



# Development and Factor Structure of Problematic Multidimensional Smartphone Use Scale

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## Abstract

Living in an intensifying technological and digital environment makes people more engaged with smartphones and related internet platforms. Alongside its highly debated advantages and disadvantages, modern smartphone use is a global phenomenon which has been mainly debated within the context of cultural and technology relationships which also influence cross-cultural activities. Focusing on one of the modern factors (i.e., smartphone use) that impact human behavior, this article presents the development of a measure of the *Multidimensional Smartphone Use Scale (MSUS)* and tests its factor structure to offer a scale that covers smartphone-related problems from a broader perspective. Using an online survey, a total of 514 participants took part in the current study. The scale was developed to measure a multidimensional conception of smartphone use-related problems and behavioral disorders including nomophobia, ringxiety, textxiety, and phubbing which were supported with exploratory and confirmatory factors analyses. The MSUS indicated good internal consistency reliability ranging from  $\alpha = .75$  to  $\alpha = .89$ . This article presents the preliminary evidence regarding the reliability and validity of the MSUS which can be used in a wide range of settings to measure maladaptive modes of smartphone use and related behaviors.

**Keywords** Multidimensional Smartphone Use Scale · Maladaptive modes of use · Reliability · Validity · Bifactor model · Cyberpsychology

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The use of information and communication technologies (ICT) is increasing in every aspect of life day by day. Mobile technologies and smartphones are the leading elements of these ICTs. Moreover, smartphones have started to shape our lives more than ever. These devices which initially had functions such as calling and sending short messages have undergone immense changes. Nowadays, smartphones can do almost everything that a computer can. They are also used to undertake various tasks by organizations of all scales (Ada & Tatli, 2012). As for individuals, the percentage of people using smartphones throughout the day is very high (Redondo et al., 2023). Smartphones are used in many diverse contexts such as homes, work environments, shopping malls, restaurants, or while walking on the street. Specifically, people seem to be under the spell of smartphones, and smartphones almost always occupy their hands (Tüzüntürk, 2017).

Such widespread use naturally brings about some negative consequences for people. Some of the negative outcomes of using ICT are being unable to keep smartphones off, being unhappy without them, or checking them at all times. These types of negative consequences are categorized under the general concept of *smartphone addiction* and/or maladaptive modes of use. Addiction can be described as the negative effect(s) of a substance or activity on an individual's psychological, social, and/or physical health, whose use continuously despite these negative consequences, and there is also an unstoppable desire to repeat this action (Tutgun-Ünal, 2015).

Media psychology, at this point, tries to explain the interaction of human activities with mass communication tools and technology itself (Stever et al., 2022). Working alongside cyberpsychology which also focuses on human interaction with digital technology, particularly the internet and so social media courses and smartphone usage (Kirwan et al., 2016), media psychology is a promising psychology field to answer questions regarding the issues examined in this article. *Smartphone addiction*, in this regard, is an addiction type that leads to negative psychological outcomes without involving chemical substances (Minaz & Çetinkaya Bozkurt, 2017). On the other hand, smartphones can also yield positive outcomes such as enabling people to connect to social platforms and the internet, which is observed to decrease individuals' loneliness and anxiety levels (Townsend, 2000). In addition to providing many types of communication, smartphones help individuals obtain and share information and make public announcements effectively (Çalışkan et al., 2017). However, unfortunately, they lead to physical, social, and psychological addictions increasingly as Griffiths et al., (2020) describe and categorize two different forms of problematic use of digital technologies have been proposed: generalized internet addictions and specific internet addictions (i.e., generalized problematic smartphone/internet use and specific problematic smartphone/internet use). Generalized problematic smartphone/internet use indicates a multidimensional and general behavioral pattern of smartphone/internet overuse, which may cause negative consequences for individuals. Such problematic smartphone/internet use has been associated with several comorbid disorders including attention-deficit/hyperactivity disorder depression and substance abuse. Generalized problematic smartphone/internet use has been associated with other dysfunctions including impaired family functioning, lowered life satisfaction, problematic family interaction, poor emotional well-being, and decreased academic performance (Özaslan et al., 2022; Yıldırım et al., 2023a, b).

