



Investigation of nomophobia and smartphone addiction predictors among adolescents in Turkey: Demographic variables and academic performance

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ABSTRACT

Most individuals spend a great amount of time on their smartphones. The intense usage of smartphones leads to some physical symptoms, good and bad feelings, pathological addiction, depression, symptoms such as fear–anxiety, productivity and low academic achievement. For this reason, prevention activities must be prioritized when dealing with the intense and uncontrolled usage of smartphones. The aim of this study is to determine nomophobia levels and smartphone addiction among 12–18 age group secondary and high school students and to investigate the demographic and academic variables predicting these levels. Designed with a relational model, the population of this research consists of 612 students studying at all levels of secondary school and high school. Personal information form and two different scales were used in the research. Descriptive analyses and hierarchical linear multiple regression analysis were used in the analysis of the data obtained by means of data collection in the research. As a result of the research, there is a significant relationship between smartphone addiction and nomophobia. In this study, Model 4 has been identified to be the most important predictor of smartphone addiction and nomophobia. In Model 4, variables related to smartphone usage are included in the analysis. Recommendations have been made according to the results of the study.

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1. Introduction

Nowadays, smartphone usage is quite prevalent, especially among young people (Aljomaa, Qudah, Albursan, Bakhiet, & Abduljabbar, 2016; Yildiz-Durak, 2018b). The functions of smartphones, including providing users with the means of communicating in different environments anytime and fulfilling the tasks typically performed through computers, have increased the utilisation potential of these technologies (Forgays, Hyman, & Schreiber, 2014; Kwon, Kim, Cho, & Yang, 2013a).

When Statista (2017a) data is checked, it is seen that the number of smartphone ownership is expected to be 2.48 billion in 2018 and can be considered that it seems

to increase at the same speed. In Turkey, on the other hand, it is reported that more than half of the population (44.6 million) have smartphones in 2018. As indicated by Montag, Blaskiewicz, Lachmann et al. (2015) and Montag, Błaskiewicz, Saryiska et al. (2015), almost 40% of individuals having smartphones use their mobiles before the last five minutes and after the first five minutes. In this technological era, in which the smartphone ownership and its usage are gradually increasing, a continuous development draw the attention in mobile technologies (Yildirim & Correia, 2015).

Mobile broadband subscriptions have grown more than 20% in five years period and reached 4.3 billion at the end of 2017 (International Telecommunications Union [ITU], 2017). According to Choi et al. (2015), internet access is a preliminary condition for a good many functions of smart-

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phones and there is a strong relationship between internet and smartphone usage.

Mobile internet access has made possible the usage of web-based social networks, such as Facebook, Twitter and Instagram on smartphones (Duke & Montag, 2017a; Przybylski, Murayama, DeHaan, & Gladwell, 2013). Furthermore, some message applications, such as WhatsApp, which has 1.3 billion users in a day (Statista, 2017b), have been designed to make the communication more convenient and active at the present time. The real usage rates of “WhatsApp and Social Networks” which can also be used on smartphones show the importance of social media in understanding of smartphone usage. Therefore, it is thought that internet and social media plays an important role in developing excessive smartphone usage since internet and social media were involved with each other (Kuss et al., 2014; Lachmann et al., 2018).

Shan, Deng, Zhang and Zhao (2013) mentions that excessive smartphone usage is closely linked to physical health problems. This problematic usage of smartphones leads to time management issues (Lin et al., 2015), insomnia (Yogesh, Abha, & Priyanka, 2014), low productivity and academic performance (Duke & Montag, 2017b; Lanaj et al., 2014; Montag & Walla, 2016; Samaha & Hawi, 2016) as well as physical health symptoms. Although the excessive usage of smartphones brings lots of benefits to the users, such as high productivity, searching for information, social interaction, relaxation and entertainment (Cho, 2015; Elhai, Dvorak, Levine, & Hall, 2017; Van Deursen, Bolle, Hegner, & Kommers, 2015), they cause problems which affect daily lives of most individuals in a negative way (Cheever, Rosen, Carrier, & Chavez, 2014; Clayton et al., 2015; Kwon et al., 2013b).

The problematic smartphone usage is connected with mental health problems, including depression and anxiety (Elhai, Levine, Dvorak, & Hall, 2016; Elhai, et al., 2017; Thomée, Harenstam, & Hagberg, 2011; Wolniewicz, Tiarniyu, Weeks, & Elhai, 2018). In the existing literature, it has been mentioned that psychopathological problems such as anxiety has a two-way relationship with smartphone use disorder, thereby leading to reciprocal cause-effect relationship between excessive smartphone usage and anxiety (van den Eijnden, Meerkerk, Vermulst, Spijkerman, & Engels, 2008; Thomée et al., 2011).

Social media usage via smartphones may lead to the necessity of being online continuously, while lack of digital environment has a possibility of causing anxiety (Przybylski et al., 2013). Fears of not being able to know about new information considered as important by individuals are explained by the concept of “Fear of Missing Out (FoMO)”. FoMO is a fear and apprehension state in which individuals spend a great deal of time on social media tools since they fear the possibility of missing the latest flows in social networks (Hato, 2013). Turkle (2012) has stated that this excessive online communication has brought about nomophobia which means the fear of lacking communication, not being able to develop social skills needed for face to face communication and a negative psychological effect.

Individuals who are highly active on social networks have a more tendency to develop some psychopathological problems such as depression and anxiety than

others (Piwek & Ellis, 2016). For this reason, FoMO can be regarded as a part of nomophobia concepts which mean the anxiety experienced in the event of lacking internet connection. The increase in nomophobic behaviours displayed by individuals affects the academic performance, motivation levels in learning processes as well as family and friend relations adversely as it may cause mental tiredness, however (Dixit et al., 2010).

The focal point of this study is to investigate whether demographic variables, Information Technology (ICT) usages and academic performance predict the smartphone addiction and nomophobia behaviours. No research on the relation nomophobia and smartphone usage has been reached even though there are some studies founding a relation between smartphone addiction and depression, anxiety and FoMO (Elhai et al., 2016, 2017). In analysing the risk factors for smartphone use disorder, related variables such as demographic, psychopathological problems, academic performance and technology usage (Elhai et al., 2017) have also been considered related factors for nomophobia.

Even though it can be thought that smartphone addiction and nomophobia may be related to each other in existing literature (Elhai et al., 2016), the relationship of these two variables haven't been examined yet. There are a great many studies examining the relationship between demographic, psychopathological, academic performance and technology usage and internet addiction (Kuss, Griffiths, Karila, & Billieux, 2014; Yildiz-Durak, 2018a). Smartphone addiction is pertinent to structure of problematic internet usage (Kuss et al., 2014) and both include similar symptoms. However, these concepts are different (Kiraly et al., 2014). For this reason, the relationship between basic variables considered as related to the investigation of problematic internet usage, smartphone addiction and nomophobia has been examined in this study.

1.1. The Importance of the Study

Smartphones are frequently being employed for a wide range of uses which influence all dimensions of life, including social communication, entertainment and education (Yildiz-Durak, 2018a). This situation, on the other hand, poses some adverse effects along with the positive ones. Adolescence can be defined as a sensitive period in which individuals may be addicted to ICT (Wang, Tao, Fan, Gao, & Wei, 2017). For this reason, this study is important in that it dwells on smartphone addiction and nomophobia levels of the young. The relationship between academic achievement and smartphone addiction and nomophobia levels of adolescence haven't been able to understand yet.

Smartphone addiction and nomophobia are considered as a psychological problems affecting academic achievement negatively in adolescence (Hsiao, Shu, & Huang, 2017).

However, the results of previous studies have not examined whether academic achievement has a predictive role on smartphone addiction and nomophobia. According to self-determination theory (Ryan & Deci, 2000), students will have low levels of motivation when they cannot sat-

isfy their pshyological needs such as efficacy (when their academic achievements are lower) and they head towards the resources out of classroom. In this situation, it can be argued that ICT use behaviours may increase. For this reason, academic achievement are investigated as students' smartphone addiction and nomophobia levels in this study.

Additionally, the investigation of smartphone addiction and nomophobia along with demographic variables and parents can develop/broaden the researches on smartphone addiction and nomophobia. It can present some suggestions as to prevention implementations of ICT addiction towards adolescents at K12 level. The current literature generally focuses on the investigation of problematic use of smartphone and its adverse effects (Billieux, Maurage et al., 2015). Only a few ones address the predictors of smartphone addiction (Aljomaa et al., 2016; Van Deursen et al., 2015). This study is believed to contribute to the existing literature, by addressing predictors of smartphone addiction and nomophobia.

The investigation of predictor factors relating o smartphone use disorder and nomophobia in adolescence was aimed to perform through social cognitive theory in terms of conceptual framework of the study. This theory is one of the theoretical models employed to examine media consumption behaviours (Bandura, 2001a, 2001b; LaRose, Lin, & Eastin, 2003). This present study has the potential to expand the social cognitive theory in the context of smartphone use disorder and nomophobia. The first and most important theoretical contribution is to address many "personal factors" as an explanation of smartphone use disorder and nomophobia. While the effects of factors such as internet, social dependency and frequent factors such as gender, age, ethnicity, belief and self-efficacy are examined in literature, explanations on these addictions are not addressed holistically.

Secondly, the original theory dwells on personal structures and ignored the role and contribution of environmental factors as well as technological addiction and nomophobic behaviors. On the other hand, the effect formed when both personal and external variables are dealt with together hasn't been addressed within the framework of social cognitive theory. Such variables as parents ICT use level, education level, sibling number, the living area (rural/urban) have been investigated in terms of predicting the smartphone use disorder and nomophobia so that environmental factors, one of the important patterns of social cognitive theory, can be able to enrich. In a nutshell, we develop a social cognitive model by including environmental factors in order to explain smartphone use disorder and nomophobia bevahiors of adolescence in Turkey.

1.2. Aim of the study

This study aims to determine the nomophobia and smartphone addiction levels among 12–18 age group secondary and high school students and to investigate the demographic and academic variables predicting these levels. In line with this aim, the research questions and hyptheses are as follows:

Q1: What are the students' nomophobia and smart-phone addiction scores, ICT and smartphone usage status, academic achievement scores related to basic courses?

Q2: Is there a significant difference between nomophobia and smartphone addiction scores of students in terms of demographic variables (age, educational level, income level, urban or rural area and number of siblings), variables related to parents (mother education level, father education level, mother ICT usage level, father ICT usage level), ICT and smartphone usage status (Internet access status, Internet usage experience, Internet usage skill level, daily internet usage time, smartphone control frequency, daily smartphone usage time, smartphone usage experience, smartphone usage purpose) and academic achievement scores related to basic courses?

Q3: Öğrencilerin nomofobi puanları ile akıllı telefon bağımlılığı puanları arasında anlamlı bir ilişki var mıdır?"

Q3: Is there a significant relation between nomophobia and smartphone addiction scores of students?

Q4: Do variables related to the students, including demographic variables, variables related to parents, ICT and smartphone usage status and academic achievement scores related to basic courses predict nomophobia and smartphone addiction scores significantly?

2. Conceptual framework

2.1. Theoretical background

There are several theories explaining the technological and smartphone use disorders. Behaviourism, for example, considers behavioral disorders based on technology regard the issue as a learned behavior relied on stimulant-reaction-reinforcement principle. For this reason, it mentions that addictive behavior, like other learned behaviors, is changeable. Psychodynamic theory defines smartphone use disorder as a way to achieve escape and pleasure from negative emotions. The socio-cultural tendency regards smartphone use disorder as a result of a culture of a society.

