation between smartphone addiction and age of high school students at a level of 0.05 statistical significance (r=.157, p<.05). Contrary to this result, other studies reported that as age decreases, the increase of smartphone dependency is in negative relation (Lu et al., 2011; Pearson & Hussain, 2016; van Deursen et al., 2015). However, it is thought that the age difference (14-19 years) between the adolescents is small and that the younger adolescents are more under control by their parents. As a result of this, endorsement seems to be that the use of smartphones differs in total and the sub-dimensions when considering age groups, and that smartphones are used most frequently by the 18 year old age group (Çakır & Oğuz, 2017).

4.2. Is there a relationship between smartphone addiction and students' sleep duration?

There was found to be a negative correlation between smartphone addiction and the nightly sleep duration of students (r=-.167, p<.05). It is seen that as smartphones addiction takes a clearer shape, there is a decrease in sleep duration. Considering that students get up early to go to school on weekday mornings, there are problems with sleep quality of students who spend time late at night with their smartphones (Lemola, S., Perkinson-Gloor, N., Brand, S. et al, 2015). In their study conducted with 319 university students, Lemola, S., Perkinson-Gloor, N., Brand, S. et al. (2015) found that participants in the high smartphone use group scored higher than the low smartphone use group in terms of depression, anxiety and daytime dysfunction scores. In the same study, it was indicated that these results may be related to depression, anxiety and poor sleep quality with an underlying cause of smartphone overuse. The situation in Turkey is no different, with excessive use of smartphones being reported to cause depression and/or anxiety, which can then lead to sleep problems (Demirci et al., 2015). A study of 2,546 adolescents in Belgium suggested that mobile phones greatly influence the sleep quality of growing adolescents. It has been stated that one quarter of young people with mobile phones face a threat to their sleep patterns. In addition, mobile phones seem to actually interfere with sleep, while seemingly affecting sleeping time (van den Bulck, 2003). In South Korea, a study by Kim (2012) showed that Smartphone addiction among high school students explained 4.5% of insufficient sleep. Sub-factors of smartphone addiction such as problems in daily life, withdrawal symptoms, and loss of control among high school students are related to insufficient sleep (Zhang, 2013). Park (2014) reported that insufficient sleep caused by smartphone addiction was observed also in university students.

4.3. Is there a relationship between smartphone addiction and students' daily duration of SNSs use?

This current study determined that, on average, high school students use SNS via their smartphones for about three and a half hours per day. It also appears that there is a meaningful positive relationship between smartphone addiction and the daily duration of smartphone use for SNS use (r=.551, p<.01). This finding supports the result of a significant difference between the duration of

smartphone use and dependency in the study conducted by Çakır and Oğuz (2017) on 540 high school students.

Nearly half of the students stated that they used their smartphones for more than four hours a day. It can be seen that this ratio is considerably higher when the amount of hours spent in school is considered. Upon examination of students' reported purposes for using smartphones, it can be seen that Social Media applications such as Viber, Tango, Skype, WhatsApp, Facebook, Foursquare, and Twitter, and game software such as Candy Crush are more intensely used. This finding should be interpreted, considering a study, which states that the use of SNS mobile applications is a significant predictor of mobile addiction (Salehan & Negahban, 2013). In the recent years, it has been seen that smartphone usage has spread rapidly, having all but abolished the obligation for desktop and laptop computers due to mobile devices' ability to access the Internet and social networks with any physical or time-bound restraints. In this respect, some researchers suggest that smartphone addiction is actually part of society's dependence on social networks (Kuss & Griffiths, 2017) and that smartphone addiction is simply excessive and problematic use of social networking (Doğan & Tosun, 2016). Future studies could therefore investigate the relationship between smartphone addiction and social networking addiction.

4.4. Is there a relationship between smartphone addiction and students' duration of smartphone ownership?

It has been determined that a positive meaningful relationship exists between smartphone addiction and duration of smartphone ownership (r=.339, p<.01). It can be said that high school students who have gained possession of smartphones at earlier times of their lives may be increasingly addicted to the smartphone. Considering that these devices provide a convergence of services such as a camera, MP3 player, GPS, web browsing, telephone calling, e-mail, gaming, and SNS use (Noh, Kim, & Lee, 2010) on a single portable device; smartphones ownership beginning at earlier age could perhaps result in young people communicating regularly with their friends and becoming addicted to entertainment applications.