As described above, there exists a disagreement over the terminology used to characterize behavioral issues associated with problematic technology use, including terms like addiction, disorder, or problematic use. The excessive use of smartphones and the internet demands particular attention in the context of mental health and behavioral disorders (Billieux et al., 2015; Pontes et al., 2015). While some studies employ the term "addiction"

concerning smartphone usage (Brand et al., 2016; Csibi et al., 2016; Griffiths, 2000; Monacis et al., 2017), this current study opts for the term “maladaptive smartphone use” to avoid potential disputes related to classification.

In this regard, some types of smartphone maladaptive modes of use recently identified in the literature are *nomophobia*, *ringxiety*, *textxiety*, and *phubbing* which suggest the problematic mass communication tools use. All four maladaptive modes of use may also demonstrate how technology and media in general, yet smartphones in particular, may impact the ways people behave, habituate, and communicate all of which could be explained through technological determinism which also is studied about media psychology and cyberpsychology (Bau, 2014).

Being one the first recalled maladaptive modes of use within the context of the mentioned technological determinism, *nomophobia* is a concept derived from the abbreviation of the words “No Mobile phone Phobia”, which is expressed as individuals’ fear of not being able to access their mobile phones, the fear of being without one’s mobile phone or without network coverage, and the fear of not being able to communicate on a mobile phone (King et al., 2014). Despite the increasing studies about this type of technological fear, nomophobia is a relatively new term and is not officially recognized as a mental disorder in diagnostic manuals such as the DSM-5 (Enez, 2021, p. 27; Sherrod, 2016, p. 79). Nomophobia is the maladaptive usage type in which individuals show an extreme reaction and physical symptoms in cases when their phone is turned off or disconnected. Nomophobics obsessively check whether their smartphone is with them, and they suffer from a permanent fear of losing their phones. This thinking type has been observed to exist for a long time, and it affects an individual’s daily life and health negatively. Ringxiety arises because of a pathological relationship with smartphones. It denotes expecting one’s smartphone to ring, which is getting messages or calls from others. Also, it is a situation where individuals feel as if their smartphone is ringing even if no one calls them. It is the feeling of perceiving the sound of individuals’ mobile phones even if they are not with them (Batic, 2013).

Phubbing is a concept that emerged by combining the words phone and snubbing for smartphone use (Nazir & Pişkin, 2016). Phubbing is expressed as the individual’s attention to the smartphone while communicating in social environments (Karadağ et al., 2016). In other words, phubbing emerges when individuals in social environments focus on their smartphones rather than being engaged with the environment (Roberts & David, 2016).

Since smartphones have both textual, audio, and visual communication features, individuals using smartphones do not want to stay away from any of these features. For this reason, when they are deprived of any of them, they have the feeling of being away from the social environment that technology has presented to them. From this point of view, it is important to examine the use of smartphones to cover all these components.

Although not widely recognized, there are some scale development studies on (maladaptive) smartphone use and smartphone addiction in the literature. Bianchi and Phillips, (2005) developed the “Problem Mobile Phone Usage Scale” to measure psychological predictors of problematic mobile phone use. Kwon et al., (2013a, b) developed the “Smartphone Addiction Scale”. On the other hand, Kim et al., (2014) developed the “Smartphone Addiction Susceptibility Scale” to determine smartphone addiction. In 2012, Chóliz developed the “Mobile Phone Dependence Scale” to degree the severity of dependence on mobile phones which then has been used in several studies (Cipresso & Immekus, 2020; Ellis, 2020) to measure the degree of nomophobia among different communities (Chóliz, 2012). Another example of a similar scale is the “Smartphone Addiction Scale” developed by Kwon et al., 2013a. This scale also measures various aspects of smartphone addiction,

including salience, mood modification, tolerance, withdrawal, conflict, and relapse (Kwon et al., 2013a).