Cognitive theory bases smartphone use disorder on distorted ideas and schematics. In conclusion, there is a complementary view proposed by Davis (2001), which puts forward that smartphone use disorder is caused by a combination of personal, cultural, social, environmental, and emotional factors. The conceptual framework of this study is based on "the social cognitive theory" (Bandura, 1986, 1989). The purpose of this study is to dwell on whether the personal and environmental factors are predictive of behavioral addiction tendencies such as smartphone use disorder and nomophobia among Turkish adolescents.

"The Social Cognitive Theory": The social cognitive theory asserts that human behaviors can be explained by three-some and mutual causality of personal factors, behaviors and environment. According to Bandura (1982), individual factors, the behavior of the individual and the environment interact with each other, and these interactions have some influences on the individual's future behaviors. In this present study, personal and environmental factors are regarded as explanations of smartphone use disorder and nomophobia. According to social cognitive theory, individ-

uals opt for realizing the behaviours which they expect to receive prizes or to have positive outcomes (Bandura, 1982; Compeau & Higgins, 1995).

In existing literature, there is some evidence on positive outcome expectancies are associated with higher dependence behaviors such as gambling among adolescents (Shell, Newman, & Xiaoyi, 2010). Likewise, the use of the internet, social media and smartphones is often reinforced by positive outcomes, including relieving loneliness, having social anxiety, and avoiding negative emotions (Chakraborty, Basu, & Kumar, 2010). At this precise point, Tsai and Lin (2001) suggest that there is a positive relation between internet addiction symptoms and perceived benefit in technology use.

Smartphones, on the other hand, host several applications (games/social media apps, etc.) and individuals often perceive/expect several benefits such as interaction, socializing, entertainment, getting/sharing information (Yildiz-Durak & Seferoğlu, 2018). Social cognitive theory suggests an optimistic scenario, stating that individuals can control their actions. But at present, it seems that individuals, especially the adolescents, are inadequate to restrict themselves in using smartphones or to resist willingness to media consumption (Grant, Potenza, Weinstein, & Gorelick, 2010; Yildiz-Durak, 2018a, 2018b). LaRose et al. (2003) developed social cognitive theory in order to explain how overuse of media can be reduced by employing media use habits and insufficient self-regulation mechanisms of individuals.

Individuals are willing to employ smartphones primarily for getting information and building relationships. The role of feedback in this process should be stressed in particular (Davis 2001). The function of instant feedback on smartphones enhances interaction and creates impulsiveness for immediate participation. This, in turn, causes fear of staying away from smartphones, increasing the frequency of control of smartphones (Park & Lee, 2011). In this present study, the predicting effects of several variables, including experiences of smartphone/ICT uses, the frequency of use, usage level on smartphone use disorder and nomophobic behaviours were investigated.

Additionally, self-regulation is a significant determinant of the actual behavior of the theoretical framework of the social cognitive model, and is influenced by the inhibition of nomophobic behavior and the maintenance of one's self-control. In this study, smartphone use disorders and nomophobia behaviours in the context of social cognitive theory academic achievement were investigated, by moving from the evidence (LaRose, 2010) which notes that individuals experiencing negative emotions are more likely to use media in a problematic way in order to relieve these negative situations.

Adolescents with low academic achievements are supposed to use their smartphone such levels that they are considered as disorders in order to get rid of this negative situation. Additionally, it can be noted that individuals with high level of nomophobia are trying to get rid of negative situations by using more of their smartphones and applications, assuming that individuals use their technology in an extreme way as a means of alleviating their life stresses and their negative situations/emotions (Long et al., 2016;

Wang, Ho, Chan, & Tse, 2015; Zhitomirsky-Geffet & Blau, 2016).

2.2. Nomophobia

Nomophobia is defined as “the fear of being out of mobile phone contact” and this term is the abbreviation of “no-mobile-phone phobia” expression (Yildirim, 2014). King, Valença and Nardi (2010) considers nomophobia as the discomfort or anxiety caused by leaving smartphone or computer connection. In this definition, it can be suggested that nomophobia includes computers as well as smartphones.

Nomophobia is an apprehension that individuals feel when they feel they can not get a signal from a mobile handset, when the phone is out of charge, when it forgets to pick up the phone, or when it only receives phone calls, emails and notifications for a certain period of time (King, Valença, Silva, Sancassiani, Machado, & Nardi, 2014). In a nutshell, it is a psychological situation which occurs when the individual cannot access to smartphone or internet connection.

The social cognitive theory presents important structures such as self-regulation and the importance of feedback to explain nomophobia. In environments such as social media, individuals who fear from missing developments in instant messaging applications and seek for immediate feedback may display uncontrolled/anxious smartphone usage behaviors. Self-regulation, however, is the determinant of individual's smartphone use behavior and can lead to nomophobic behavior that an individual cannot achieve self-regulation competence.

They, however, feel discomfort without these technologies. Nomophobia, on the other hand, is the degree of an individual's anxiety about not being able to communicate with the group (Yildirim & Correia, 2015). The nomological network displayed in Fig. 1 is formed by summarizing the results of the literature search related to nomophobia.

There are several studies dwelling on the relation between nomophobia and smartphone addiction in the existing literature (Dixit et al., 2010; Forgays et al., 2014). According to Yildirim (2014), the use of addiction concept suppressed the meaning of nomophobia, and therefore it is not the addiction of smartphone, however. Nomophobia is a situational phobia (King et al., 2010, 2014). Situational phobia is caused by an intense reaction that can be both physical and emotional, and is caused by an irrational fear (Choy, Fyer, & Lipsitz, 2007). Therefore, in the event of nomophobia, people will have an irrational fear and anxiety about breaking their communication with the smartphone or leaving the Internet untapped.

Fomo, on the other hand, is a fear, anxiety and apprehension situation experienced by individuals involved in following the events, news and conversations (Przybylski et al., 2013) and is considered as an important factor in order to explain nomophobia described as fear of lacking internet connection. FoMO has been found to be associated with excessive use of individuals' smartphones due to the anxiety in which individuals fear from not being able to follow the latest developments (Carbonell, Oberst, & Beranuy, 2013).

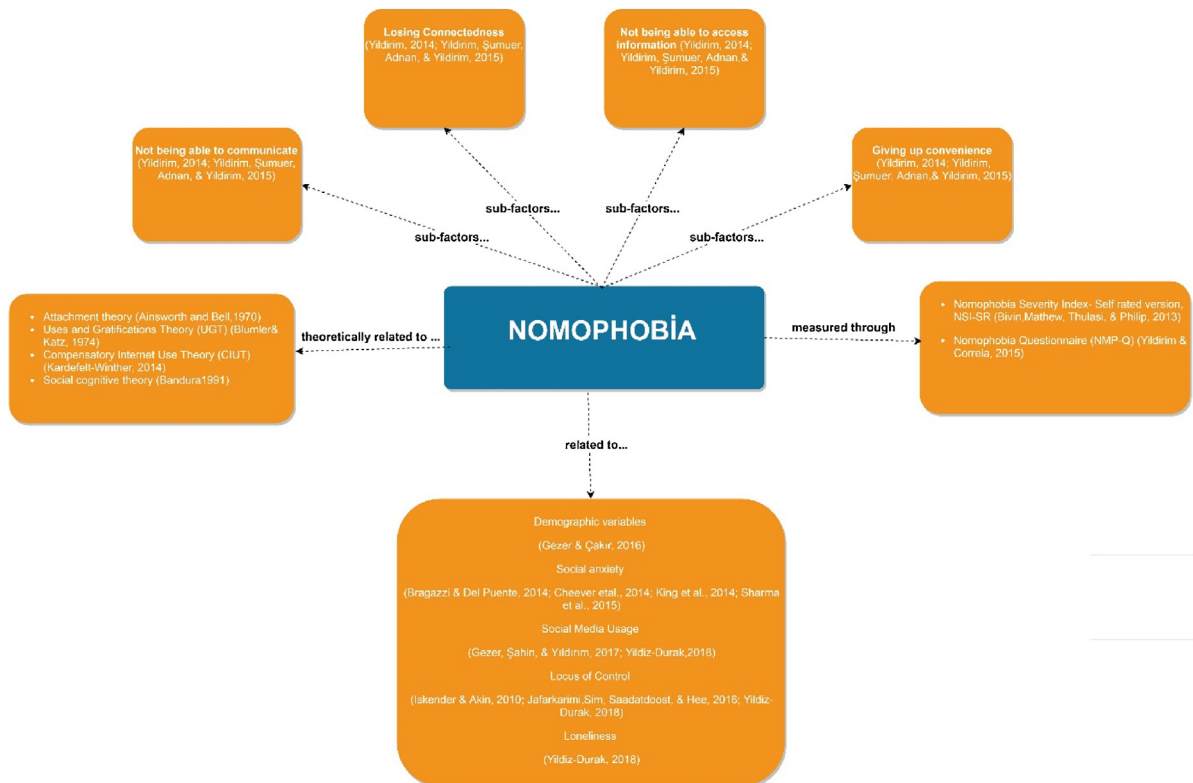


Fig. 1. Nomological network related to nomophobia.

Referenced resources (Ainsworth & Bell, 1970; Bandura, 1991; Bivin, Mathew, Thulasi, & Philip, 2013; Blumler & Katz, 1974; Bragazzi & Del Puente, 2014; Cheever et al., 2014; Gezgin & Çakır, 2016; Gezgin, Şahin, & Yıldırım, 2017; Iskender & Akin, 2010; Jafarkarimi, Sim, Saadatdoost, & Hee, 2016; Kardefelt-Winther, 2014; King et al., 2014; Sharma et al., 2017; Yıldırım & Correia, 2015; Yıldırım, 2014; Yıldırım, Sumuer, Adnan, & Yıldırım, 2015; Yıldız-Durak, 2018a)

In order to grasp nomophobia better, dimensions related to it were investigated and it was found that “not being able to communicate, losing connectedness, not being able to access information and giving up convenience” are common dimensions employed to explain the term “nomophobia” (See Fig. 1). “Not being able to communicate” dimension stands for anxiety which occurs when individuals cannot instantly communicate. “Losing connectedness” is associated with the fear that individuals are suffering from the loss of connections to smartphones and the interruption of a person’s online identity (especially in the social media). “Not being able to access information” reflects the disturbance of the loss of information via smartphones, the inability to receive information via smartphones, and the blocking of information calls with smartphones. The “giving up convenience” dimension concerns individuals’ feelings of giving up on smartphones and reflects the comfort of having a smartphone and the desire to use smartphones.

2.3. Smartphone addiction

Smartphone addiction is defined as “excessive/obsessive use of smartphones, which will interfere with the daily lives of users and cause negative consequences,” although it is not officially considered a disorder (Lee, Ahn, Choi, & Choi, 2014a). When people are addicted to their smartphones, they are actually dependent on

the functionality they allow their phones to do (Kuss & Griffiths, 2017).

The primary obsessive-compulsive symptoms of using smartphone devices for users with smartphone addiction can be listed as: (1) Conflict: It is the use of the smart phone to prevent other important tasks such as work from being performed.; (2) reinstatement: Smartphone users are not able to diminish their smartphone usage voluntarily; (3) behavioral salience: The behavior of users is managed by their smartphones.; and (4) withdrawal: Users are beginning to feel negative emotions when they can not use their smartphones. (Charlton & Danforth, 2007; Turel, Serenko, & Giles, 2011; Xu, Ryan, Prybutok, & Wen, 2012). Kwon et al. (2013a, 2013b) suggested “daily-life disturbance, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse, and tolerance” dimensions in order to explain smartphone use disorder, on the other hand.

In this study, the addictive symptoms of smartphone users were evaluated in terms of their discomfort when they could not use their smartphone in daily life, the symptoms of physical health, happiness/expectation when using smartphone, unhappiness when they could not use smartphone, developing addiction on social media environments, living negative emotions. The nomological network shown in Fig. 1 is formed by summarizing the results of the survey of the literature on smartphone use disorder.



