

**Original Article****The Effect of Problematic Internet Use and Digital Game Addiction in Adolescents on Nomophobia Levels****Dijle Ayar, PhD, RN**

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**Correspondence:** Dijle Ayar, Department of Pediatric Nursing, Faculty of Nursing, Dokuz Eylul University, Izmir 35340, Turkey E-mail: dijleozer87@gmail.com**Abstract**

**Background:** There is a growing use of all sorts of technologies and technological devices around the world. The widespread use of the technological devices among children today shows the risk that children carry in terms of nomophobia.

**Aim:** This study examined the effect of problematic internet use and digital game addiction on nomophobia level.

**Methodology:** The study was designed to collect descriptive, correlational, predictive, and cross-sectional data on 668 adolescents. Data were collected using the Problematic Internet Use Scale, Game Addiction Scale and Nomophobia Questionnaire. Numbers, percentage analysis, and correlation and regression analyses were employed to evaluate the data.

**Results:** The mean age of the adolescents that participated in this study was  $15.42 \pm 0.38$  years. Regarding the correlation between adolescents' problematic internet use and digital game addiction and their nomophobia levels, the study found that there was a positive and moderate correlation between the adolescents' problematic internet use and nomophobia levels ( $r=.683$ ,  $p<.001$ ), while there was a positive, moderate, and significant correlation ( $r=.714$ ,  $p<.001$ ) between their digital game addiction and nomophobia levels. There was a positive correlation between the adolescents' problematic internet use and digital game addiction mean scores and their nomophobia levels, and 59% ( $F=477,107$ ,  $p<.001$ ) of the factors that affected nomophobia levels were explained by problematic internet use and digital game addiction.

**Conclusions:** This study found that adolescents who have high levels of problematic internet use and digital game addiction might increase their nomophobia levels as well.

**Keywords:** problematic internet usage, game addiction, nomophobia.

**Introduction**

According to World Health Organization (WHO), there is a growing use of all sorts of technologies and technological devices (e.g., internet, computer, smartphone) around the world (WHO, 2014). The data collected by The Study of Household Use of Information Technologies (2018) indicate that the rate of internet use in 16-year-old individuals is 59.6% in Turkey. Also, 83.8% of houses have internet access (Turkish Statistical Institute [TURKSTAT], 2018). In Turkey, among children aged between 6 and 15 who use internet, the mean age of beginning to use the internet is nine (TURKSTAT, 2013). When adolescents

use the internet excessively, there is a concern about Problematic Internet Use (PIU) and digital game addiction (Ayar et al., 2017).

Digital games are played by more people as the internet is used more frequently each day (Yalçın and Bertiz, 2019). Especially children and adolescents, have developed interest in digital games. Moreover, excessive gaming behavior has rapidly increased, particularly among male adolescents between the ages of 10 and 19 years (Goswami and Singh, 2016). In addition, previous studies indicated that problematic internet use also triggers game addiction, particularly in adolescents (Ayas, 2012; Kuss, 2013). Digital game addiction is described as an

excessive and problematic use of the computer and playing digital games (Lemmens et al., 2009). The digital games that are played on the computer or mobile phone are usually played online, which causes a positive correlation between internet addiction and game addiction (Ayas, 2012; Muezzin, 2015). Relevant studies also showed that playing online games had effects on Problematic Internet Use (PIU) (Jeong et al., 2016). Having already evolved into a social issue PIU can be broadly conceived as a failure to control one's use of the Internet, leading to adverse consequences in everyday life (Spada, 2014). PIU can be observed in any age group; however, adolescents are one of the groups that are at the greatest risk of PIU (Kwon et al., 2013; Haug et al., 2015; Jeong et al., 2016).

