Samet Makas[1], Seyhan Bekir[2], Kübra Dombak[1], Hasan Batmaz[3],
Mehmet Kaya[1], Eyup Çelik[1]

Loneliness and nomophobia in the context of risks to mental health: smartphone addiction

Samotność i nomofobia w kontekście zagrożeń dla zdrowia psychicznego: uzależnienie od smartfona

[1] Educational Science, Sakarya University, Sakarya, Türkiye
[2] Faculty of Science and Letters, Demiroğlu Science University, Istanbul, Türkiye
[3] Faculty of Humanities and Social Sciences, Karabuk University, Karabük, Türkiye
Correspondence: Seyhan Bekir, Department of Psychology, Demiroğlu Science University, Türkiye, e-mail: seyhanbekir93@gmail.com

ORCID iDs
1. Samet Makas   https://orcid.org/0000-0002-9896-4013
2. Seyhan Bekir   https://orcid.org/0000-0002-4191-6539
3. Kübra Dombak   https://orcid.org/0000-0002-1362-3958
4. Hasan Batmaz   https://orcid.org/0000-0002-5979-1586
5. Mehmet Kaya   https://orcid.org/0000-0003-2659-3601
6. Eyup Çelik   https://orcid.org/0000-0002-7714-9263

Abstract

Introduction and objective: In the hierarchy of needs theory, Maslow emphasises that individuals need to establish and maintain close relationships with others to meet their love and belonging needs. People overcome loneliness by fulfilling this need. Loneliness can also be defined as an unsatisfied experience in which individuals gain no satisfaction from their social relationships. This study examines the mediating role of smartphone addiction in the relationship between nomophobia and loneliness. The study was carried out with a correlational research design, which reflects the direction and/or strength of the relationship between variables. **Materials and methods:** Data were gathered from 357 university students (M_{age} = 19.90, SD_{age} = 1.85). The Nomophobia Questionnaire (NMP-Q), UCLA Loneliness Scale, and Smartphone Addiction Scale were used for data collection. Regression-based mediation analysis tested the mediating effect of smartphone addiction on the relationship between nomophobia and loneliness. **Results:** The analyses showed a positive and statistically significant correlation between nomophobia and loneliness. **Conclusions:** While loneliness has a direct effect on nomophobia, nomophobic behaviours may decrease with the addition of addiction symptoms. Considering factors such as smartphone battery life (e.g. charging), sudden anxiety may directly trigger nomophobia and influence behaviours such as reduced engagement in social media and game-playing.

Keywords: mental health, smartphone, smartphone addiction, loneliness, nomophobia

Streszczenie

Wprowadzenie i cel: Zgodnie z teorią hierarchii potrzeb Maslowa jednostki dążą do nawiązywania i utrzymywania bliskich relacji z innymi, aby zaspokoić potrzebę miłości i przynależności. Spełnienie tej potrzeby pozwala przezwyciężyć samotność. Samotność można zdefiniować jako stan niezaspokojonej potrzeby bliskości, pojawiający się w sytuacji, gdy relacje społeczne nie dostarczają oczekiwanej satysfakcji. Niniejsze badanie analizuje mediacyjną rolę uzależnienia od smartfona w relacji między nomofobią a samotnością. Zastosowano metodę korelacyjną, która pozwala określić kierunek i/lub siłę zależności między analizowanymi zmiennymi. **Materiał i metody:** Zebrano dane od 357 studentów uczelni wyższych (średnia wieku M_{wiek} = 19,90; odchylenie standardowe SD_{wiek} = 1,85). W procesie gromadzenia danych wykorzystano Kwestionariusz Nomofobii (Nomophobia Questionnaire, NMP-Q), Skalę Samotności UCLA oraz Skalę Uzależnienia od Smartfona. Do zbadania pośredniczącego wpływu uzależnienia od smartfona na zależność między nomofobią a samotnością zastosowano regresyjną analizę mediacji. **Wyniki:** Przeprowadzone analizy potwierdziły statystycznie istotną dodatnią korelację między