Fig. 2. Nomological network related to smartphone addiction.

Referenced resources (Ainsworth & Bell, 1970; Bae, 2015; Baxter & Simon, 1993; Billieux, Van der Linden, & Rochat, 2008; Blumler & Katz, 1974; Brambilla et al., 2017; Buxton et al., 2015; Casey, 2012; Chahal et al., 2013; Cho, Kim, & Lee, 2016; Cho & Lee, 2017; Choliz, 2012; Connell, Lauricella, & Wartella, 2015; Demirci et al., 2014; Dube et al., 2017; Eutsler, 2018; Ezoe et al., 2009; Falbe et al., 2015; Gallimberti et al., 2016; Guxens et al., 2016; James & Drennan, 2005; Jeong et al., 2016; Joo, 2013; Kabali et al., 2015; Kardefelt-Winther, 2014; Kesten et al., 2015; King et al., 2014; Kwon et al., 2013a; Lauricella et al., 2015; Lee & Cho, 2015; Lee et al., 2016; McCloskey et al., 2018; Merlo, Stone, & Bibbey, 2013; Pavia, Cavani, Di Biasi, & Giordano, 2016; Park, 2005; Pea et al., 2012; Perry & Lee, 2007; Raman et al., 2017; Seo & Choi, 2018; Toda, Monden, Kubo, & Morimoto, 2006; Walsh et al., 2008; Walsh, White, & McD Young, 2010; Yen et al., 2012; Young, 1998)

Smartphone addiction can be seen to be similar to other technology-based dependencies such as Internet, gaming, computer addiction (Kim, 2013). However, it can be argued that it is more dangerous because of the mobile nature of smartphones and the scope of other technology-based dependencies of smartphone dependency (See Fig. 2) (Demirci, Orhan, Demirdas, Akpinar, & Sert, 2014). Current studies focus on the effects of excessive smartphone usage on mental and physical health (Jenaro, Flores, Gómez-Vela, González-Gil, & Caballo, 2007). The findings show that smartphone users who tend to be dependent on smartphones have a tendency towards internet addic-

tion (Beranuy, Oberst, Carbonell, & Chamarro, 2009), game addiction (Lee, Ko, & Chou, 2015) and have health problems (Beranuy et al., 2009; Lee et al., 2015).

In addition, smartphone addiction has been associated with anxiety and depression (Thomée et al., 2011; Beranuy et al., 2009; Cheever et al., 2014; Chotpitayasunondh & Douglas, 2016). It has also been determined that there is a positive relationship between the level of tendency of smartphone addiction in children and aggression and attention deficit (Davey & Davey, 2014). For this reason, there are concerns about the consequences of overuse

of smartphones especially in children and young people (Chotpitayasunondh & Douglas, 2016).

2.4. Smartphone addiction and nomophobia

Current studies has shown that FoMO is associated with smartphone addiction (Cheever et al., 2014; Lepp, Barkley, & Karpinski, 2014). Therefore, nomophobia is thought to be associated with smartphone addiction. In addition, nomophobic behaviours of individuals are associated with self-control. They are closely related to self-control dependency behaviours, on the other hand (Gökçearslan, Mumcu, Haşlamam, & Çevik, 2016). Similar to symptoms associated with substance abuse, individuals who have not been able to control their concerns about staying away from smartphone use seem to have used their phones problematically (Yildiz-Durak, 2018b). For this reason, it is logical to argue that smartphone addiction is related to nomophobia. However, both nomophobia and smartphone addiction may have the same characteristics since they are associated with problematic smartphone usages and behaviours.

2.5. Demographic variables as predictor of smartphone addiction

The findings of the studies vary in terms of whether there is a relationship between demographic variables and problematic technology usage behaviours. Some researchers suggest that there is no relationship between gender and the problematic use of smartphones (Walsh & White, 2007), but it can be said that smartphone usage patterns differ according to gender in general (Wei & Lo, 2006). As the reason of this situation, it is argued that women spend more time talking over the phone, whereas men use the phone to get information. On the other hand, there are limitations in literature on the generalizability of the relation with smartphone usage patterns and demographic variables such as gender, age, education level. Within this context, there is a need for more studies with different age groups in regions with different cultural characteristics (Cameron, 2009).

Differences in the developmental status of individuals according to age groups lead to the problematic use of technology and the differentiation of its effects, as well. For this reason, there is a need for more information on problematic usages of ICT and smartphone according to age and education level (Gilly, Celsi, & Schau, 2012). It is therefore important to examine the role that smartphones play in the lives of students and to shed light on problematic usage behaviors they exhibit.

2.6. Demographic variables as predictor of nomophobia

Smartphone usages of individuals, the amount of time in which individuals spend on WhatsApp, Facebook, Twitter and other social networking sites, the activities they perform, the sharing frequencies as well as motivations vary according to demographic variables (Anshari, Alas, Hardaker, Jaidin, Smith, & Ahad, 2016; Baron & Campbell, 2012; Ha & Hwang, 2014; Jang & Ji, 2012). Smartphone usage, therefore, may show differences according to indi-

vidual variables. As indicated by Van Deursen et al. (2015), The type of smartphones used, their distinguishing features, and the way smartphones are used differ between men and women.

According to Nakhaie, Silverman and LaGrange (2000), demographic variables in online events affect individual self-control, social norm perceptions, consumption behaviors, communication desires, ethical behavior in communication and sharing, and anxiety/fear situations. It is therefore logical to suggest that demographic variables play an important role in predicting nomophobia. In addition, there are studies showing that demographic variables are related to nomophobia, which is an example of inappropriate use of smartphone as smartphone addiction (Arpaci, Baloglu, Kozan & Kesici, 2017; Elhai et al., 2016).

2.7. Variables related to parents as predictor of smartphone addiction

In the research conducted, parental variables such as education level of parents of adolescents, level of technology knowledge and financial status of the family were found to be related to their internet dependence (Mei, Yau, Chai, Guo, & Potenza, 2016; Zhang, Wang, Yuan, Zhang, & Li, 2014). However, it can be argued that studies examining the relationship between smartphone addiction and parental variables are very limited (Lim & Kim, 2014; Na, 2013; Yim et al., 2014). As indicated by Cho and Lee (2017), parents' smartphone usage intensities are very high in many countries and parents encourage their children to use their smartphones to reduce emotional and physical fatigue. Since children have less physical and mental maturity, this excessive smartphone usage may affect them adversely. In addition, the attitudes and approaches of parents have an important place in the emergence or disappearance of negative behaviors.

Livingstone, Haddon, Görzig and Ólafsson (2011) have emphasized that it is important to take support of social environments in negative situations in which children involved in ICT usages. Hence, parents whom we can call children's social environment are the most important stakeholders in terms of technology-dependent addiction (Mascheroni & Ólafsson, 2014). Children, on the other hand, learn most of the negative behaviours in their surroundings, by observing them. Bandura's Social Learning Theory (1977) explains this situation and emphasizes that observations mean experiencing indirectly. From moving on this point, it can be said that the interaction of parents with technology will be modeled by children and this will be reflected in the behavior of technology usage. It can be said that parents will direct their children in the use of conscious technology in the context of technology competencies (Çetinkaya & Sütçü, 2016).

2.8. Variables related to parents as predictor of nomophobia

Oulasvirta et al. (2012) mentions that nomophobic behaviors and problematic smartphone use are developed through habit. The continuous control behavior of the phone and the anxiety state experienced when away from

the phone include learned behaviors (Elhai et al., 2017). For this reason, parents' attitudes and behaviours on this issue are significant. The article by Cho and Lee (2017) shows that parental variables are associated with the tendency of students to use problematic and uncontrolled smartphones. From moving on this point, it has been assumed that variables related to parents' education levels and ICT usage are associated with nomophobia.

2.9. *ICT usage as predictor of smartphone addiction*

In existing literature, it has been argued that ICT use intensity is associated with smart phone dependency. Psychological dependence models suggest that what can be called "addiction" is the result of a positive and/or negative reinforcement process (Robinson & Berridge, 2003). Negative reinforcement models show that the dependency originates as a means of dealing with negative feeling (Baker et al., 2004). Therefore, the excessive usage of the smartphone and the applications it contains to abstain from the negative situations that individuals experience causes problematic usage.

Negative reinforcement models present a system for ICT usage, but don't explain how this usage may evolve into a pathological situation. In explaining how the usage may evolve into a pathological situation, negative positive reinforcement models are put into use (Robinson & Berridge, 2001). This indicates that dependency is initially in the form of using the basic features of technology (eg, notification control) and then is transformed into a strong desire for the use of technology. For this reason, as in the case of smartphone use, pathological use can begin as a positive reinforcement process (Wise & Koob, 2014). As a result, the intensity of smartphone usage increases so as to ease negative symptoms originating when using smartphone (Billieux, Maurage et al., 2015; Billieux, Schimmenti, Khazaal, Maurage, & Heeren, 2015). For this reason, it is believed that smartphone and ICT usages are related to each other.

2.10. *ICT usage as predictor of nomophobia*

In the present day, smartphones can be used both as a mobile phone and as a personal computer with features they have (Samaha & Hawi, 2016). The ever-increasing features of smartphones include many things to do in everyday life such as making calls, instant messaging/chatting, surfing the web, catching up on news, sending email, watching/sharing photos/videos, playing games and especially social networks resulting in overuse of these technologies (Zheng & Lionel, 2010).

Social networks support the individuals' self-esteem perceptions and make them feel well psychologically (Andreassen & Pallesen, 2014; Anshari et al., 2016; Stead & Bibby, 2017). Individuals experience FoMO which means not being able to follow the latest developments, conversations with their friends and fear of missing the likes and nomophobia which means fear of keeping away from smartphone or losing the internet access (Yildirim, Sumuer, Adnan, & Yildirim, 2015).

Individuals who display nomophobic behaviors experience some psychosocial problems, behavior and anxiety disorders that affect their lives when they are away from mobile devices (Dixit et al., 2010; Yildiz-Durak, 2018a). For this reason, the ICT and smartphone usage durations and the control frequency of these technologies are associated with nomophobia (Yildiz-Durak, 2018a). There is also a relationship between the competence and experience of individuals using technology such as smartphones and their problematic behavior, on the other hand (Anshari et al., 2016).

2.11. *Academic achievement as predictor of smartphone addiction*

One of the factors that is considered as related to smartphone use disorder is academic performance (Dixit et al., 2010). However, when the related literature is examined, it can be argued that the two-sided relationship between academic performance and smartphone addiction has been ignored. In existing literature, it has been reported that smartphone addiction causes the symptoms of depression, anxiety, physical and mental fatigue (Beranuy et al., 2009; Cheever et al., 2014; Chotpitayasunondh & Douglas, 2016; Davey & Davey, 2014; Rosen, Carrier, & Cheever, 2013; Thomée et al., 2011). As indicated by Samaha and Hawi (2016), it is inevitable that these symptoms affect the academic performances of students adversely.

However, students may exhibit problematic smartphone use behaviors to reduce emotional level of motivation in their learning process due to the negative situation related to their academic performance, and to be emotionally satisfied due to their sense of failure. Kardefelt-Winther (2014) emphasizes that individuals use smartphones to tackle real-world problems and avoid duties and/or avoid negative feelings and effects. As a result, it can be argued that smartphone use behavior is related to academic achievement because it affects children physically and mentally. When the studies conducted are analyzed, it can be seen that there is a negative relationship between smartphone usage and academic performance (Judd, 2014; Karpinski, Kirschner, Ozer, Mellott, & Ochwo, 2013; Samaha & Hawi, 2016).