4.5. Is there a relationship between smartphone addiction and students' frequency of checking SNSs on smartphones?

It has been determined that there is a negative and statistically meaningful correlation between smartphone addiction and the frequency of checking SNS applications on smartphones (r=-.234, p<.01). In the current study, the frequency of SNS checking was requested from students in terms of minutes. Therefore, as this variable decreases, frequency increases. In this regard, as the duration of intervals between checking their SNS notifications decreases, smartphone addiction increases. A study by Gökler et al. (2016), has found that the FoMO scores were related to the frequency of student urge to use an Internet accessible device in order to check their Facebook and Twitter status. Young people heavily use their smartphones for managing their social network accounts; therefore, it is thought that students often check their social media accounts on smartphones too. It can be said that the notification features (audible and visual) of smartphones are especially effective. In addition, a result of the study conducted by Lee et al. (2014) demonstrated that compulsive use of smartphones and technology-related stress are positively related to the need for touch.

4.6. Is there a relationship between smartphone addiction and students' FoMO levels?

It has been determined that there is a statistically meaningful positive relationship between smartphone dependency and measured levels for Fear of Missing Out (r=.661, p<.01). As seen in the study, FoMO has the highest correlation with smartphone dependency, which supports the findings of the study conducted by Elhai et al. (2016) demonstrating that FoMO is related to problematic smartphone use. In the study conducted by Gökler et al. (2016) with university students in Turkey, researchers have also discovered a positive relationship between FoMO and problematic mobile phone use (r=0.587, p<.01). In addition, a significant relationship was reported between being online on SNS accounts throughout the day, active use of SNS for periods exceeding seven hours, and FOMO in preservice teachers (Gezgin, Hamutoglu, Gemikonakli, & Raman, 2017). Abeele and van Rooij (2016)

argued that FoMO has a significant impact on the problematic use of social media, and that FoMO is important in explaining the problematic use of social media. Their study showed FoMO as one of the predictors of problematic SNS use. Finally, FoMO was also found to be significant in association with social smartphone usage by Wolniewicz, Tiamiyu, Weeks, and Elhai (2017).

4.7. Which variables predict smartphone addiction?

The results of a stepwise regression test in the study revealed that three variables predicted smartphone addiction: FoMO was entered in the regression equation and 43% of the variance in the smartphone addiction was shown to be explained in terms of FoMO (R=.66, R2=.43). In other words, the strongest predictor of smartphone addiction is students' Fear of Missing Out. Later on, the Duration of SNS Use on Smartphone variable was added to the model after FoMO and the variance explained in the smartphone addiction score increased from 43% to 52% (R=.72, R2=.52). In other words, a contribution of about 9% to the explained variance by duration of daily SNS use has been observed. In the third attempt at improving the regression model, DoSO variables were added after FoMO and DoSUS, increasing the ratio of variance explained in smartphone addiction scores by 2%, from 52% to 54%. These findings are supported by a previous study by Wolniewicz et al. (2017) demonstrating that FoMO is most strongly related to both problematic smartphone use and social smartphone use.

5. Limitations and Recommendations

There are a few limitations to be considered in interpreting the findings of this study. The high school student sample used did not represent the wider population in Turkey, as it is difficult to obtain the necessary permission from governmental institutions to conduct research with high school students. The questionable reliability of self-reported measurements, which were used to conduct and evaluate quantitative analyses should be mentioned. More importantly, individuals always carry the risk of inaccurately perceiving the time spent using their mobile devices (Grondin, 2010) and thereby misinterpret the time spent (Boase & Ling, 2013; Lin et al., 2015). Finally, as the study is based on cross-sectional method, causality cannot be established based on the findings.

This study showcases a pattern of correlational and predicting relations pertaining to high school students' smartphone addiction levels and their daily use of SNS and FoMO, hopefully paving the way for future studies towards the solution of problematic smartphone use in the future. Considering the fact that young people who lack sleep can experience problems in their academic performance or end up cyberloafing (Akbulut, Dursun, Dönmez, & Şahin, 2016) even during lessons; researchers are recommended to include low academic performance possibly caused by lack of sleep and excessive SNS use as an extra factor, when studying smartphone addiction, SNS overuse and FoMO interactions in the future. As it can be seen, smartphone addiction is spreading among young people, and is especially triggered by SNS usage. Further research into these variables may help reduce the problems that students experience in academic life.

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