nomofobią a samotnością. **Wnioski:** Chociaż samotność wywiera bezpośredni wpływ na nomofobię, uwzględnienie objawów uzależnienia w analizie może prowadzić do osłabienia zachowań nomofobicznych. W kontekście czynników takich jak czas pracy baterii smartfona (np. konieczność ładowania) nagły niepokój może bezpośrednio wywołać nomofobię i wpłynąć na zachowania takie jak ograniczone zaangażowanie w media społecznościowe czy gry.

Słowa kluczowe: zdrowie psychiczne, smartfon, uzależnienie od smartfona, samotność, nomofobia

INTRODUCTION

As social beings, humans need interaction with other individuals to survive and adapt to changes in their environment. As individuals develop, these interactions differentiate and serve to meet various needs (Hamarta, 2004). In the hierarchy of needs theory, Maslow emphasises that individuals need to establish and maintain close relationships with others to meet their love and belonging needs. People overcome loneliness by fulfilling this need (Maslow, 1981). Loneliness can also be defined as an unsatisfied experience in which individuals derive no satisfaction from their social relationships (Peplau and Perlman, 1982). Loneliness is a different concept from being single, which refers to a person who is on their own, and may or may not feel lonely. On the other hand, loneliness is an emotional response to dissatisfaction with one's need to relate to others (Svendsen, 2017).

Loneliness can be an adaptive emotion in the short run but damaging in the long run. It reflects a disturbing subjective state characterised by a lack of affection and intimacy with a close person or close friends (Cefa, 2021; Perissinotto et al., 2012). Weiss (1973) distinguished between social and emotional loneliness. Emotional loneliness occurs due to the inability to establish a relationship, such as after the death of a partner, separation, or divorce. Social loneliness, on the other hand, reflects a lack of social integration often linked to major life events. In this context, situations such as starting university or moving from a residential area can be considered causes of social loneliness.

Risk factors for both emotional and social loneliness include shyness and introversion (Iranmanesh et al., 2021); demands and loss of social partners (Peplau and Perlman, 1982); depression (Liu et al., 2016); low income and limited education (Ong et al., 2016); living alone; and infrequent participation in social activities (Coyle and Dugan, 2012). Rokach (2004) explained in a study that inadequacies in relationships, difficulty in revealing problems to others, and relationships established without intimacy cause loneliness. Individuals who need socialisation may feel lonely when they cannot establish close relationships and friendships. Among these disturbing feelings, individuals may tend to spend more time on the Internet and make friends on social networks to alleviate the feeling of loneliness (Ren et al., 2017). Kraut et al.'s (2002) study, which found that Internet use is associated with reduced loneliness in extroverted individuals supports this claim. According to Bian and Leung (2014), smartphones reduce individuals' anxiety about loneliness, as they enable quick communication even when people are far apart. According to Jesse (2016), the idea of being "just one click" away from friends meets the basic human need to feel safe. Briefly, when studies are examined, it can be said that smartphones and social networking sites reduce feeling of loneliness by meeting the socialisation needs.

Although the use of the Internet and smartphones has certain advantages, such as establishing friendships, easy and fast communication, shopping, playing games, listening to music and accessing information, it brings problems when used in an undisciplined manner. For example, excessive use of social media can cause depression (Balcı and Baloğlu, 2018; Lin et al., 2016), low life satisfaction (Balcı and Koçak, 2017; Sahin, 2017), low self-esteem (Chethana et al., 2020), loneliness (Odacı and Kalkan, 2010), distraction (Kateb, 2017), and shyness (Odacı and Berber-Çelik, 2013). In addition, when excessive use of smartphones is uncontrolled, Internet addiction (Ağırtaş and Güler, 2020), problematic smartphone use (Yang et al., 2019), and fear of being deprived of a smartphone (nomophobia) have been observed to occur (Yıldırım and Kişioğlu, 2018).