With accessibility and smart devices that provide immediate access to the Internet, the menace caused by PIU seems to be on the rise (Lopez-Fernandez, Freixa-Blanxart, and Honrubia-Serrano, 2013; Škařupová, Ólafsson, and Blinka, 2016). In Turkey, Gezgin, Cakir, and Yildirim (2018) conducted a study with the participation of 929 high school students and showed a moderately positive relationship between nomophobia prevalence and Internet addiction among the adolescent participants. Similarly, Gezgin and Cakir (2016) reported that adolescents who spend more time on the Internet each day have a higher level of nomophobia than those who spend less. Gezgin et al. (2017) studied 1,151 social network users and reported that individuals whose duration of mobile Internet ownership or daily mobile Internet use is longer display higher levels of nomophobic behavior.

Nomophobia should be considered in relation to smartphones, which have the standard capabilities of a cell phone, (phone calls, texting, etc.) and have more advanced capabilities like internet access, applications, or sensors (Park et al. 2013). Nomophobia is a specific disorder caused by smartphone use. Whereas mobile phone dependence is defined as a loss of control on phone use that interferes with other activities, nomophobia refers to fear (Chóliz, 2012). "Acronym is a term referring to 'no mobile phone phobia' and it is "fear of not being able to use his/her mobile phone or being unavailable on mobile phone" (Yildirim and Correia, 2015). Nomophobia is considered as a problematic use of mobile phones. Therefore, it is suggested to be

listed as a "situational phobia" under "specific phobia" identified in Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (American Psychiatric Association, 2013; Bragazzi and Del Puente, 2014). "Nomophobia is the modern fear of being unable to communicate through a mobile phone or the Internet". The individual starts to get anxious when he/she has forgotten to take their mobile phone together, when the mobile phone is out of battery or when the mobile phone has no signal (Gezgin, 2017). One of the indicators of nomophobia is that the person regularly uses a mobile phone, in particular having more than one mobile phone and always with a charger. To keep the mobile phone always switched on (24 hours a day), to sleep with the mobile device in bed, also to have few social face-to-face interactions with humans which would lead to anxiety and stress; to prefer to communicate using the new technologies (Bragazzi and Del Puente, 2014). Studies in various countries have shown that nomophobia among adolescents is gradually increasing (Cheever et al. 2014; Kaur and Sharma 2015; Pavithra and Madhukumar, 2015; Sharma et al., 2015; Gezgin et al., 2017). Studies of nomophobia among the adolescents in Turkey have examined the effect of variables such as the use of smart phones, solitude, and achievement at school on nomophobia (Durak Yıldız, 2018). The studies show that problematic internet use by the adolescents results in excessive smart phone use, which is thought to pave the way for nomophobia—one of the significant issues of the present time. In addition to these studies Adnan and Gezgin (2016) examined the prevalence of nomophobia in their study, and suggested focusing on the factors that affected nomophobia, and analyzing especially how problematic internet use and affected nomophobia. In this context, a review of the studies carried out in Turkey and other countries revealed that there were no studies that made a combined analysis of the effects of adolescents' problematic internet use and digital game addiction on nomophobia. For this reason, this study examined the effect of problematic internet use and digital game addiction on nomophobia level.

## Methods

**Data and study population:** This is a descriptive, cross-sectional, and correlational study that was intended to examine the effect of adolescents' problematic internet use and digital game addiction on their nomophobia levels.

**Participants:** On the G\*Power statistics software, at medium effect size, the study had Type I error of 0.05 and Type II error of 0.20 (according to 80% power), also the needed sample size was determined to be 196 students. With the purpose of showing the relationship between variables more clearly, the study included in the sample 668 adolescents from the ninth, tenth, and eleventh grades that had permission from their parents, who volunteered for the study and who filled out the scale questionnaires without leaving any questions blank.

The inclusion criteria were a) being aged from 14 to 18 years, b) agreeing to participate in the study voluntarily or having a consent form from parents, c) being capable of reading and understanding the survey questions, d) owning a smartphone, and e) having played digital games in the last six months. Provincial Directorate for National Education provided the number of high schools ( $n=25$ ) located in the city where the study was conducted. Each school was assigned a number and two schools were randomly selected using a table of random numbers. In cooperation with school managements, the research team determined one day to be appointed for each class and at the same time, the data related to the study were gathered by the researchers from the students whose family-signed consent forms were also available, confirming that the students could take part in the study.