Similar scales in the literature are generally developed to examine smartphone addiction. Yet, it is significant to note that while these scales can be benefitted from in measuring and discussing nomophobia and other related phenomena, it would be quite unfair to state that they have the ability to diagnose mobile device phobias; therefore, they should be used in conjunction with clinical findings and other methods of assessment.

Unlike existing scales, this study highlights and analyzes four distinct components and associated anxieties related to maladaptive smartphone use: nomophobia, ringxiety, textiety, and phubbing. Terms like “ringxiety” and “textiety” denote relatively novel concepts that have yet to gain widespread recognition in previous research, underscoring the originality and significance of this study. Therefore, this research offers an exploration of the diverse functionalities of smartphones. Additionally, the extent of individuals’ reliance on smartphone features such as ringxiety, textiety, and phubbing can be thoroughly examined. The primary goal is to develop a scale that enables the simultaneous assessment of these various smartphone features.

## Method

### Participants and Procedure

This cross-sectional research design collected data from a total of 514 participants at a single point in time. There were 364 (70.8%) females and 150 (29.2%) males. Their ages ranged from 18 to 35 years with a mean age of 27.0 ( $SD=4.59$ ). The inclusion criteria included individuals aged 18 and above who were willing to participate and had access to the Internet and electronic devices for survey completion. Exclusion criteria applied to those who did not meet these specified conditions. Data were collected through a web-based survey distributed on popular social networking sites like Facebook, Twitter, and WhatsApp. Participants were thoroughly briefed about the objectives of the research, and their explicit informed consent was obtained before they proceeded. Those who opted to take part were guided through an anonymous online survey, covering various questions and requests for demographic information. No incentives were provided for participation. Participants were informed about their rights, and the confidentiality and anonymity of their responses were ensured throughout and after their involvement. All participants followed a standardized sequence to complete the survey components. The study adhered to the ethical principles outlined in the Declaration of Helsinki.

### Validation of Multidimensional Smartphone Use Scale

The Validation of Multidimensional Smartphone Use Scale is designed to scale how dependent individuals are on smartphone features such as nomophobia, ringxiety, textiety, and phubbing. The scale consists of 16 items rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The scale consists of four different sub-factors: nomophobia, ringxiety, textiety, and phubbing. Each sub-factor comprises four items without any reverse-coded items. The subscale’s total score can be obtained by summing all items within the corresponding sub-factor, where higher scores indicate

elevated levels of nomophobia, ringxiety, textxiety, and phubbing. Evidence concerning the internal consistency reliability is presented in the Results section.

## The Process of Scale Development

While developing the items, firstly, the relevant literature was checked in a detailed way. All the studies and scales existing in the literature were investigated meticulously. The review of the literature suggested that previous studies usually focused on general addiction to smartphones. Accordingly, to investigate maladaptive smartphone use from various perspectives, the researchers focused on not only nomophobia but also the concepts of ringxiety, textxiety, and phubbing, and the literature was reviewed for these concepts as well. In this way, the theoretical background for the scale to be developed was created. Depending on this theoretical background, the item pool was identified. As it is advisable to have more than 3–4 times the aimed number of items (Tezbaşaran, 1996), 48 items were created in total. After the creation of the items, they were subjected to expert opinion, and they were revised accordingly to complete the process.

## Ethical Statement

The research procedures comply with ethical principles for research with human participants consistent with the 1964 Helsinki Declaration and its later amendments and comparable ethical standards. Informed consent was obtained from all the individual participants included in the current study.