Problematic use of smartphones has been classified as a type of addiction in the literature (Babadi-Akaşe et al., 2014). It has become one of the most common addictions due to its negative impact on emotional, social and behavioural development (Griffiths and Kuss, 2017). Moreover, problematic smartphone use carries typical withdrawal symptoms associated with other addictions, such as loss of control, intolerance, mood swings, and relapse (Yen et al., 2009). In addition, problematic smartphone use causes individuals to experience nomophobia as a result of not wanting to be away from their phone and worrying when they are separated from it.

Nomophobia, a negative aspect of smartphone use, has become a controversial issue in recent years. It is defined as the urge to panic or despair when separated from the mobile phone, inability to focus on conversations or work, and constant checking of the phone (King et al., 2010). The literature describes nomophobia through four sub-dimensions (Yildirim and Correia, 2015). The first sub-dimension is the stage of "not being able to communicate". This sub-dimension expresses the fear of losing contact with others or not being able to access applications that provide instant communication. The second dimension is "losing connectedness", which refers to the fear of losing one's online identity or contact. "Not being able to access information", which is the third sub-dimension, refers to the

deprivation of information obtained through smartphones and the inability to search. Lastly, the dimension of "giving up convenience" explains the anxiety of getting away from the comfort offered by smartphones or the desire for the comfort offered by smartphones. In summary, nomophobic individuals feel anxious when they cannot use or control their mobile phones and try to avoid situations that distract them from this comfort (Yildirim and Correia, 2015). The intense penetration of the Internet and smartphones into daily life has increased the number of studies on nomophobia in the literature over the years. When these studies are examined, the relationship between nomophobia and variables such as gender (Apak and Yaman, 2019; Büyükçolpan, 2019; Erdem et al., 2017; Gezgin et al., 2018; Yaman and Kavuncu, 2019), class level, and academic achievement (Erdem et al., 2016; Tavolacci et al., 2015) is explored. There are studies in the literature showing that nomophobia does not differ significantly depending on gender (Apak and Yaman, 2019; Dixit et al., 2010; Yaman and Kavuncu, 2019), while others find significant differences (Büyükçolpan, 2019; Erdem et al., 2017; Gezgin et al., 2018) according to gender. Studies examining the relationship between nomophobia and age found that nomophobic tendencies decrease with age (Erdem et al., 2017). However, in some studies, no significant relationship was found between nomophobia and age (Apak and Yaman, 2019; Hoşgör et al., 2017; Yıldırım et al., 2016). Studies examining the relationship between nomophobia and academic achievement found a negative relationship between academic achievement and nomophobia (Dixit et al., 2010; Erdem et al., 2016; Hawi et al., 2018; Samaha and Hawi, 2016). However, other studies have shown that nomophobia is positively related to social media addiction (Yıldız Durak, 2018) and depression (Büyükçolpan, 2019), while being negatively related to subjective well-being (Erdem et al., 2016) and academic achievement (Tavolacci et al., 2015). In addition to these, there are studies demonstrating a positive and significant relationship between nomophobia and loneliness (Gezgin et al., 2018; Özdemir et al., 2018; Yıldız Durak, 2018). As a result, nomophobia appears to be associated with many variables and more studies should be conducted on this subject, given that the use of smartphones is becoming increasingly common. It is important to consider the relationships between variables in terms of problematic smartphone use to better understand risk and protective factors. With the excessive use of smartphones, individuals move away from the real world and increase their presence in digital environments (Yılmaz et al., 2015). Individuals who cannot establish one-to-one connections in daily life may use their smartphones to cope with the feeling of loneliness; constant online presence may cause them to experience nomophobia over time. In short, it can be expected that feelings of loneliness in individuals will increase the use of smartphones and, as a result, create nomophobia. The literature includes more than one study examining the relationship between nomophobia and loneliness. However,

there are no studies evaluating loneliness, nomophobia, and problematic smartphone use together. Therefore, this study aims to determine the mediating effect of problematic smartphone use on the relationship between loneliness and nomophobia.