2.12. *Academic achievement as predictor of nomophobia*

Nomophobia is more likely to appear in younger generation students who think they are socially addicted. Nomophobia may lead to anxiety and trouble when the smartphones aren't controlled for a while (Cheever et al., 2014; Hong, Chiu, & Huang, 2012; Lee, Chang, Lin, & Chen, 2014b; Lepp et al., 2014; Nazri & Latiff, 2013). Cheever et al. (2014) states that students who exhibit nomophobic behaviors are faced with problems such as not being able to collect concentrate or deriving cognitive skills. The works of Froese et al. (2012) tell us that being occupied with using smartphone during instructional time reduces the academic achievement. Thus, learning activities may be confined when the students' achievements, interests and satisfaction levels are low (Baddeley, Lewis, Eldridge, & Thomson, 1984).

It is possible that students who have low attitudes towards the course and who are not able to perform satisfactorily at academic level tend to concentrate on using smartphone during and after the instructional time. [Mendoza, Pody, Lee, Kim, and McDonough \(2018\)](#) mention that mobile phone usage and learning performance must be carefully thought to have a more balanced perspective of the effects of mobile phones on attention and learning. Therefore, this belief differs from the view that smartphones are always harming learning.

Some researchers even argue that smartphones contribute to learning environments positively when used as a supplementary ([Eyyam & Yaran, 2014](#); [Jan, Ullah, Ali, & Khan, 2016](#)). As indicated by [Rashid and Asghar \(2016\)](#), smartphones are key to self-directed learning in relation to learning performance of problem-based use, and nomophobic behaviors are less common in learners who can take responsibility for learning and manage their learning performance. According to the social cognitive theory, it has been assumed that individuals can overuse technology as a means of alleviating their life stresses, self-esteem and their negative situations/emotions related to the low level of academic performance. Therefore, it is believed that low academic performance of students may increase FoMO levels and nomophobia behaviours. In this study, the predictive power of the academic achievements levels of the students on nomophobia has been dealt with.

3. Method

Since it examines the relationships between students' smartphone addiction and nomophobia levels, this study is a relational study. The relational model aims to determine the state and/or degree of covariance between two or more variables ([Karasar, 2013](#)).

3.1. Population and its characteristics

The population of the study consists of 612 students at all levels of secondary and high school. The population was formed voluntarily from schools where the researcher was able to reach participants face-to-face using appropriate sampling method. The schools in which the participants attend have been defined as moderate socio-economic level by District Directorate of National Education. Therefore, it is thought that participants represent the general population. Distribution of demographic characteristics of the students participating in the research are given in [Table 1](#).

Of the students who participated in the study, 48.0% are female and 52.0% are male. The study group consists mostly of secondary school students (69.1%). The average age of participants is 12.79. The average number of siblings is 2.35. Participants' average monthly income is \$ 537.5. Most of them live in urban areas, participants' parents mainly have educational levels of high school, and they stated that their parents' ICT use level was "having very little information" (See [Table 1](#)).

3.2. Data collection instruments

"Personal Information Form" and two different data collection tools were used in the research. These are the Smart Phone Addiction Scale and the Nomophobia Scale. Some information on data collection instruments and items were given in [Table A1](#) in [Appendix A](#). Data collection instruments used in this study were developed by different researchers and were suitable, reliable and valid instruments according to the aims of the study.

Personal information form was developed by researcher to collect data on participants' personal information, access to technology, and smartphone usage parameters. Data on participants' academic performance were also collected with this questionnaire. This questionnaire consists of 48 items. Most of the questions are likert type. While developing the data collection instruments, opinions of five field experts were asked and it was designed according to their opinions.

Smartphone addiction questionnaire was developed by [Kwon et al. \(2013a\)](#), and adapted to Turkish by [Demirci et al. \(2014\)](#). The Likert-type scale's rating options range between "1-Definitely No" and "5-Definitely Yes". An increase in the scale score indicates that risk of smartphone addiction also increases. There are 7 sub-dimensions of the scale, and the items related to these dimensions are as follows: "Factor 1 (daily life disturbance and tolerance) 8 items; Factor 2 (deprivation indications) 7 items; Factor 3 (positive expectations) 5 items; Factor 4 (cyber-focused associations) 4 items; Factor 5 (overuse) 4 items; Factor 6 (social network addiction) 2 items; Factor 7 (physical symptoms) 3 items". Cronbach's alpha reliability coefficient for this scale is .925. The reliability coefficients of the scale are as follow: .789, .815, .799, .814, .901, .713, .901.

Nomophobia questionnaire (NMP-Q) was developed by [Yildirim and Correia \(2015\)](#) and adapted to Turkish by [Yildirim et al. \(2015\)](#). The scale is composed of 5 items with likert type and a total of 20 items. There are four sub-dimensions of the scale. These include: Losing Access to Information (4 items), Losing Connection (5 items), Communication Failure (6 items) and Feeling Uncomfortable (5 items). The reliability coefficient of the study was found as .95. The reliability coefficients of the scale are as follow: .741; .819; .856, .906.

3.3. Collection of the data

The practice of this present study was conducted in the last week of the fall semester (January) and spring (June) of the academic year 2016–2017. In the study, data were collected from the research population by means of on-line data collection tools in the information technology class in public schools affiliated to Ministry of National Education (MoNE) schools by getting permission from school administration and teachers. As the practice was carried out in the schools affiliated to MoNE, the relevant ministry ethics committee decided that the study had no ethical problems in terms of purpose and content and sent a written decision to implement the practice to the district national education directorates.

Table 1

Distribution of demographic characteristics of the students participating in the research.

Variables	Options	f	%
Gender	Female	294	48.0
	Male	318	52.0
Educational level	Middle school level	423	69.1
	High school level	189	30.9
Age	Min = 10, Max = 18, Mean = 12.79, SD = 1.671		
Monthly income	Min = 500TL/about 125\$, Max = 8000TL/about 2000\$, Mean = 2150TL/about 537.5\$, SD = 1000.721		
Number of siblings	Min = 0, Max = 7, Mean = 2.35, SD = 1.211		
Urban or rural area	Rural	209	34.2
	Urban	403	65.8
Mother ICT level of use	Having very little information	262	42.8
	Novice	54	8.8
	Moderate	72	11.8
	Advanced	80	13.1
	Expert	144	23.5
Father ICT usage level	Having very little information	257	42.0
	Novice	53	8.7
	Moderate	68	11.1
	Advanced	60	9.8
	Expert	174	28.4
Educational background of your mother	Primary school graduate	148	24.2
	Middle school graduate	157	25.7
	High school graduate	216	35.3
	Bachelor's, Master's or PhD degree	91	14.9
Educational background of your father	Primary school graduate	90	14.7
	Middle school graduate	113	18.5
	High school graduate	276	45.1
	Bachelor's, Master's or PhD degree	133	21.7

In addition, the permissions of school administrators and teachers working in the schools in which the practice was conducted were taken. The students were voluntarily included in this present study. Prior to the application, the students were given the necessary guidelines about the study and process. During the implementation process, grades of students on data collection instrument were transferred from a web-based software, called as “e-okul”, which is a school administration system including detailed information on students such as personal information and school grades. The teacher who conducted the practice helped students to be able to provide reliable data about their grades. At the end of the practice, the average score of the grades that the students stated and the grades of the grades were checked with the grading average and grade distribution from the system. The students were provided enough time to read the data collection instruments and to provide reliable data.

3.4. Analysis of the data

Descriptive analyses and hierarchical linear multiple regression analysis were used for the analysis of data obtained by means of data collection tools in the research. For the analyses, the suitability of the data before regression was first examined. It has been specified after examining whether the relationship between the dependent variables is linear and whether the scores are normally distributed, that there is a linear relationship and a normal distribution. In addition, the Mahalanobis' distance values were assessed to determine whether there were extreme values related to the variables included in the analysis to assess the multivariate normality test. The data of 5 par-

ticipants with extreme values were not included in the analysis.

Since some of the predictors in the study are categorical variables, these variables are transformed into dummy variables (Field, 2005). Since some of the predictors in the study are categorical variables, these variables are transformed into dummy variables (Field, 2005). At this point, in regression analysis, dependent and independent variables must be continuous variable at least equal interval scale and show normal distribution.

However, in some studies, independent variables which are considered as classifying scale is needed to examine whether they are effective on dependent variables or not. A new artificial variable which is called “dummy” variable and is formed as one-minus of level numbers (G-1), by excluding one of the categorical variables in the analysis. The fact that one of these new variables has a significant effect on dependent variable means that this variable has a significant effect on dependent variable (Buyukozturk, 2009).

Discrete variables included in this present study were included in the regression analysis as “dummy variable”, while continuous variables were employed as their original values. Discrete variables coded as dummy variable are listed below:

- Gender variable is two categories as “female” and “male”. “Male” category was coded as “0” and was turned into a dummy variable. Similarly, in educational level with two categories, “high school level” variables was coded as “0”. In urban or rural area category, “rural” was coded as “0” and was turned into a dummy variable.
- ICT level of use variable related to mother and father were examined in five categories. “Having very little information” category was coded as “0” and was turned into a

dummy variable. Education level of mother and father variable was examined in four categories. “Bachelor’s, Master’s or PhD” category was coded as “0” and was turned into a dummy variable.

- Level of internet use variable was examined in five categories. “Having very little information” category was coded as “0” and was turned into a dummy variable. Smartphone purpose of use variable was examined in four categories. “educational” category was coded as “0” and was turned into a dummy variable.

In addition, the assumption of “multicollinearity” has been tested among predictor variables. Once the assumptions were performed, the hierarchical regression analysis has been made. In hierarchical linear multiple regression analysis, the independent variables are taken to analysis as analytic blocks, and each block becomes the control variable for the variables that enter the analysis after itself (See Fig. 2). In this analysis, the order of the entry of equations into independent variables has been determined according to the literature search of the researcher.

In this present study, demographic variables (age, educational level, income level, urban or rural area and number of siblings) were placed on the first block. Variables related to parents (mother education level, father education level, mother ICT usage level, father ICT usage level) were placed on the second block. For the third and fourth blocks, ICT and smartphone usage status variables (Internet access status, Internet usage experience, Internet usage skill level, daily internet usage time, smartphone control frequency, daily smartphone usage time, smartphone usage experience, smartphone usage purpose) were included. Academic achievements variables were at the last block (Fig. 3).

4. Findings

4.1. Descriptives

Descriptive analysis results of variables are shown in Table 2.

Roughly 49% ($n=300$) of the participants got 50 or above scores and were classified as probable problematic users according to the nomophobia scale. Roughly 53% ($n=327$) of the participants got 75 or above scores and were classified as probable problematic users according to the smartphone use disorder scale. The classification recommended by Young (1998) was taken as a reference in the literature while defining the scores as low/high.

Table 2 shows that, the highest total score average taken from the nomophobia subscales is the item of “not being able to communicate” ($M=15.84$, $Sd=4.736$). The lowest average among these subscales is the item of “not being able to access information” ($M=10.00$, $Sd=4.674$). The highest total score average taken from the smartphone addiction subscales is the item of “positive expectation” ($M=13.10$, $Sd=5.310$). The lowest average among these subscales is the item of “overuse” ($M=9.48$, $Sd=4.332$).

Table 3 demonstrates that about half of the participants have continuous internet access. Average internet usage experience of students is 5 years, while that of smartphones usage is 4.9 years. 31.2% of participants rated their internet

usage skill levels as “expert”. Students spend an average of 4.6 h a day on the internet and of 2.99 h on smartphones on a daily basis. The control variables are related to how many times the participants looked or controlled their smartphones for any reason (writing messages and controlling mailing, social media, instant messaging environments, etc.). Students were asked to write a number, by taking into account the daily smartphone uses. The students were provided some explanations on the time interval (as soon as wake up in the morning-until sleeping at night) for the control variable during data collection process. 21.2% of participants control their phone every 5 min. Participants use smartphones for entertainment, social media, communication and educational purposes, respectively.