## Data Analysis

Using a split-sample approach for cross-validation (see Yildirim & Aziz, 2017; Yildirim et al., 2018), participants were randomly split into two subsamples of equal sample size (Subsample 1,  $n = 257$ ; Subsample 2,  $n = 257$ ). Exploratory factor analysis was carried out on the first subsample to examine the underlying factor structure of the set of items. Confirmatory factor analysis was conducted on the second subsample to investigate the structure validity of the scale. To evaluate the goodness of fit of the data, we used multiple statistics suggested by researchers (Hu & Bentler, 1999; Kline, 2005): the chi-square ( $\chi^2$ ), the relative chi-square (CMIN/DF), the comparative fit index (CFI), the non-normed fit index (NNFI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). We used the following criteria to assess whether the model fit to the data was satisfactory: (i) CMIN/DF must range between 2 and 5 to be acceptable and  $< 2$  to be good; (ii) the CFI and NNFI should be  $> 0.90$  to be acceptable and  $> 0.95$  to be good; (iii) that the RMSEA should be  $< 0.08$  to be acceptable, and  $< 0.06$  to be good; and (iv) SRMR values  $< 0.08$  are acceptable and  $< 0.05$  to be good. Pearson product-moment correlation was computed to explore the relationship between the scale and subscales. The Cronbach's alpha coefficient was estimated for internal consistency reliability. The data were analyzed using SPSS 24.0 and AMOS 24.0 for Windows.

## Results

### Exploratory Factor Analysis

A Promax rotation was selected due to the expected correlation among factors, with a set delta value of 0. The evaluation of meaningful loadings adhered to established thresholds: 0.32 (poor), 0.45 (fair), 0.55 (good), 0.63 (very good), and 0.71 (excellent) (Tabachnick & Fidell, 2007). Following these rule of thumb, preliminary analyses were conducted on the items of the MSUS, revealing that 17 items within the nomophobia subscale, 7 items within the ringxiety subscale, 3 items within the textiety subscale, and 5 items within the phubbing subscale either displayed cross-loading on multiple factors or exhibited inadequate factor loading below 0.32. With this solution, 10 items demonstrated loadings surpassing 0.32 across two or more factors. The item loadings for the final solution can be found in Table 1. For the initial four factors, loadings surpassing 0.63 (falling within the “very good” to “excellent” range) have been highlighted in bold, while those ranging between 0.55 and 0.63 have been underlined. In the case of the remaining four factors, the highest-loading items have been underlined.

Exploratory factor analysis (EFA), using a maximum likelihood extraction method, was carried out to determine the underlying factor structure of the MSUS with the first subsample data. Bartlett’s test confirmed that an EFA was suitable for the sample [ $\chi^2(120)=1787.84, p<0.001$ ], and a Kaiser–Meyer–Olkin test (0.86) showed an adequate number of participants. Researchers suggested that parallel analysis is the most suitable and accurate approach for identifying the number of factors (Zwick & Velicer, 1996). In a parallel analysis, eigenvalues were compared to those estimated from purely random data. The results of the parallel analysis showed that the fifth eigenvalue (5.73, 2.04, 1.69, 1.22, and 0.75) failed to exceed the fifth mean eigenvalue (1.46, 1.36, 1.28, 1.16, and 1.04) calculated from 1000 generated datasets with 257 cases and 16 variables. This suggested a four-factor solution with the factors

**Table 1** EFA (maximum likelihood extraction with Promax rotation) of the sixteen smartphone use items

| Item         | Factor      |             |             |             |
|--------------|-------------|-------------|-------------|-------------|
|              | Nomophobia  | Ringxiety   | Textiety    | Phubbing    |
| Nomophobia 3 | <b>0.92</b> | –0.06       | 0.00        | –0.02       |
| Nomophobia 4 | <b>0.78</b> | –0.07       | 0.02        | 0.12        |
| Nomophobia 6 | <b>0.76</b> | –0.01       | –0.04       | –0.08       |
| Nomophobia 9 | <b>0.74</b> | 0.12        | –0.09       | –0.02       |
| Ringxiety 1  | 0.15        | <b>0.70</b> | 0.01        | 0.00        |
| Ringxiety 2  | –0.09       | <b>0.78</b> | –0.17       | 0.11        |
| Ringxiety 3  | –0.02       | <b>0.79</b> | 0.17        | –0.22       |
| Ringxiety 5  | –0.03       | <b>0.71</b> | –0.07       | 0.17        |
| Textiety 1   | –0.04       | 0.05        | <b>0.54</b> | 0.10        |
| Textiety 5   | –0.09       | –0.15       | <b>0.92</b> | –0.02       |
| Textiety 6   | 0.07        | 0.30        | <b>0.55</b> | –0.02       |
| Textiety 7   | 0.01        | –0.01       | <b>0.58</b> | 0.15        |
| Phubbing 3   | –0.06       | 0.03        | –0.03       | <b>0.89</b> |
| Phubbing 4   | 0.17        | 0.00        | 0.13        | <b>0.36</b> |
| Phubbing 6   | 0.22        | –0.04       | 0.14        | <b>0.36</b> |
| Phubbing 7   | –0.07       | 0.03        | 0.09        | <b>0.67</b> |