## Measures

**The Sociodemographic Data Collection Form :** The researchers created a socio-demographic data collection form after a review of the literature. This form included 7 items about Internet use as well as age, gender, grade, parents 'educational background. To determine the internet use, digital game use and smartphone usage levels of adolescents, the researchers asked them "how many hours a week do you play digital games", "how old began using a smartphone".

**Problematic Internet Usage Scale-Adolescent Form (PIUS-A):** Problematic Internet Usage Scale- Adolescent Form (PIUS-A) Ceyhan and Ceyhan (2014) used 27 items on the high school students to determine the level of problematic internet use behaviors. The scales are scored as "Not at all appropriate" (1 point), "Rarely appropriate" (2 points), "Somewhat appropriate" (3 points), "Fairly appropriate" (4 points) and

"Completely appropriate" (5 point) the lowest score that can be taken from the scale is 27 and the highest score is 135. The total Cronbach's alpha coefficient observed in the the scale was .93 (Ceyhan and Ceyhan 2014).

**Game Addiction Scale for Adolescents:** The original scale was created by Lemmens et al. (2009), and it includes 21 items. The items in the "Game Addiction Scale for Adolescents" are based on whether the children think about video games all day, play the games too long, control themselves while playing, get negative feelings when they do not play, and neglect their friends or families due to playing.

The scales are scored as "Never" (1 point), "Rarely " (2 points), " Occasionally" (3 points), "Often" (4 points) and "Very Often" (5 point) the lowest score that can be taken from the scale is 21 and the highest score is 105 (Lemmens et al., 2009). The validity and reliability study of the Turkish scale was conducted by Ilgaz (2015). The total Cronbach's alpha value of the scale was 0.92. It is a valid and reliable scale that can be used to determine game addiction levels of the adolescents in the Turkish sample (Ilgaz, 2015).

**Nomophobia Questionnaire (NMP-Q):** This scale was created by Yildirim and Correia (2015), to measure the nomophobic of adolescents. A 7-point Likert scale which ranges from 1 for "strongly disagree" to 7 for "strongly agree" is applied to each NMP-Q item leading to a summated total score. The higher the score, the greater the severity of nomophobia. In addition, the interpretation of the NMP-Q score into the level of nomophobia (out of a total score between 20 and 140) is 20 corresponding to the absence; 21–59 corresponding to a mild level; 60–99 corresponding to a moderate level; and  $\geq 100$  corresponding to severe level (Yildirim and Correia, 2015). The scale is a valid and reliable instrument that can be used to assess the nomophobia levels of adolescents in the Turkish sample.

**Data Analysis:** Descriptive analyses were conducted using percentages, means, and standard deviation. To evaluate constancy of data allocation, Shapiro – Wilk tests were utilized. Shapiro-Wilk analysis was found  $p>0.05$ . Relationships among problematic internet usage, digital game addiction and nomophobia level were evaluated using Pearson correlation analysis. The impacts arising from students' problematic internet use and their addiction to digital games in respect to their nomophobia levels were evaluated using multiple

linear regression analyses. Also, for regression analysis, multicollinearity testing was applied. The predictors which were added to the model by variance inflation factor coefficients consisted of those <10 and tolerance coefficients consisted of those >0.20. The significance level was accepted as  $p < 0.05$  (Yan and Su 2009).

**Ethical considerations:** Prior to the research, permits were obtained from the owners of the scales used in the research via email. The written consent of University Non-Invasive Research Ethics Board was obtained in a decision numbered (3569-GOA, 2017/23-03), written institutional permit approved by the Provincial Directorate of National Education, and the written consents which were required for the adolescents as well as their parents were obtained. Before the study, parents were informed about the study content in a meeting at the school. Informative forms about the study aim and content were mailed to parents who did not attend the meeting. Only the students whose parents gave written consent were included in the study.