The data on academic achievements included in Table 3 was taken from the online school administration system used by MoNE in Turkey, which is called “e-school”. During the practice, the students were asked to write down their grades displayed on “e-school” on the form. In order to this happens, the teachers conducting the study supported the students when needed.

At the end of each application for each class, the average and grades of grades indicated by the students in that class and the grade average and distribution obtained from the system were examined. The results show that the grades reported by the students reflect the truth. For example, the e-school grade average of class 5C mathematics is 2.44; grade distributions are as follows: “5 students with a rating of 1; 15 students with grade 2; 9 students with grade 3; 4 students with grade 4; 1 student with grade 5”. When the data of the students in this class was checked, it was seen that the e-school grade average of the mathematics course is 2.45. When the distributions of grades were checked, “4 students with a notation of 1; 14 students with grade 2; 9 students with grade 3; 3 students with grade 4; 1 student with a rating of 5”. It is thought that the difference between the e-school student declarations was caused by the students who were not eager to participate in the research or who are absent.

According to Table 3, the most successful course of the students is information technologies, and the most unsuccessful one is mathematics. The grades included in Table 4 were obtained by converting the scores of the relevant course into a 5-point system during a semester (is calculated by taking 2 or 3 exams scores- change according to the course hours- performance scores and teacher average scores for activities in the classroom). The grades and grade points according to 5 grading system for students in Turkey are as follows: 0 and 1 “fail”; 2 “passes”; 3 “medium”; 4 “good”; 5 “very”.

4.2. T-test and one-way ANOVA result

T-tests and one-way analysis of variance (ANOVA) were performed on demographic variables, parental variables, children’s ICT and smartphone use, and achievement levels to determine the mean differences between the groups in relation to nomophobia and smartphone use disorder. Before the analysis, the assumptions of the ANOVA test were examined and it was seen that these assumptions

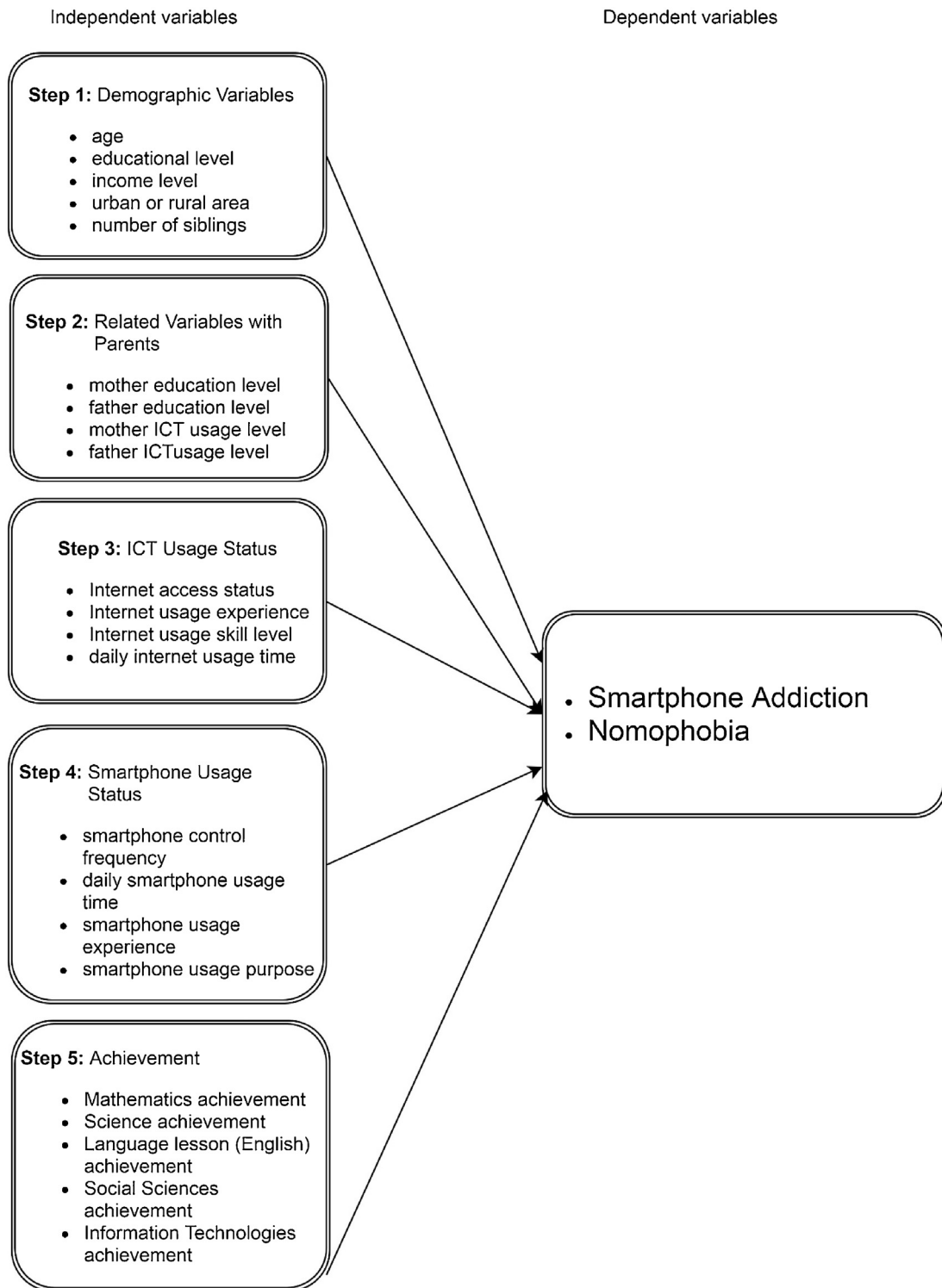


Fig. 3. Model examined with hierarchical regression analysis.

were met. Detailed results were presented in Table A2 in Appendix A.

Nomophobia scores show significant differences according to demographic variables; gender, age, monthly

income and urban or rural area ($p < .05$). Smartphone addiction scores show significant differences according to demographic variables; gender, age and urban or rural area ($p < .05$). Male students had higher scores on nomophobia

Table 2
Descriptive Statistics.

Scales	Number of items	Min score	Max score	Mean	Mean/k	SD
Nomophobia	20	20.00	100.00	51.29	2.56	26.26
Not being able to access information	4	4.00	20.00	10.00	2.50	4.674
Losing connectedness	5	5.00	25.00	12.95	2.59	4.657
Not being able to communicate	6	6.00	30.00	15.84	2.64	4.736
Giving up convenience	5	5.00	25.00	12.55	2.51	4.586
Smartphone Addiction	33	33.00	165.00	81.84	2.58	41.044
Daily life disturbance and tolerance	8	8.00	40.00	19.36	2.44	6.270
Deprivation indications	7	7.00	35.00	17.50	2.49	6.324
Positive expectations	5	5.00	25.00	13.10	2.62	5.310
Cyber-focused associations	4	4.00	20.00	9.64	2.41	4.341
Overuse	4	4.00	20.00	9.48	2.37	4.332
Social network addiction	2	2.00	10.00	4.98	2.54	3.404
Physical symptoms	3	3.00	15.00	7.53	2.50	3.323

k: number of items.

Table 3
Distributions in terms of ICT, smartphone usage and academic achievement of students.

Variables		f	%
Internet access status	1- Limited access	98	16.0
	2-Rare access possibility	48	7.8
	3-Sometimes they have access	66	10.8
	4-Accessibility most of the time	133	21.7
	5- Always accessible	267	43.6
Internet use experience (years)	Min = 1, Max = 10, Mean = 5.03, SD = 2.958		
	Having very little information	184	30.1
Level of internet using skill	Novice	43	7.0
	Moderate	94	15.4
	Advanced	100	16.3
	Expert	191	31.2
Daily internet usage time	Min = 1, Max = 14, Mean = 4.60, SD = 2.087		
	Min = 1, Max = 144(Once every 5 min), Mean = 4.60, SD = 2.087		
Smartphone control frequency (number of times per day)	Every 5 min	130	21.2
	Every 10 min	69	11.3
	Every 30 min	46	7.5
	One per hour	96	15.7
	Every two to three hours	88	14.4
	Several times a day	183	29.9
Daily smartphone usage time (hours)		Min = 1, Max = 12, Mean = 2.99, SD = 1.649	
Smartphone usage experience (years)		Min = 1, Max = 10, Mean = 4.925, SD = 2.350	
Smartphone purpose of use	Educational	Min = 1, Max = 5, Mean = 3.06, SD = 1.585	
	Communication (video and non-video call, SMS)	Min = 1, Max = 5, Mean = 3.48, SD = 1.600	
	Social media	Min = 1, Max = 5, Mean = 3.12, SD = 1.543	
	Entertainment (game, video, etc.)	Min = 1, Max = 5, Mean = 3.57, SD = 1.505	
	Math	Mean = 2.64, SD = 1.113	
	Science	Mean = 3.68, SD = .799	
Academic achievement	Language course (English)	Mean = 3.66, SD = .804	
	Social studies	Mean = 4.30, SD = .817	
	Information technologies	Mean = 4.36, SD = .822	

and smartphone addiction scores ($M = 51.37$, $M = 85.06$) than female students ($M = 51.21$, $M = 78.23$).

In terms of age, the scores of nomophobia and smartphone addiction scores ($M = 53.86$, $M = 94.79$) for students aged 16–18 years were between 10 and 12 years ($M = 50.90$, $M = 80.27$). Another remarkable finding is that the scores of nomophobia and smartphone addiction scores ($M = 53.19$, $M = 83.11$) were higher in urban settlement areas than those living in rural areas ($M = 47.61$, $M = 79.22$).

Variables related to parents differ only in nomophobia and smartphone addiction scores according to the variable “educational background of your mother”. Higher education graduates ($M = 52.27$, $M = 84.52$) have higher scores than other groups. There are significant differences between nomophobia and smartphone scores according to

the variables related to ICT and smartphone usages, including internet use experience (years), daily internet usage time, smartphone control frequency (number of times per day), daily smartphone usage time (hours), smartphone usage experience (years), smartphone purpose of use.

According to academic achievement variables, nomophobia and smartphone addiction scores showed significant differences according to academic achievement levels ($p < .05$). As the level of academic achievement increases, nomophobia and smartphone addiction scores decrease.

4.3. Correlation

There is a positive correlation at a high level between nomophobia scores and smartphone addiction ($r = .819$,

Table 4

Hierarchical regression analysis results.