explaining 35.79%, 12.76%, 10.57%, and 6.48% of the variance, respectively. Meaningful factor loadings were evaluated based on the threshold values of 0.32 (poor), 0.45 (fair), 0.55 (good), 0.63 (very good), and 0.71 (excellent) (Tabachnick & Fidell, 2007). The loadings ranged between 0.36 and 0.92 (see Table 1). For this subsample, Cronbach's alpha coefficients were good: nomophobia group factor=0.86; ringxiety group factor=0.83; textiety group factor=0.79; and phubbing group factor=0.75.

Cronbach's alpha coefficients were 0.84 for the nomophobia factor, 0.75 for the ringxiety factor, 0.79 for the textiety factor, and 0.79 for the phubbing factor. Furthermore, the overall scale yielded a Cronbach's alpha of 0.89, indicating strong internal consistency. These results affirm the satisfactory internal consistency of both the composite scale and its constituent sub-factors.

Furthermore, Table 2 presents the Pearson correlation results for both Subsamples 1 and 2. These findings indicated significant positive correlations among nomophobia, ringxiety, textiety, and phubbing in both Subsamples 1 and 2. In Subsample 1, the correlation coefficients ranged from 0.32 to 0.57, while in Subsample 2, they varied between 0.35 and 0.61 (all  $r_s < 0.01$ ).

### Confirmatory Factor Analysis

Several comparisons using confirmatory factor analysis (CFA) were conducted to investigate the structural validity of the MSUS with the second subsample data. The purpose of comparisons is to establish the incremental value of hypothesized models (Barrett, 2007). Four competing models were tested for goodness of fit. The first model was a unidimensional model presenting an underlying latent factor structure of general smartphone use for the sixteen items of the MSUS. The second model was the four-factor structure for the MSUS, nomophobia, ringxiety, textiety, and phubbing factors. The third model was the second-order factor model in which general smartphone use represented the top level of a hierarchy and nomophobia, ringxiety, textiety, and phubbing represented the group factors. The final model was the bifactor model reflecting a single common construct (general smartphone use) while also acknowledging the multidimensionality of the construct.

The goodness-of-fit values for the four models are reported in Table 3. For the unidimensional model, all the goodness-of-fit statistics did not meet all the above-mentioned criteria for an acceptable fit, and as such, the model did not present a sufficient explanation of the data. The four-factor, second-order, and bifactor models presented a good model fit to the data. Among these models, the findings for the bifactor models indicated an incremental CFI value over the other competing models, as demonstrated by changes in CFI being  $> 0.01$ .

The standardized factor loadings for bifactor structure with general and group factors are illustrated in Fig. 1. Factor loadings ranged between 0.32–0.71 for the general factor and 0.08–0.71. The internal consistency reliability estimates for the general and group factors were good: general factor  $\alpha=0.89$ ; nomophobia group factor=0.84; ringxiety group factor=0.75; textiety group factor=0.79; and phubbing group factor=0.79.

### Discussion

The current study has sought to develop a new scale entitled *Multidimensional Smartphone Usage Scale (MSUS)* and tested its factorial structure using a sample of young Turkish adults. The results showed that the MSUS is a multidimensional scale that is best