MATERIALS AND METHODS

The study was carried out with a correlational research design. This type of study reflects the direction and/or strength of the relationship between variables.

Participants

Data were collected from 357 university students (M_{age} = 19.90, SD_{age} = 1.85). Of the participants, 69.7% were female and 30.3% were male; 51% were first-year students, 16.5% second-year, 24.6 % third-year, and 7.8% fourth-year students. Participants were selected using a convenience sampling method and voluntarily completed the questionnaires.

Procedure

Participants were recruited through convenience sampling and an online survey targeting university students in Turkey. The questionnaires were digitised and administered through Google Forms, ensuring complete confidentiality and anonymity by assigning each participant a numeric ID and avoiding the storage of personal data. Informed consent was obtained from all participants. Participants volunteered without any compensation. The inclusion criterion was being a university student aged 18 years or older. Exclusion criteria were being under 18 years of age and using pathological drugs. The study adhered to the principles of the Declaration of Helsinki, and ethical approval was granted by the Research Ethics Committee of Sakarya University (Reference number: E-61923333-050.99-231228/42).

Measures

UCLA Loneliness Scale-Short Form
The scale developed by Hays and DiMatteo (1987) to measure the loneliness levels of individuals was developed by Doğan et al. (2011). Items on the scale are answered using a four-point rating. Exploratory (EFA) and confirmatory factor analyses (CFA) determined that the scale consisted of eight items and one dimension, explaining 36.69% of the total variance. Before conducting the EFA, the Kaiser–Meyer–Olkin (KMO) and Bartlett's tests were performed. The KMO value obtained for the data was 0.78 and Bartlett's Test of Sphericity was significant. The goodness-of-fit indices were GFI (Goodness of Fit Index) = 0.97, CFI (Comparative Fit Index) = 0.94, and RMSEA (Root Mean Square Error of Approximation) = 0.066. The Cronbach's alpha internal consistency reliability coefficient reported in the adaptation study

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of the scale was found to be 0.72. In this study, the internal consistency coefficient was calculated as 0.80.

Problematic Smartphone Addiction Use Scale Short Form

The scale was developed to measure individuals' smartphone addiction. The original scale was developed by Kwon et al. (2013), and the Turkish validity and reliability study of the measure was conducted by Noyan et al. (2015). The scale, which consists of 10 items, uses a 6-point Likert format. Some sample items are: "I disrupt my planned work due to using a smartphone" or "I use my smartphone for longer than I intended". The KMO value of 0.855 and Bartlett's test were found to be significant ($p < 0.001$). The test–retest reliability coefficient was found to be 0.926. The internal consistency coefficient of the entire scale was found to be 0.87. According to factor analysis, the scale consisting of 10 items explained 46.3% of the total variance in scores. The test–retest reliability coefficient is 0.93. In this study, the internal consistency coefficient was calculated as 0.90.

The Nomophobia Questionnaire (NMP-Q)

The scale was developed by Yildirim and Correia (2015) and adapted into Turkish by Yildirim et al. (2016). It consists of four factors (Lack of Access to Information, Loss of Connection, Inability to Communicate and Feeling Comfortable) and 20 items rated on a 5-point Likert scale (1 – "Strongly disagree", 5 – "Strongly agree"). CFA results showed that the relationships between factors and items were valid ($\chi^2 = 2.86$, CFI = 0.92, RMSEA = 0.08). The Cronbach's alpha value for the scale's internal consistency was calculated as 0.94. In this study, the internal consistency coefficient was calculated as 0.89.

Data analyses

Before the mediation analysis and the bootstrap test, the data were examined for normality, linearity, and multicollinearity. The results of these examinations are presented in Tab. 1.