	Smartphone addiction		Nomophobia	
Predictor	β	t	β	t
Block 1: demographic variables				
Gender	.069	1.986*	.009	.261
Age	.424	3.908*	.318	2.901*
Educational level	.415	3.803*	.320	2.946*
Income level	.068	1.679	.100	2.474*
Urban or rural area	.019	.463	.089	2.151*
Number of siblings	-.004	-.101	-.013	-.350
	R = .193, R ² = .037, F(6,605) = 3.884 Sig. = .001		R = .190, R ² = .036, F(6,605) = 3.795, Sig. = .001	
Block 2: related variables with parents				
Mother education level	.088	1.970*	.050	1.110
Father education level	-.005	-.120	-.022	-.489
Mother ICT usage level	.072	1.739	.068	1.636
Father ICT usage level	-.043	-1.037	-.002	-.039
	R = .222, R ² = .049, F(6,605) = 3.129 Sig. = .001		R = .208, R ² = .043, F(6,605) = 2.721, Sig. = .003	
Block 3: ICT usage status				
Internet access status	.038	1.002	.055	1.217
Internet usage experience	-.195	-4.545*	-.255	-3.050*
Internet usage skill level	-.056	-1.241	-.085	-2.520*
Daily internet usage time	.150	2.359*	.559	16.191*
	R = .456, R ² = .208, F(6,605) = 11.222, Sig. = .000		R = .497, R ² = .247, F(6,605) = 13.570 Sig. = .000	
Block 4: smartphone usage status				
Smartphone control frequency	-.205	-6.180*	-.151	-4.454*
Daily smartphone usage time	.207	5.828*	.157	4.649*
Smartphone usage experience	-.120	-3.001*	-.105	-2.150*
Smartphone usage purpose	.269	7.473*	.214	5.796*
	R = .692, R ² = .479, F(6,605) = 16.998, Sig. = .000		R = .675, R ² = .456, F(6,605) = 27.619 Sig. = .000	
Block 5: achievement				
Mathematics achievement	-.005	-.107	-.015	-.381
Science achievement	-.033	-.321	-.197	-1.988*
Language lesson (English) achievement	-.010	-.100	-.186	-1.799
Social sciences achievement	-.071	-1.173	-.066	-1.068
Information technologies achievement	.122	2.039*	.093	1.523
	R = .696, R ² = .484, F(6,605) = 13.361, Sig. = .000		R = .680, R ² = .462, F(6,605) = 21.982, Sig. = .000	

* $p < .05$.

$p < .001$). Related to the absolute value of the correlation coefficients, the ranges can be listed as .07 and 1.00 high; .70–.30 moderate and .30–.00 low level relationships (Buyukozturk, 2009). Therefore, as scores from the nomophobia scale increase, it can be said that smartphone addiction scores will also increase.

4.4. Hierarchical regression of smartphone addiction and nomophobia factors

Hierarchical linear multiple regression analysis results are given in Table 4

When the values in Table 4 are examined, it was found that demographic variables which are predictors of smartphone addiction employed in the analysis (all together) explained the variance 3.7% [$F(6,605) = 3.884$, Sig. = .001] in the first step; this ratio increased 4.9% [$F(6,605) = 3.129$, Sig. = .001]; when the variables related to the parents (all together) were included in the analysis in the second step; this ratio increased 20.8% [$F(6,605) = 11.222$, Sig. = .000] when the variables related to ICT usage (all together) were included in the analysis in the third step; this ratio increased 47.9% [$F(6,605) = 16.998$, Sig. = .000] when the variables related to smartphone use situation (all together) were included in the analysis in the fourth step; this ratio increased 48.4% when the variables related to academic

achievement (all together) were included in the analysis in the last step.

It was found that the increase of R^2 in all last steps was significant ($p < .01$) Models 1–5 are significant. Model 4 ($R = .692$, $R^2 = .479$, $p < .05$) are the most important predictors of students' smartphone addiction. From moving the current findings, it can be argued that the smartphone use situations must be investigated before the explanation smartphone addiction and taking precautions.

Even though demographic variables all together seems as significant predictors of smartphone addiction in regression analysis, only age, educational level and gender variables predict smartphone addiction significantly. Similarly, variables related to parents all together are predictors of smartphone use disorder, but all variables except mother education are not statistically significant predictors of smartphone use disorder. ICT use situations are significant predictors of smartphone use disorder, as well. However, only internet usage experience and daily internet usage time variables are significant predictors of smartphone use disorder. The striking point is here that the standardized regression coefficient between internet usage experience and smartphone addiction is negative. Therefore, it can be argued that there is a significant negative correlation between internet usage experience and smartphone use disorder.

All of the smartphone usage variables (both individually and collectively) are significant predictors of smartphone use disorder. While academic achievement variables are all significant predictors of smartphone dependency, variables outside the information technologies achievement variable do not significantly predict smartphone dependency.

When the values in Table 4 are examined, it was found that variables which are predictors of nomophobia employed in the analysis (all together) explained the variance 3.6% [$F(6,605) = 3.795$, $\text{Sig.} = .002$]; in the first step; this ratio increased 4.3% [$F(6,605) = 2.721$, $\text{Sig.} = .003$] when the variables related to the parents (all together) were included in the analysis in the second step; this ratio increased 24.7% [$F(6,605) = 13.570$, $\text{Sig.} = .000$]; when the variables related to ICT usage (all together) were included in the analysis in the third step; this ratio increased 45.6% [$F(6,605) = 27.619$, $\text{Sig.} = .000$]; when the variables related to smartphone use situation (all together) were included in the analysis in the fourth step; this ratio increased 46.2% when the variables related to academic achievement (all together) were included in the analysis in the last step.

It was found that the increase of R^2 in all last steps was significant ($p < .01$). Models 1–5 are significant. Model 4 ($R = .675$, $R^2 = .456$, $p < .05$) are the most important predictors of students' smartphone addiction.

Even though demographic variables all together seems as significant predictors of nomophobia in regression analysis, gender and the number of sibling variables don't predict smartphone addiction significantly. Similarly, variables related to parents all together are predictors of nomophobia, but none of the variables are not statistically significant predictors of nomophobia when evaluated separately. ICT use situations are significant predictors of nomophobia, as well. Internet access status isn't significant predictors of nomophobia. However, the standardized regression coefficient between internet usage experience and Internet usage skill level and nomophobia is negative. Therefore, it can be argued that there is a significant negative correlation between Internet usage experience and Internet usage skill level and nomophobia scores. All of the smartphone usage variables (both individually and collectively) are significant predictors of nomophobia scores.

While academic achievement variables are all significant predictors of nomophobia scores, variables except the science achievement variable do not predict nomophobia scores significantly. In addition, the standardized regression coefficient between the nomophobia scores and the academic achievement variable is negative.

5. Discussion, conclusion, limitations and suggestions

In this present study, 10 different models (5 + 5) which were related to both smartphone addiction and nomophobia were tested in order to determine the smartphone addiction and nomophobia levels among 12–18 age group secondary and high school students and to investigate demographic and academic variables predicting them.

This study is the first one which dwells on the investigation of demographic variables and academic achievement in a holistic manner as predictors of smartphone addiction

and nomophobia among adolescents in Turkey. In general, there are four main findings that are significant in the present study. The first one is that demographic variables have the predicting power as to gender-related symptoms of smartphone addiction and nomophobia.

Second, parents' education and ICT use levels are indicators of the symptoms of smartphone addiction and the nomophobia levels of adolescents. Third, academic achievement is predictive of smartphone addiction symptoms and nomophobia levels. Finally, it was found that the most important variables that need to be examined in prediction of smartphone addiction symptoms and increases in nomophobia levels are the smartphone usage frequencies/durations, purposes and smartphone experience.

5.1. Smartphone addiction and nomophobia

According to findings of the study, it is seen that there is a significant relationship between smartphone addiction and nomophobia. Social cognitive theory stresses that personal self-regulation and self-control form the basis of personal behavior (Bandura 1991). Regarding smartphone use literature, It is emphasized that individuals with low self-regulation and self-control skills can use their smartphones uncontrollably and create a higher dependency risk. (Van Deursen et al., 2015). From this point of view, students who show intense nomophobic behavior do not exhibit rigorous self-regulation and appear to be prone to smartphone use disorder. Thus, in accordance with previous findings (Beranuyet et al., 2009; Lee et al., 2014b; Lepp, Li, Barkley, & Salehi-Esfahani, 2015), the likelihood of having symptoms associated with smartphone addiction is higher in adolescents with high levels of nomophobic behavior.

Przybylski et al. (2013) pointed out the concept of FoMO and stated that individuals have been experiencing fear, anxiety and anxiety over their inability to follow events, news, exchanges and discussions, especially in social networks. Nomophobia concept is associated with smartphone addiction and FoMO (Cheever et al., 2014; Lepp et al., 2014). From moving on this point, it can be argued that as the anxiety about the breakdown of the communication caused by the applications that can be used in smartphones such as social media increases, the symptoms of smartphone addiction will increase.

The works of Gökçearsan et al. (2016) tell us that self-control variable is moderator in this relationship. As indicated by Yildiz-Durak (2018b), individuals who cannot keep their smartphone access away from control their problems are using their phones in a problematic way. For this reason, it is important to develop students' self-control skills to prevent problematic smartphone usage behaviors.

5.2. Discussion of models related to smartphone addiction

5.2.1. Demographic variables and smartphone addiction

According to the findings of the study, it was determined that the demographic variables predict smartphone addiction levels significantly. When the relative effect of demographic variables on smartphone addiction is examined, it is seen that age is the most effective predictor

variable. It has been determined that the level of smartphone addiction increases with age. Consistent with this finding, some studies in the literature have shown that levels of smartphone addiction increase with age (Gilly et al., 2012).

Differences in the developmental duties of individuals according to age groups, change of interests, more attractive social networks, increased communication need can be considered as the main reasons for this situation. When the findings of the study are analyzed, it has been found that the level of education is the most effective predictor of smartphone addiction after age within demographic variables. As education level increased with age, it was observed that the level of smartphone dependency increased. For this reason, it may be important for schools to arrange awareness trainings on smartphone use disorder, especially at high school level, to prevent these symptoms.

In research findings, gender was found to be the third most effective predictor of smartphone addiction among demographic variables. In addition, students' levels of smartphone addiction were higher in males than in females. In the literature, the patterns of phone use differ according to gender (Wei & Lo, 2006). It can be said that the reason for this is the more intense use of ICT by males than females in social networks. Turkstat (2017) conducted a study on ICT Usage in Household in Turkey and found that males had more use of smartphone, ICT access and social networking than females. According to the findings of the study, variables such as income level, area and number of siblings have less impact on smartphone addiction and are not significant predictors of smartphone addiction.

Even though there is no significant relationship, the level of smartphone addiction increases as the level of income increases. In addition, students living in rural areas have lower levels of smartphone addiction than those living in cities. Restrictions on access to technology can be considered as a reason for this situation. Another notable finding is that the sibling number and smartphone addiction predictivity coefficient are negative. Therefore, it can be said that as the number of siblings increases, the level of smartphone addiction decreases. It can be thought that the reason for this situation is that the students communicate with their siblings to satisfy their communication needs.

5.2.2. Variables related to parents and smartphone addiction

The variables which are related to parents and predicting smartphone addiction were investigated in this study. According to the findings of the study, it was determined that variables related to parents predict students' level of smartphone addiction significantly. This finding may give an idea of the smartphone addiction of adolescents in Turkey. These results have broadened the scope of work on parent-related situations and smartphone use disorder.

On the other hand, according to Sharabi, Levi and Margalit (2012), the family environment with better educated parents affects cognition about individual awareness and self-efficacy positively and this can diminish loneliness by affecting social relations of adolescents. According to Yan, Li and Sui (2014), this also reduces the likelihood of adolescents seeking online support and ultimately

becoming a smartphone addict. According to social cognitive development, environmental factors (in the context of family-related variables) are predictors of individual behavior, as well.

However, we need to know more about the internal mechanism of parents' ICT usage levels and how their education levels affect their smartphone usage habits, and there is a need for qualitative work in the future as we cannot make some practical implications for taking measures.

When the predictive effects of the variables in this model formed through variables related to parents are examined separately, it is seen that none of them (except mother and father education level) have a significant effect on smartphone addiction but they all have influence on smartphone use disorder. Whang, Lee, and Chang (2003) observed that internet-addicted teenagers tend to establish new online social relationships and show a desire to communicate with strangers rather than their family and friends. However, adolescents in Turkey tend to create a digital identity of the person they dreamed of (Durak, 2016). While creating this digital identity, the applications they employ on smartphones offer a wide range of opportunities. The perception of family and acquaintances as an obstacle to creating the desired digital identity is regarded as a limitation of social cognitive theory. The environmental factor ranges which were suggested by social cognitive theory have negative effects in explaining smartphone use disorders of adolescents.