**Table 2** Descriptive statistics and correlation coefficients between the subscales

| Variable       | Subsample 1            |      |          |          | Subsample 2            |       |       |       |       |      |      |       |   |       |       |       |
|----------------|------------------------|------|----------|----------|------------------------|-------|-------|-------|-------|------|------|-------|---|-------|-------|-------|
|                | Descriptive statistics |      |          |          | Descriptive statistics |       |       |       |       |      |      |       |   |       |       |       |
|                | M                      | SD   | Skewness | Kurtosis | 1                      | 2     | 3     | 4     |       |      |      |       |   |       |       |       |
| 1. Nymphomania | 12.47                  | 3.88 | -0.09    | -0.55    | 1                      | .34** | .32** | .41** | 12.46 | 3.71 | 0.11 | -0.76 | 1 | .35** | .44** | .42** |
| 2. Ringxiety   | 7.35                   | 2.89 | 0.96     | 1.21     | 1                      | .47** | .38** | .38** | 7.53  | 2.84 | 0.62 | -0.17 | 1 | .57** | .52** | .52** |
| 3. Textxiety   | 10.13                  | 3.39 | 0.43     | -0.07    | 1                      | 1     | .57** | .57** | 10.51 | 3.50 | 0.10 | -0.44 | 1 | 1     | .61** | .61** |
| 4. Phubbing    | 9.71                   | 3.05 | 0.62     | 0.77     | 1                      | 1     | 1     | 1     | 9.49  | 3.07 | 0.54 | 0.00  | 1 | 1     | 1     | 1     |

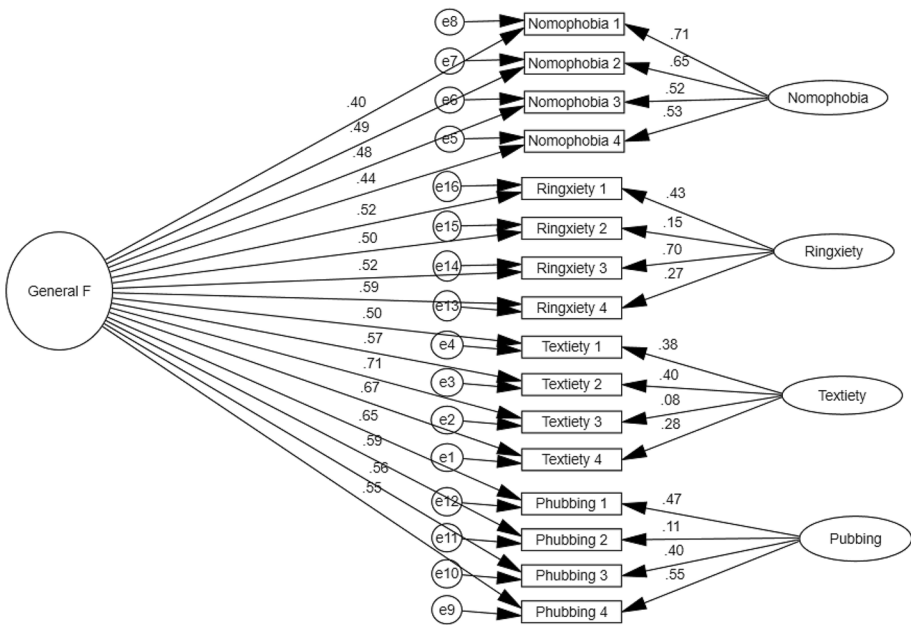
\*\*\*  
 $p < 0.01$



**Table 3** CFA fit statistics for the different models proposed for the MSUS

| Model                | $\chi^2$ | df  | $\Delta\chi^2$  | $p$    | CMIN/DF | CFI   | NNFI  | RMSEA | SRMR  |
|----------------------|----------|-----|-----------------|--------|---------|-------|-------|-------|-------|
| Unidimensional model | 552.139  | 104 | —               | <0.000 | 5.309   | 0.711 | 0.667 | 0.130 | 0.095 |
| Four factors         | 194.151  | 98  | 357.988 (6)***  | <0.000 | 1.981   | 0.938 | 0.924 | 0.062 | 0.054 |
| Second order         | 194.204  | 100 | 357.935 (4)***  | <0.000 | 1.942   | 0.939 | 0.927 | 0.061 | 0.054 |
| Bifactor             | 158.031  | 88  | 394.108 (16)*** | <0.000 | 1.796   | 0.955 | 0.939 | 0.056 | 0.043 |