As seen in Tab. 1, the results showed that the data meet the required assumptions for mediation analyses. In this context, the mediating effect of problematic smartphone use was tested using the process macro developed by Hayes (2013).

FINDING

Before the mediation analysis and the bootstrap test, the relationships between variables (problematic smartphone use, nomophobia, and loneliness) and descriptive statistics were examined. The findings are presented in Tab. 2.

As seen in Tab. 2, nomophobia was positively related to loneliness ($r = 0.12$) and problematic smartphone use ($r = 0.67$). Furthermore, problematic smartphone use was positively related to loneliness ($r = 0.15$).

Mediating role of problematic smartphone use

Whether problematic smartphone use mediates the relationship between nomophobia and loneliness was tested using mediation analysis in two stages. The findings are presented in Tab. 3 (stage 1) and Tab. 4 (stage 2).

As seen in Tab. 3, loneliness significantly predicted nomophobia (Coeff. = 0.38, 95% CI: 0.03–0.72; $p < 0.001$). Furthermore, as shown in Tab. 4 and Fig. 1, the mediation

Dependent variable	Independent variables	Skewness	Kurtosis	VIFs	CI
Nomophobia		−0.27	0.02		1.000
	Loneliness	1.17	1.33	1.02	5.508
	Smartphone addiction	0.36	−0.43	1.02	8.987

Tab. 1. Results for normality, linearity and multicollinearity

Variable	Descriptive statistics			Correlations		
	α	Mean	SD	1	2	3
1. Nomophobia	0.89	63.68	13.87	–	0.12**	0.67**
2. Loneliness	0.80	14.76	4.19		–	0.15**
3. Problematic smartphone use	0.90	29.64	11.60			–
** $p < 0.01$.						

Tab. 2. Descriptive statistics and correlation analysis

Predictor	Coeff.	SE	p	F	R²
Constant	58.04	2.67	<0.001	4.798	0.13
Loneliness	0.38	0.17	<0.005		

Tab. 3. Result regarding whether loneliness predict nomophobia

	Consequent					
	Problematic smartphone use			Nomophobia		
Predictors	Coeff.	SE	p	Coeff.	SE	p
Loneliness	a 0.42	0.14	<0.005	c' 0.05	0.13	>0.005
Problematic smartphone use	–	–	–	b 0.79	0.04	<0.001
Constant	i_1 23.43	2.22	<0.001	i_2 39.39	2.29	<0.001
	$R^2 = 0.15$			$R^2 = 0.66$		
	$F(1, 355) = 8.44, p < 0.005$			$F(2, 354) = 142.74, p < 0.001$		

Tab. 4. Mediational model coefficients

Paths	Effect	SE	BootLLCI	BootULCI
Loneliness → Problematic smartphone use	0.42	0.16	0.09	0.73
Loneliness → Nomophobia	0.05	0.14	−0.22	0.31
Problematic smartphone use → Nomophobia	0.79	0.05	0.69	0.89

Tab. 5. Results for indirect effects

analysis demonstrated that loneliness significantly and positively predicted problematic smartphone use (Coeff. = 0.42, 95% CI: 0.13–0.70; $p < 0.001$) and nomophobia (Coeff. = 0.05, 95% CI: −0.21–0.30; $p > 0.005$). Problematic smartphone uses significantly and positively predicted nomophobia (Coeff. = 0.79, 95% CI: 0.70–0.89; $p < 0.001$). When problematic smartphone use was added to the model, the core effect of loneliness on nomophobia decreased (from 0.38 to 0.05). As can be seen, the relationship between loneliness and nomophobia was mediated by problematic smartphone use. Furthermore, the total effect of loneliness on nomophobia was 0.38 ($p < 0.001$), the direct effect of loneliness on nomophobia was 0.05 ($p > 0.005$), and the indirect effect was 0.33 ($p < 0.001$). This indicates a full mediation effect of problematic smartphone use between loneliness and nomophobia.