Even though these variables don't predict smartphone addiction significantly, it is seen that as mother ICT usage skill level and mother education level increase, smartphone addiction level also increases when the arithmetic average is evaluated. It has been found that there are no similar patterns in father-related variables. As indicated by Livingstone, Haddon, Görzig and Ólafsson (2011), parents are the most important stakeholders in ICT use and technology-oriented addictions. Parents are both a model for providing information about getting rid of adverse situations that children are exposed to, raising awareness about children's conscious usage, and using ICT as an example. In this respect, it can be said that the interaction of parents with technology will be modeled by children and this will be reflected in the behavior of technology usage. It is important for parents to guide their children on the use of conscious technology in the context of technology competencies (Çetinkaya & Sütçü, 2016).

5.2.3. Variables related to ICT usage status and smartphone addiction

According to the findings of the study, it was determined that the variables related to ICT use predict students' levels of smartphone addiction significantly. The Internet usage experience variable in this model seems to have a significant and negative effect on smartphone use disorder. Similarly, there is a negative relationship between Internet usage skill level and smartphone use disorder. The most important contribution in explaining smartphone addiction has been provided by the variable "Smartphone Usage Status". According to the findings of the study, it was determined that variables related to smartphone usage predict students' smartphone addiction levels significantly. Kim

et al. (2016) found that smartphone usage was one of the predictors of smartphone use disorder. Haug et al. (2015) also coincides with the findings of this study. As a result, smartphone addiction can be regarded as the most important risk factor for smartphone use purpose, duration of use, smartphone usage experience in predicting participants' smartphone use disorder.

5.2.4. Variables related to academic achievement and smartphone addiction

According to the findings of the study, it was determined that variables related to academic achievement predict students' levels of smartphone addiction significantly. In the research findings, it was determined that the relationship between smartphone addiction and other variables other than achievement towards Information Technologies course was negative. In other words, it can be argued that the level of smartphone addiction will decrease as the achievement scores in these courses increase. This research confirms various studies showing that there is a relationship between academic achievement and problematic smartphone usage (Jackson, Von Eye, Witt, Zhao, & Fitzgerald, 2011; Jacobsen & Forste, 2011; Lepp et al., 2014; Wentworth & Middleton, 2014).

However, it has been reported that the relationship between smartphone addiction and academic achievement is two-way (Mendoza et al., 2018), but it is reported that smartphone addiction generally affects academic achievement. In this respect, it is thought that this study has brought a different perspective to the existing literature. For example, the theory of Internet addiction (Young, 1998) reports that people who are addicted to Internet are increasingly losing their control and motivations towards learning over the course of their online life, losing their international for entertainment (games, conversations, videolars, etc.) and consequently academic achievement. From this point of view, this work has brought a different perspective.

In this study, we found that the reduction in academic achievement was linked to an increase in the symptoms of smartphone use disorder. Low academic achievement points to low levels of participation and low learning motivation for both academic and behavioral, cognitive, and emotional tasks (Ryan & Deci, 2000; Skinner & Pitzer, 2012). In addition, low academic achievement in the field has led to an increase in school burnout with extreme internet addiction (Salmela-Aro et al., 2017).

Stage-environment fit theorists (Eccles et al., 1993) emphasize that the academic commitment of the adolescents will disappear if the academic environment does not satisfy the needs of the students, and the participation in learning activities will diminish and so will academic achievement. In this case, it is obvious that the students will go on-line activities. (Zhang, Qin, & Ren, 2018). However, in secondary and high school levels in Turkey, a strong academic achievement is needed in order to ensure achievement in the exams at the national level. Academic achievement puts pressures on adolescents and their parents in Turkey. It is possible for students to use smartphones problematically because these pressures create school burnout (Durak & Seferoğlu, 2017). This may

make sense in predicting the smartphone addiction of academic achievement in this study. In conclusion, this study highlights that smartphone addiction level may increase due to the pressure caused by national exams at secondary and high school levels in Turkey.

5.3. Discussion of models related to nomophobia

5.3.1. Demographic variables and nomophobia

According to the findings of the study, it was determined that the demographic variables predict students' nomophobia significantly. This finding can provide important clues to the diagnosis of nomophobia and to the intervention of nomophobia. For example, we found that the students at high school level had higher nomophobia levels and that the adolescents in this period were at a more vulnerable time to show nomophobic behavior, which provided a clue that we should pay more attention to high school students during adolescence.

When the relative effect of demographic variables on nomophobia is examined, it is seen that age is the most effective predictor variable as it is in smartphone use disorder. It was determined that the nomophobia level of the students increases along with age. According to Van Deursen et al. (2015), smartphone usage patterns may vary depending on various personal characteristics. It is obvious that personal factors based on social cognitive development are fundamental to explain nomophobia. For instance, people with high impulsivity tend to initiate an urgent action to instantly meet their needs (Patton et al., 1995). The impulsivity level, influenced by demographic characteristics, can lead to nomophobic behaviors due to activities such as acquiring information and satisfying relational needs, especially through smartphones, and these individuals are prone to problematic smartphone use symptoms (Wu, Cheung, Ku, & Hung, 2013).

Education level was found to be the most effective predictor of nomophobia after age among demographic variables. At this point, it may be useful to include training of problematic technology use in curriculum. Income level was found to be the third most effective predictor of nomophobia among demographic variables. According to Van Deursen et al. (2015), the type of smartphones used affects the nomophobia levels of the smartphone features used. From this, it can be said that depending on the level of income, the characteristics of the device which is owned will be different and the nomophobic behaviors differentiate depending on the device characteristics.

The urban or rural area was the fourth most effective variable on nomophobia. Students living in rural areas have lower levels of nomophobia than those living in the city. It is thought that this difference is caused by smartphone and internet access opportunities. As indicated in a study conducted at K-12 level in all regions of Turkey by Yildiz and Seferoğlu (2014), ICT access, usage and literacy were found to be digital divide according to the urban or rural area. It has been found that gender and sibling number variables have less influence on nomophobia than other variables and are not significant predictors of nomophobia.

Even though there is no significant relationship, it is found that males have higher levels of nomophobia than

females. In addition, it is observed that the levels of the nomophobia decrease as the number of siblings increases. Based on the number of siblings, it can be argued that the levels of empathy and life satisfaction of the individuals can vary and this can differentiate the levels of nomophobia (Lachmann et al., 2018).

5.3.2. Variables related to parents and nomophobia

According to the findings of the study, it was determined that the variables related to the parents predicted the nomophobia levels of the students significantly. When the predictive effects of the variables included in this model are examined separately, it is seen that none of them has a significant effect on nomophobia but all of them are effective on it. Even though these variables are not statistically significant predictors on the nomophobia, it is seen that as the mother ICT usage skill level and mother education level increase, the nomophobia level also increases when the arithmetic average is evaluated. There are no similar patterns in the variables related to the father.

As indicated by Hwang, Choi, Yum and Jeong (2017), given that parents' 'smartphone usage behaviors and parenting styles may affect children's problematic use of smartphones, parents' approach will play a role in preventing adverse effects of problematic smartphone use. In the study conducted by parents of secondary school students, it has been mentioned that the level of smartphone usage and nomophobia symptoms may increase in students as the tendency of parents to show smartphone addiction increases.

In addition, according to Elhai et al. (2017), the behavior of constantly controlling the smartphone and the anxiety state experienced when keeping away from the smartphone include learned behaviors. From this point of view, it can be said that students are influenced by parents' ICT literacy situations as well as the frequency of smart phone use and their problematic use. It is thought that the severity of this effect may be related to parental children's associations, attachment and parenting styles. For this reason, one of the precautionary measures that can be taken to reduce the tendency of students to show nomophobic behavior is to increase the level of knowledge about parents' usage of conscious technology.

5.3.3. Variables related to ICT usage and nomophobia

According to the findings of the study, it was determined that the variables related to the use of ICT predict students' nomophobia significantly. The Internet usage experience variable included in this model seems to be significantly effective in a negative way on nomophobia. It can be argued that nomophobia levels decrease as the experience of internet use of students increases. This may be due to the development of conscious habits as students gain both positive and negative experiences. On the other hand, according to Avcı, Usluel, Kurtoğlu and Uslu (2013), "innovation effect" has an effect on ICT usage behaviors. For this reason, it can be said that experience has formed a differentiation on nomophobia.

According to the findings of the study, it was determined that the variables related to the use of smartphone predict students' nomophobia levels significantly. In addition,

the relationship between smartphone control frequency and smartphone usage experience and nomophobia is in a negative way. Smartphone control frequency (1 – Every 5–10 min, ... – 6 – Several times a day) have been ordered by time intervals. For this reason, this finding suggests that the level of control increases along with the frequency of control. Similarly, as the duration of smartphone use increases over the course of the day, the level of nomophobia seems to increase. On the other hand, it has been found that as the experience of smartphone usage increases, the level of nomophobia decreases.

The nomophobia level of students who use the smartphone for instructional purposes significantly differs from those who use communication, social media and entertainment, and the nomophobia level of students who use educational purposes is lower. Moving from this finding, as indicated in the study conducted by Yildiz-Durak (2018a), it can be said that it is important to take advantage of the educational use potential of smartphones to prevent the symptoms of nomophobia. When the existing literature is examined, the studies that focus on the nomophobia reveal the features of smartphones, the inability to access social media and various internet based gaming applications lead to the addiction on individuals and cause them to have fear of staying away from these applications (Anshari et al., 2016; Yildirim et al., 2015). At this point, it seems natural that ICT usage frequency and nomophobia are related terms.

5.3.4. Variables related to academic achievement and nomophobia

In the present study, it was determined that variables related to academic achievement significantly predicted students' nomophobia levels. The relationship between nomophobia and other variables other than achievement towards Information Technologies course is negative. In other words, it can be said that as the scores of achievement in these courses increase, the level of nomophobia will decrease. There are studies that report that academic performance is related to nomophobia in literature (Rashid & Asghar, 2016). In conclusion, it is thought that students who have negative academic life performance tend to exhibit nomophobic behavior.

5.4. Practical implication

This present study broadened the nomological network of the variables including demographic, academic, and ICT variables that totally predicted nomophobia and smartphone addiction as it dealt with these variables in a holistic manner. Additionally, it is important that parents' ICT usage and educational levels are predictors of smartphone addiction and nomophobia levels of adolescents. In this context, it should be noted that during intervention programs for problematic ICT use, we should pay more attention to the level of education and ICT use of the parents, and to the personal characteristics of the individual.

Differences in gender, class level, and region-specific differences indicate that different "ICT addiction intervention practices" are needed for adolescents. Despite studies that prove the relationship between parent factors and

ICT dependence, there was no research that examined this relationship in the context of ICT usage level variance. This study attempted to reveal this mechanism by taking into account both demographic and parental factors as well as academic achievement variables in hopes of helping teenagers establish a more comprehensive theory for understanding smartphone addiction and nomophobic behavior.

Moreover, when choosing variables for this study, the results are expected to provide some practical advice for schools to intervene in ICT dependencies. For example, the finding which puts forward that smartphone addiction and nomophobia levels decrease as ICT use knowledge increases in the present study suggests that the development of ICT use skills in other lessons as well as the informatics courses to prevent ICT dependence in schools is a solution. Similarly, this finding can help parents and teachers design interventions to reduce anxiety levels in nomophobic individuals or to prevent the symptoms of smartphone use disorder. This present study suggests that academic performance may also be a predictor of nomophobia and smartphone use disorder, as well as the association between academic achievement and smartphone addiction and nomophobia in previous research.