## Results

The age range of the adolescents was 14-18 years old. The mean age of the adolescents that participated in this study was  $15.42 \pm 0.38$  years. Of these adolescents, 34.4% (n=231) were ninth grade students while 43.6% (n=293) were in tenth grade and 21.4% (n=144) were in eleventh grade. Also, 56.7% (n=381) of the adolescents were males and 42.7% (n=287) of the adolescents were females. A review of the parents' education levels showed that 27.1%

(n=182) of mothers were primary school graduate, 23.7% (n=159) of mothers were middle school graduate, 30.1% (n=202) of mothers were high school graduates and 18.6% (n=125) of mothers were university graduates. A review of the parents' education levels showed that 13.1% (n=88) of fathers were primary school graduate, 29.0% (n=195) of fathers were middle school graduate, 32.1% (n=216) of fathers were high school graduates and 25.1% (n=169) of fathers were university graduates. The adolescents began to use smartphones at the age of seven years. Also, 78.6% (n=528) of the adolescents had internet access on their mobile phones. The study determined that 21.3% (n=143) of the adolescents played digital games for 5-14 hours every week. In the study, 43.6% (n=291) of the adolescents had a mild level of nomophobia while 46.3% (n=309) of them were moderate level of nomophobia, and 9.7% (n=64) were severe level of nomophobia. Regarding the correlation between adolescents' problematic internet use and digital game addiction and their nomophobia levels, the study found that there was a positive and moderate correlation between the adolescents' problematic internet use and nomophobia levels ( $r=.683$ ,  $p<.001$ ), while there was a positive, moderate, and significant correlation ( $r=.714$ ,  $p<.001$ ) between their digital game addiction and nomophobia levels. There was a positive, moderate, and significant correlation between adolescents' problematic internet use and digital game addiction ( $r=.660$ ,  $p<.001$ ) (Table 1).

**Table 1. The Correlation Between Problematic Internet Use and Digital Game Addiction and Nomophobia Level (n=668)** Note. \*  $p < .001$

	1	2	3
1. Nomophobia Level	1.0		
2. Problematic Internet Use	.683*	1.0	
3. Digital Game Addiction	.714*	.660*	1.0

**Table 2. Multiple Linear Regression Analysis of the Factors That Affect Nomophobia Levels (n=668)**

	Model 1	Model 2	Model 3
	$\beta$	$\beta$	$\beta$
Problematic Internet Use	.618*		.339*
Digital Game Addiction		.741*	.484*
R <sup>2</sup>	.47	.51	.59
F	582.245	692.842	477.107
p	<.001	<.001	<.001

Note: p<.001\*

Multiple regression analysis revealed that there was a positive and significant correlation ( $\beta=.618$ ,  $p<.001$ ) between the adolescents' problematic internet use and nomophobia levels, and 47% ( $F=582,245$   $p<.001$ ) of the factors that affected nomophobia were explained by the adolescents' total mean scores regarding problematic internet use (Table 2). Multiple regression analysis, presented in Model 2, determined that there was a positive and significant correlation ( $\beta=.741$ ,  $p<.001$ ) between adolescents' digital game addiction and nomophobia levels. Also, 51% ( $F= 692,842$ ,  $p<.001$ ) of the factors that affected nomophobia were explained by the adolescents' total mean scores regarding digital game addiction (Table 2). In Model 3, there was a positive correlation between the adolescents' problematic internet use and digital game addiction mean scores and their nomophobia levels, and 59% ( $F=477,107$ ,  $p<.001$ ) of the factors that affected nomophobia levels were explained by problematic internet use and digital game addiction. Digital game addiction had the greatest impact ( $\beta=.484$ ,  $p<.001$ ) on the adolescents' nomophobia levels, and problematic internet use had the second greatest impact ( $\beta=.339$ ,  $p<.001$ ) on them (Table 2).