When Tab. 5 is examined, all direct path coefficients are statistically significant because of the bootstrapping process ($p < 0.001$). Similarly, the indirect path coefficients are also significant (bootstrap coefficient = 0.05, 95% CI = −0.22–0.31, $p > 0.005$).

The direct effect of loneliness on problematic smartphone use is significant (Coeff. = 0.38, $p < 0.05$). However, when the mediating variable nomophobia is added to the model, the effect of loneliness on problematic smartphone use becomes statistically insignificant (Coeff. = 0.04, 95% CI = 0.14–−22). This supports the *full mediation* effect of nomophobia.

DISCUSSION

This study showed a positive and statistically significant correlation between nomophobia and loneliness. However, the relationship between loneliness and nomophobia became insignificant in the mediation analysis. This shows that it has a full mediating effect. as According to the literature, some studies examine the relationship between nomophobia and loneliness (Gezgin et al., 2018; Özdemir et al., 2018; Yıldız Durak, 2018), and their findings are consistent with the results of this study. King et al. (2010) evaluated nomophobia as a disorder that emerged in the technology era. The reason why they were evaluated to this extent may be that cell phones were initially designed for a specific purpose (communication) to reduce loneliness. However, today's studies show that while in the past individuals used cell phones to reduce their loneliness (Kim, 2018), nowadays they may be vulnerable to the overuse of technology (Enez Darcin et al., 2016). In addition, loneliness is highly correlated with escaping from reality (Shen and Wang, 2019) and problematic social media use (Şafak
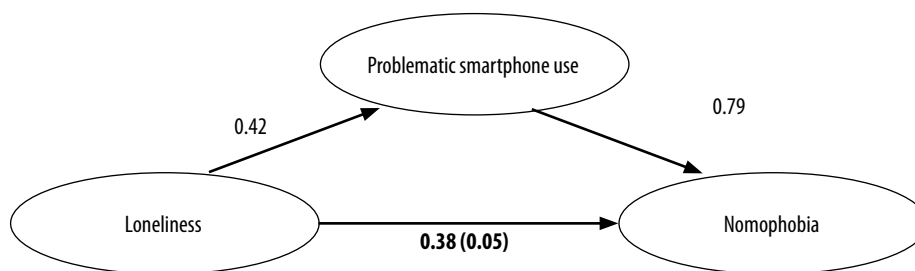

Fig. 1. Mediational role of problematic smartphone use

and Kahraman, 2019). Considering the smartphone usage rates of the age group in the study sample (Savcı and Aysan, 2017), there may be a positive relationship between nomophobia and loneliness due to the frequency of social media use, the storage of personal data on the phone, and the fact that much of their communication can be experienced one-way on social media.

Another finding of the study is that there is a positive and statistically significant correlation between loneliness and smartphone addiction. There is a study in the literature that investigated the relationship between problematic Internet use and loneliness (Mahapatra, 2019). The findings of these studies are similar to those of this study. Enez Darcin et al. (2016) found that approximately 95% of university students had a profile on at least one social networking site (Facebook, for example) and 41% cited accessing their accounts as the main reason for using smartphones. According to another study, 22% of young people stated that they use their smartphones for social media, 21% for cameras, and 10.5% for playing games. In addition to these scientific findings, the fact that education systems are online, games previously played in person have moved to virtual platforms, and banking and similar operations are now completely digitalised, reduces the need to communicate. Therefore, loneliness may be a result of problematic Internet use instead of preferring face-to-face communication. Thus, a significant and positive relationship may have emerged between loneliness and smartphone addiction.

A positive and statistically significant correlation was found between nomophobia and problematic smartphone addiction. When the literature is examined, there are studies examining the relationship between problematic Internet use and nomophobia (Randler et al., 2016). Menezes and Pangam (2017) claim that problematic Internet use plays a vital role in increasing nomophobia. Many individuals with high problematic Internet use do not realise that they are developing nomophobia, even though it is a serious risk (Chen, 2015). This makes it difficult to understand the existence of nomophobia. Both concepts have many common features, such as a high duration of time spent on the phone and behavioural and cognitive symptoms. Therefore, there may be a relationship between problematic Internet use and nomophobia.