5.5. Theoretical implication

The findings obtained from this study is believed to have contributed to the existing literature in terms of theoretical bases. To begin with, one of the most important contributions of this study is to provide an expanded model of adolescents' smartphone use disorder and nomophobic behavior in the theoretical context. In this model, in addition to the original social cognitive model, the time spent with smartphones, the frequency of control, smartphone experience and skill are more predictive on smartphone use disorder and nomophobia than personal factors.

External factors (variables related to parents) are less predictive than the personal ones on smartphone use disorder and nomophobia. In this present study, it was found that there was a negative relationship between smartphone use disorder and nomophobia. This finding suggests that low academic achievement may lead to problematic smartphone use disorders in adolescents. In a nutshell, we present compelling evidence showing that smartphone use disorder and nomophobia are related to academic achievement and academic achievement issues have some driven forces in smartphone use disorders.

5.6. Limitations and recommendations

This research has some limitations. As the results of this research reveal the relationship between problematic use of smartphones and demographic variables, it is important to conduct further research with similar groups and related variables, both within the same culture and between cultures. Also, in this study, the current relationship between smartphone use disorder, nomophobia and academic performance is defined by using the cross-sectional research design. However, the research design does not reveal cause-effect relationships.

Students' smartphone habits have been evaluated based on the information they have reported. In studies conducted in the existing literature, it was stated that obtained data based on self-report constitute a limitation in terms of "reliability of results" for research (Lin et al., 2015; Montag, Blaskiewicz, Lachmann et al., 2015; Montag, Błaskiewicz, Sariyska et al., 2015). In order to prevent this limitation from adversely affecting the results of the research, consistency was checked between the responses given to the items in the scales that were in the scales. It was seen that the responses to the items in the opposite direction were almost the same as the arithmetic average.

When the literature is examined, it has been suggested that the results of the research are evaluated in this context and the variables in the opposite direction are evaluated as control elements (Guo, Li, & Yu, 2017). Also in literature, in future years, It is also emphasized that the organization of psychological data with computational techniques will gain importance in the coming years (Montag, Duke, & Markowetz, 2016; Montag et al., 2016; Yarkoni, 2012). This study only includes secondary and high school students since the most important group to suffer from smartphone addiction is adolescents. Future research may explore the same hypothesis model with larger research kits.

Declaration of conflicting interests

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Appendix A.

Table A1

Outline on data collection instruments and sample Items.

Questions	Reference	Sample items																																																						
Demographic items (Q1–Q6) Parent variables (Q7–Q10) ICT usage status (Q11–Q39).	Developed by researchers	Gender a. Male b. Female Age How many hours do you use your smartphone in a day? Lees than one hour 1–3 h 4–6 h 7–9 h 10 and over Educational Background of Your Mother Primary school graduate Middle school graduate High school graduate Bachelor's degree Master's PhD degree Your internet access status: 1- Limited access 2-Rare access possibility 3-Sometimes they have access 4-Accessibility most of the time 5- Always accessible 40. Academic achievement Select your grades in your school report in the last semester for the following courses. Please pay attention that your answers match up with the grades in the e-school system.																																																						
Academic achievement (Q40–Q48)	Developed by researchers	<table><tr><th>Courses</th><th>1 (44-0 points)</th><th>2 (54-45 points)</th><th>3 (69-55 points)</th><th>4 (84-70 points)</th><th>5 (100-85 points)</th></tr><tr><td>1. Mathematics</td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr><tr><td>2. Science</td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr><tr><td>3. Social Sciences</td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr><tr><td>4. Turkish</td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr><tr><td>5. Foreign Language Course (English)</td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr><tr><td>6. Art Classes</td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr><tr><td>7.Information Technology and Software</td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr><tr><td>8. Academic Grade Point Average of the Last Semester</td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr></table>	Courses	1 (44-0 points)	2 (54-45 points)	3 (69-55 points)	4 (84-70 points)	5 (100-85 points)	1. Mathematics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2. Science	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3. Social Sciences	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4. Turkish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	5. Foreign Language Course (English)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	6. Art Classes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7.Information Technology and Software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8. Academic Grade Point Average of the Last Semester	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Courses	1 (44-0 points)	2 (54-45 points)	3 (69-55 points)	4 (84-70 points)	5 (100-85 points)																																																			
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Smartphone addiction Scale (SAS) (Q49–Q81)	Demirci, Orhan, Demirdaş, Akpınar and Sert (2014)	2. I have difficulty in concentrating due to smartphone usage while studying in classroom or doing homework. 9. It is possible to get rid of stress through smartphone. 13. Using a smartphone is the most enjoyable thing in my life. 25. I check social networks such as Twitter and Facebook as soon as I wake up.																																																						
Nomophobia scale (Q82–Q101)	Yildirim, Şumuer, Adnan and Yildirim (2015)	1. I feel disturbed when I cannot access to information on my smartphone. 11. If my smartphone is not with me, I worry that my family and/or my friends will not be able to reach me. 16. If my smartphone is not with me, I get nervous since I am offline. 20. If my smartphone is not with me, I feel strange since I am not sure what I will do.																																																						

Table A2

T-test and one-way ANOVA result.

Variables		Nomophobia			Smartphone addiction		
	Options	M (SD)	F	p	M (SD)	F	p
Demographic variables	Female	51.21 (26.34)	2.16	.040*	78.23 (38.32)	2.10	.039*
Gender	Male	51.37 (26.22)			85.06 (43.21)		
** Age	10–12 years	50.90 (26.05)	2.96	.031*	80.27 (40.52)	3.10	.045*
	13–15 years	51.48 (26.12)			81.81 (40.97)		
	16–18 years	53.86 (30.38)			94.79 (45.36)		
Educational level	Middle School	50.62 (26.45)	0.581	.561	79.86 (41.03)	1.07	.285
	Level						
	High School Level	51.86 (26.11)			83.43 (41.04)		
** Monthly Income	Low	45.82 (26.09)	5.045	.007*	71.60 (39.83)	5.163	.006
	Moderate	51.69 (26.56)			83.14 (38.87)		
	High	56.68 (24.22)			84.86 (41.56)		
*** Number of siblings	I have not got	52.99 (25.59)	1.90	.102	82.88 (41.70)	1.502	.223
	brother or sister						
	1–3 siblings	51.78 (26.74)			81.93 (40.70)		
Urban or rural area	4 and up siblings	44.41 (22.75)	2.504	.013*	72.97 (35.72)	2.541	.011*
	Rural	47.61 (25.35)			79.22 (40.05)		
	Urban	53.19 (26.54)			83.11 (41.54)		
Related Variables with Parents	Options	M (SD)	F	p	M (SD)	F	p
Mother ICT Level of Use	Having very little information	48.62 (24.66)	1.243	.291	77.67 (37.48)	1.216	.303
	Novice	53.64 (28.57)			86.74 (45.50)		
	Moderate	53.20 (28.29)			83.65 (43.57)		
	Advanced	52.01 (26.89)			83.66 (42.98)		
	Expert	53.87 (26.69)			85.41 (42.95)		
	Having very little information	51.11 (26.23)			82.78 (41.26)		
Father ICT Usage Level	Novice	49.85 (27.36)	.191	.943	81.69 (43.28)	.376	.826
	Moderate	52.56 (25.57)			85.37 (39.96)		
	Advanced	49.52 (23.95)			77.57 (38.45)		
	Expert	52.09 (27.19)			80.37 (41.59)		
	Primary school	49.09 (29.85)			71.33 (44.41)		
Educational Background of Your Mother	graduate		2.635	.049*		2.798	.039*
	Middle school	48.40 (25.28)			75.51 (39.13)		
	graduate						
	High School	51.99 (25.97)			82.89 (41.01)		
	Graduate						
Educational Background of Your Father	Bachelor's,	52.27 (26.57)	.740	.528	84.52 (41.41)	1.944	.121
	Master's or PhD						
	Primary school	51.50 (17.16)			64.00 (15.55)		
	graduate						
	Middle school	55.55 (28.15)			86.39 (45.66)		
ICT Usage Status	graduate		F	p		F	p
	High school	50.75 (26.81)			81.54 (39.72)		
	graduate						
	Bachelor's,	50.60 (25.57)			78.32 (38.05)		
	Master's or PhD						
	Options	M(SD)			M(SD)		

Internet Access Status	Limited access	43.93 (16.05)			76.00 (29.65)		
	Rare access possibility	50.12 (26.77)	2.030	.089	80.27 (39.95)	1.275	.278
	Sometimes they have access	51.19 (26.32)			81.21 (42.25)		
	Accessibility most of the time	51.20 (27.05)			81.22 (42.43)		
	Always accessible	54.15 (26.89)			85.67 (41.80)		
***Internet use experience (years)	Less than 1 year	63.82 (30.08)			104.73 (43.44)		
	1–3 years	57.17 (21.04)	30.979	.000*	92.44 (36.14)	43.960	.000*
	4 years and over	45.00 (24.25)			70.31 (37.21)		
	Having very little information	55.44 (28.11)			88.69 (45.54)		
Level of internet using skill	Novice	55.27 (26.49)	1.657	.158	84.15 (41.71)	.707	.587
	Moderate	51.02 (24.93)			81.77 (41.04)		
	Advanced	50.03 (23.14)			80.86 (40.39)		
	Expert	50.00 (23.11)			80.11 (39.90)		
	Less than 1 h	44.89 (22.11)			71.54 (34.49)		
***Daily internet usage time	1–3 h	54.41 (26.76)	9.729	.000*	86.15 (41.85)	10.730	.000*
	4 h and over	55.56 (31.76)			91.77 (49.21)		
	Options	M (SD)	F	p	M (SD)	F	p
Smartphone Usage Status	Every 5–10 min	61.17 (27.13)			100.08 (41.57)		
	Every 10–30 min	58.67 (23.08)	43.499	.000*	94.11 (35.92)	51.042	.000
	Every one to three hours	55.15 (23.46)			85.49 (34.16)		
***Daily smartphone usage time (hours)	Several times a day	34.79(30.49)			55.04 (33.83)		
	Less than 1 h	49.80 (25.85)			79.53 (40.11)		
	1–3 h	50.04 (25.72)	2.63	0.033*	80.04 (40.24)	2.53	0.044*
	4 h and over	53.17 (26.85)			84.42 (42.18)		
***Smartphone usage experience (years)	Less than 1 year	66.03 (31.90)			89.25 (41.68)		
	1–3 years	50.57 (25.71)	10.867	.000*	79.35 (38.37)	15.073	.000*
	4 years and over	50.47 (24.22)			78.22 (39.29)		
	Educational	39.32 (20.90)			61.77 (30.44)		
Smartphone purpose of use	Communication (video and non-video call, SMS)	56.89 (21.81)	90.733	.000*	90.60 (34.70)	106.323	.000*
	Social media	63.46 (23.01)			108.69 (27.43)		
	Entertainment (game, video, etc.)	76.85 (24.22)			121.28 (42.62)		
Achievement	Options	M (SD)	F	p	M (SD)	F	p
	0–1 Failed	62.44 (27.37)			106.04 (42.56)		
	2 Pass	53.72 (25.73)			86.46 (45.49)		
Academic average	3 Medium	53.91 (27.51)	2.955	.020*	79.37 (39.81)	3.708	.005*
	4 Good	49.48 (25.96)			82.65 (40.14)		
	5 Well	32.71 (15.09)			53.00 (27.07)		

* $p < .05$.** Turkstat (2017) in Turkey are classified according to their income level limits set by the http://www.tuik.gov.tr/pretablo.do?alt_id=1013.

*** Variables belonging to continuous data are given to experts and categorized.

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