### Discussion

In the study, 43.6% (n=291) of the adolescents had a mild level of nomophobia while 46.3% (n=309) of them were moderate level of nomophobia, and 9.7% (n=64) were severe level of nomophobia. The researcher created three

models with a consideration of the correlations among the variables. Model 1 studies the correlation between the adolescents' total mean scores on problematic internet use and nomophobia; Model 2 studies the correlation between the adolescents' total mean scores on digital game addiction and nomophobia; and Model 3 studies the correlation between the adolescents' total mean scores on both problematic internet use and digital game addiction and their total mean scores on nomophobia.

Model 1 revealed that the adolescents who had high levels of problematic internet use also had high levels of nomophobia. This study determined that problematic internet use level has an important place in the factors that affect nomophobia level (47%, Table 2). Ayar et al. (2017) conducted a study with 609 high school students, and found that the adolescents with high levels of internet addiction also had high levels of smartphone addiction, which is consistent with the present study. Pavithra et al. (2015) found in their study with 200 students aged 17 to 27 years that those who had high levels of problematic Internet use had higher nomophobia levels. Bivin et al. (2013) conducted a study with 547 nursing, dental science, physiotherapy and ayurveda undergraduate students. A positive significant relationship was found between smart phone use and severity of nomophobia. Gezgin and Çakir (2016) found a moderately positive relationship between Internet addiction and nomophobia prevalence. The literature supports the result that participants

with a high level of problematic Internet use have high nomophobia levels.

Model 2 showed that the adolescents with high digital game addiction also had high levels of nomophobia. This study determined that digital game addiction has an important place in the factors that affect nomophobia levels (51%, Table 2). Liu et al. (2016) determined that in particular, games played on smartphones increased the addiction to smartphones, which is consistent with the findings of this study. Recent studies also show that the digital games played on smartphones lead to smartphone addiction (Bian and Leung, 2015; Jeong et al. 2016; Kim et al. 2016). The studies of this subject indicated that playing games is one of the most influential determinants of smartphone addiction (Cha and Seo, 2018). Some researchers emphasize that adolescents mostly prefer computers to play games since the game through the smartphone may not be as immersive as the PC-based game (the reason for this is that the screen of the smartphone is smaller than that of the PC) (Hou et al., 2012). Thus, it is currently hard to claim that playing games on smartphones has a direct impact on smartphone addiction (Bae, 2017).

Model 3 showed that the adolescents with high digital game addiction along with high internet addiction also had high nomophobia. This study determined that internet addiction and digital game addiction have an important place in the factors that affect nomophobia levels (59%, Table 2). The studies in this area show that playing games on the internet and problematic internet usage is the most principal activity that leads to addiction. When individuals can do things playing online games that they cannot do in real life, it increases their interest in playing online games. Players use nicknames, or pseudonyms, when playing online games and this hides their real identity. For this reason, in particular, internet addicts are inclined to play games, since they are free from the limitations they have in real life, and able to escape from their problems (Wan and Chiou, 2006). All of these points indicate that adolescents would not be inclined to stay away from their smartphones, since relevant studies associate internet addiction with playing games, and both of these activities are easily accessible using smartphones. Past studies also show that online games in particular lead to compulsive internet use in adolescents (Kormas et al., 2011; van Rooij et al., 2010).

**Conclusion:** To conclude, this study found that adolescents who have high levels of problematic internet use and digital game addiction might increase their nomophobia levels as well. Nomophobia is also described as the fear of being deprived of a personal mobile phone, and it might increase in direct proportion with the increase in the popularity using of smartphones. Regular evaluation of the nomophobia levels of adolescent is recommended to determine in detail the factors that affect them. Further interventional studies for the prevention of nomophobia are also needed.

**Limitations:** The data were collected at only two high schools in a provincial center of Western Turkey; hence their generalization could be of limited for the all adolescents.

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