Note: \*\*\* $p < 0.01$



**Fig. 1** Standardized factor loadings for the Multidimensional Smartphone Use Scale

represented by a bifactor model. The four grouping factors include *nomophobia*, *ringxiety*, *textiety*, and *phubbing*. To improve the utility of the MSUS, several competing models namely the unidimensional model, four-factor model, second-order model, and bifactor model were compared. The results indicated that the bifactor model was superior to other competing models. These results suggest that the MSUS can be used both as a grouping factor where the aim is to obtain detailed information about the use of smartphones and as an overall factor where the aim is to have a general idea about smartphone use in young adults. In addition to this, the analysis has revealed that the MSUS has satisfactory internal consistency reliability, suggesting that the general factor and the sub-factors are inherently coherent with each other.

This study will greatly contribute to the literature by presenting a scale that is compact and versatile. As justified in the literature review, similar scales in the literature are generally developed to examine smartphone addiction and maladaptive modes of use in general

(Bianchi & Phillips, 2005; Chóliz, 2012; Kim et al., 2014; Kwon et al., 2013a, b). In contrast to these studies, different components and anxieties related to smartphones usages (nomophobia, ringxiety, textiety, and phubbing) are emphasized and analyzed together in this article. This has made it possible to examine the phenomenon in focus in a more comprehensive way through the components: ringxiety, textiety, and phubbing in addition to nomophobia. On the other hand, the research conducted here can contribute to the literature by providing a reliable scale that will enable researchers and practitioners alike to examine all these features of smartphone addiction and maladaptive modes of use at the same time.

The increasing usage of technologies has resulted in technologies becoming an important part of our lives (Dafoe, 2015; Nor et al., 2020, p. 114). Especially digital devices like smartphones are becoming more and more a part or extension of daily life which ends up changing the cultural patterns, ideas, and behaviors we have. Although studies focused on the relationships of younger ages with mobile technologies and the usage of various social media platforms, recent articles have also examined elderly people's dealing with their smartphones (Ehrentraut, 2016; Tanhan et al., 2023; Turan et al., 2023; Yıldırım & Çiçek, 2022). Yet, most of the studies suggest that in most cases, prolonged usage of mobile phones and related platforms like social media courses negatively impacts daily life and in the long run causes maladaptive behaviors like *phubbing* in which mobile phone holders ignore those with whom they are communicating and end up with an impolite behavior (Lopez-Fernandez et al., 2018). On the other hand, uncontrolled mobile usage also may result in developing psychological disorders such as *nomophobia*, *ringxiety*, and *textiety* all of which imply apprehension while the users do not have their phone with them, and when they check their phones even though they receive no notification of ring (ringxiety) or text (textiety/textaphrenia) (Chotpitayasunondh & Douglas, 2018; Verma et al., 2014).

Having intense and increasing use of the smartphone is at the very center of digital culture debates. To better understand these debates (Miller, 2012; Rajan, 2020; Lim & Soriano, 2016; Flanigan et al., 2023; Desjarlais, 2019), this study was carried out to create a scale focused on maladaptive modes of smartphone use. The lowest score that can be obtained from the scale is 16, and the highest score is 80. For the content validity of the scale, a comprehensive literature review was conducted by the researchers, and items were written considering the maladaptive smartphone use (*nomophobia*, *phubbing*, *ringxiety*, *textiety*) in the literature. Accordingly, the item pool was created in line with expert opinions. The suitability of the data for factor analysis was tested with the KMO and Bartlett tests, and the construct validity of the scale was primarily provided by EFA. The structure and results obtained as a result of EFA were confirmed by CFA. These tests suggest that the scale is sound.

## Implications for Practice

As the smartphone is a common and highly engaged instrument for communication and information gathering, there have been many ongoing studies regarding its usage and the platforms accessed through this usage. However, this study is one of its first kind as it has analyzed four concepts (nomophobia, ringxiety, textiety, and phubbing) altogether. Being unique and addressing the problematic usage and attitudes regarding smartphone engagement, this study can compare excessive and maladaptive smartphone use with other social

media addictions and then shed light on future research, which may suggest how to better engage with digital/smart technologies and social networks.