Another finding of the study is that problematic Internet use fully mediates the relationship between loneliness and nomophobia. In the model, loneliness predicted nomophobia significantly and positively, but when problematic Internet use was added, the main effect of loneliness on nomophobia decreased. Nomophobia is positively correlated with phobias, such as social phobia (Apak and Yaman, 2019), while there is no relationship between social phobia and problematic Internet use (Ghosh et al., 2021). Although these two terms are closely related, loneliness may directly affect nomophobia because loneliness is highly correlated with other types of phobias (Halkacıoğlu, 2019). Furthermore, considering the functional status of

phones, problematic Internet use is reflected in spending more time on the phone, while nomophobia appears as the fear of being away from the phone. Thus, while loneliness has a direct effect on nomophobia, nomophobic behaviours may decrease with the addition of addiction symptoms. Especially considering the limitations of smartphones, such as battery life, it may push directly to nomophobia due to the emergence of sudden anxiety and may show the behaviour of not engaging in social media and game-playing behaviours. Hence, full mediation may have emerged.

IMPLICATIONS AND RECOMMENDATIONS FOR FUTURE STUDIES

The study examined the mediating role of problematic smartphone use in the relationship between nomophobia and loneliness. The analysis results indicated a positive and statistically significant correlation between nomophobia and loneliness. Problematic smartphone use negatively influences university students' feelings of loneliness (Alosaimi et al., 2016; Lee et al., 2018). Furthermore, nomophobia, which is associated with factors like social networking, depression, and peer relations, leads to smartphone addiction rather than a deterioratr of study-related goals (Kumcagiz and Gündüz, 2016; Wang et al., 2017). Based on university student life, the current study reveals the personal and environmental antecedents of smartphone use, such as loneliness and nomophobia in adolescence. Thus, the first implication of this article is that nomophobia was positively related to loneliness and problematic smartphone use. Moreover, problematic smartphone use was also positively related to loneliness. Previous studies have confirmed these findings, showing similarities with this study. The second conclusion of the research is that loneliness significantly predicted nomophobia. In addition, as shown in the mediation analysis, loneliness significantly and positively predicted both problematic smartphone use and nomophobia. With this in mind, the support for the variables addressed in this study may help raise awareness and reduce problematic smartphone usage. For this reason, the study findings suggest that school counsellors, educators, and parents should take into consideration students' loneliness and nomophobic behaviours in cases involving problematic smartphone usage.

Convenience sampling was used to select the study participants. Therefore, it is suggested that repeat studies be conducted with adolescents in the future to improve the generalisability of the findings. Based on problematic smartphone use, new mediation models can be constructed for this purpose. In this regard, the present study focused only on the duration of smartphone use. Considering this limitation, future studies are recommended to investigate the purposes of smartphone use, including loneliness and other phobias. This study was conducted with the sole participation of university students. Future studies should test the relationships in both older and younger age groups, as well as

explore possible bidirectional causality between the variables. Finally, the variables identified as influential in problematic smartphone usage, such as depression, anxiety, aggression, and insomnia could be included in future studies (Daraj et al., 2023; Geng et al., 2021; Matar Boumosleh and Jaalouk, 2017).

Conflict of interest

The authors do not report any financial or personal connections with other persons or organisations which might negatively affect the content of this publication and/or claim authorship rights to this publication.

Author contribution

Original concept of study: SM, SB. Collection, recording and/or compilation of data: SM, SB, HB. Analysis and interpretation of data: SM, SB, KD, HB, MK. Writing of manuscript: SM, SB, KD, EÇ. Critical review of manuscript: SM, SB, KD, MK, EÇ. Final approval of manuscript: SM, SB, MK, EÇ.

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