Because this article presents preliminary evidence regarding the reliability and validity of the *MSUS* which can be used in a wide range of settings to measure smartphone use, the study will eventually contribute to a better model for smartphone users who to some extent have digital or new media literacy and develop knowledge and skills which will guarantee a healthier and prudent smartphone usage. However, benefitting more from media psychology and cyberpsychology literature, future research should also consider investigating other aspects of smartphone usage that can give deeper insights into the technological determinism of people and new media device relationships.

## Strengths and Limitations

The current research has a few main strengths. The study is the first of its kind as it analyses the four maladaptive smartphone uses (nomophobia, ringxiety, textxiety, and phubbing). Scales employed in this article were developed to evaluate a multidimensional conception of smartphone use which were also supported with exploratory and confirmatory factors analyses. Therefore, the present research, while accompanying the previous studies on the challenging use of smartphones, also can motivate new epistemic and psychological debates about the issue.

Yet, there are several limitations of this study which need to be addressed as well. Although the present research is the first to employ a measure of the *MSUS*, the results might be influenced by certain limitations. First, due to the ongoing COVID-19 pandemic and its effects, we used an online form to collect data. However, those who were unable to use the internet or had limited internet access might not have been represented sufficiently. Nonetheless, collecting data via an online survey is a practical method compared to adopting a face-to-face interview during the pandemic outbreak.

On the other hand, because we collected data through online forms, the study was based solely on self-reporting. Despite the anonymity of responses, the environment at the very time of form-filling may have impacted the degree of the sincerity of the respondents. Therefore, future research, after the pandemic times, should use other types of procedures which will decrease the effect of other surroundings instead of online data collection. In this manner, it would be possible to sketch a better picture of the inappropriate use of smartphones.

The second limitation of our study is the absence of explicit construct validity measures for the *MSUS* scale. While we have prioritized the establishment of factor structures and content validity, we recognize the significance of showing the associations with pertinent measures as an essential facet of construct validation. Incorporating evidence related to concurrent, discriminant, or predictive validity would enhance the credibility of the scale. Subsequent studies could potentially address this limitation, thus bolstering the construct and various validity aspects of the *MSUS* measure.

The final limitation of this study is that we opted to gather only fundamental demographic data, such as age and gender, to maintain a concise questionnaire and enhance the response rate. Subsequent research should aim to collect data from participants with diverse sociodemographic characteristics to enhance the applicability and utility of the *MSUS* measure.

Furthermore, while the current study has successfully established a valid measure of multidimensional smartphone use, it is evident that substantiating its utility in investigating smartphone behavioral disorders will necessitate additional research conducted in diverse contexts and situations.

## Appendix

### Multidimensional Smartphone Use Scale

#### Nomophobia

1. I cannot do without my smartphone.
2. I cannot keep my smartphone away from me.
3. I cannot think of a life without smartphones.
4. Being without my smartphone disturbs me.

#### Ringxiety

1. I get anxious if I do not get any reactions from social media.
2. I cannot sleep if my friends do not respond to my messages.
3. Being not able to get any reactions from social media upsets me.
4. I get anxious if my smartphone does not ring or get a message notification for a long time.

#### Textiety

1. Responding to social media groups takes a lot of time for me.
2. Social media correspondence takes a lot of time for me.
3. I check my social media messages frequently.
4. Checking my social media accounts takes a lot of time for me.

#### Phubbing

1. I cannot focus on my other duties because of checking my smartphone.
2. I check my smartphone when I am busy with something else.
3. I cannot leave my phone when I am with others in the same place although I should not do it.
4. My smartphone use prevents me from doing my main responsibilities.

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**Data Availability** The data are available from the corresponding author upon reasonable request.

## Declarations

**Ethics Approval** The research procedures comply with ethical principles for research with human participants consistent with the 1964 Helsinki Declaration and its later amendments and comparable ethical standards. Informed consent was obtained from all the individual participants included in the current study.

**Conflict of Interest** The authors declare no competing interests.

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