Assessing Nomophobia: Validation Study of the European Portuguese Version of the Nomophobia Questionnaire

Ana Galhardo, Daniela Loureiro, Elsa Raimundo, Ilda Massano-Cardoso & Marina Cunha

Community Mental Health Journal

ISSN 0010-3853
Volume 56
Number 8

Community Ment Health J (2020)
56:1521-1530
DOI 10.1007/s10597-020-00600-z

Springer

Community Mental Health Journal (2020) 56:1521–1530
https://doi.org/10.1007/s10597-020-00600-z

ORIGINAL PAPER

Assessing Nomophobia: Validation Study of the European Portuguese Version of the Nomophobia Questionnaire

Ana Galhardo[1,2] · Daniela Loureiro[1] · Elsa Raimundo[1] · Ilda Massano-Cardoso[1,3,4] · Marina Cunha[1,2]

Received: 18 October 2019 / Accepted: 6 March 2020 / Published online: 11 March 2020

Abstract

Nomophobia (no mobile phone phobia) can be defined as a situational phobia described by the fear of not having a smartphone available or being incapable of accessing the Internet. Based on these characteristics, the Nomophobia Questionnaire (NMP-Q) was designed, showing a four-factor structure and good psychometric characteristics. The current study intended to adapt the NMP-Q to European Portuguese (NMP-Q-PT) and test its factor structure and psychometric properties. Five hundred participants from the general population (convenience sampling) filled in the NMP-Q-PT, the Smartphone Addiction Scale-Short Version (SAS-SV) and the Depression, Anxiety, and Stress Scales (DASS-21). Three models were tested through confirmatory factor analysis. One higher order factor (global nomophobia) with four lower order factors revealed a good fit to the data. The NMP-Q-PT presented excellent consistency, construct and discriminant validity, as well as good concurrent and divergent validities. Overall, the NMP-Q-PT showed to be a reliable and valid instrument for measuring nomophobia.

Keywords Nomophobia · Assessment · Confirmatory factor analysis · Psychometric properties

Introduction

Nomophobia (no mobile phone phobia) consists on the fear of being without a mobile phone, a smartphone or the Internet. The term nomophobia has been pointed as controversial, being related to a modern age phobia but also being indicated as the dependence on mobile phones (Dixit et al. 2010) or an addiction to these devices (Forgays et al. 2014). Additionally, nomophobia has also been described as a smartphone separation anxiety. Han et al. (2017) state that subjects that identify the smartphone as an extended self are more prone to get attached to it. King et al. (2014) define nomophobia as a set of behaviours or symptoms related to the use of mobile phones, stating that people presenting nomophobia show an irrational fear of being incapable of using their mobile device or being out of mobile phone contact, leading them to try to avoid the possibility of being unable to use it. Thus, nomophobia can be conceptualized as a situational modern age phobia resulting from the way individuals interact with information and communication technologies, namely smartphones. According to the Mail Online survey, conducted in 2008, nomophobia was more frequent for men than for women. Nevertheless, subsequent studies have found a higher prevalence of nomophobia in women (e.g., Bragazzi et al. 2016; SecurEnvoy 2012; Tavolacci et al. 2015). Moreover, there seems to be a relationship between nomophobia and age, with younger subjects more prone to nomophobia (González-Cabrera et al. 2017; SecurEnvoy 2012).

In this context, a set of self-report instruments have been developed aiming to measure mobile phone-related behaviours in adults and adolescents. Some examples are the Cellular Phone Dependence (Toda et al. 2004), the Mobile Phone Problem Use Scale (Bianchi and Phillips 2005), The

✉ Ana Galhardo
anagalhardo@ismt.pt

1 Instituto Superior Miguel Torga, Largo da Cruz de Celas, nº1, 3000-132 Coimbra, Portugal

2 CINEICC – Centre for Research in Neuropsychology and Cognitive Behavioral Intervention - Faculty of Psychology and Educational Sciences, University of Coimbra, Rua do Colégio Novo, 3000-115 Coimbra, Portugal

3 Faculty of Medicine, University of Coimbra, Azinhaga de Sta. Comba, Celas, 3000-548 Coimbra, Portugal

4 CEISUC- Faculty of Economics, University of Coimbra, Av. Dr. Dias da Silva, 165, 3004-512 Coimbra, Portugal

Cell-Phone Over-Use Scale (Jenaro et al. 2007), the Mobile Phone Addiction Scale (Leung 2008), the Mobile Phone Involvement Questionnaire (Walsh et al. 2010), the Problematic Use of Mobile Phone Scale (Merlo et al. 2013), and the Smartphone Addiction Scale–Short Version (Know et al. 2013).

This seems to be an emergent phenomenon with Yildirim et al. (2016) stating that in a sample of 537 Turkish college students, 42.6% presented nomophobia. According to van Velthoven et al. (2018), problematic smartphone use may be considered a public health problem resulting from modern age. Thus, including nomophobia as a specific phobia in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) may be relevant considering that new phobias related to technologies are emerging, due to rapid and substantial improvements, leading to changes in human behaviour and routines (Bragazzi and Del Puente 2014). These authors suggest some symptoms of nomophobia would be the regular use of the cell phone, spending considerable amount of time in using it, owning one or more devices, always having a charger accessible, experiencing symptoms of anxiety and nervousness when considering that one may have lost the smartphone or when wireless or credit are not available. Other examples would be keeping the device on 24 h a day and even sleep with it in bed, and avoid situations where the use of these devices is not allowed (e.g., planes, theatres, etc.). It is also worth noting that the decrease in face-to-face social interactions and the tendency for choosing communication through new technologies may increase stress and anxiety (Bragazzi and Del Puente 2014). The mobile phone verification can act as a safety behaviour in anxious subjects and it may be hypothesized that these behaviours play an important role in the development and maintenance of psychopathological symptoms (King et al. 2013).

Individuals with pre-existing anxiety disorders tend to show greater susceptibility for developing nomophobia due to higher levels of anxiety and worry in their daily lives, which are factors of greater vulnerability (King et al. 2014). For example, individuals suffering from agoraphobia or panic disorder tend to show more severe physical or psychological symptoms once deprived of access to their smartphones when compared to controls (King et al. 2014).

Although the inflated worry of being connected to the world can interfere with the subject's daily life and generate internal conflicts or conflicts with others (González-Cabrera et al. 2017), the use of smartphones entails a set of benefits. Being constantly reachable, perform work tasks, establish communication rapidly, and access information, or simply for leisure, are some of the possibilities. In fact, the mobile phone has a series of functionalities that go beyond the basic purposes of making/receiving phone calls. It allows users to play, talk, access websites and look for information (Choi et al. 2015), having the additional advantage of being used whenever and wherever wanted (Nielsen and Fjuk 2010). In fact, the smartphone is the easiest mobile device to use, allowing a wide range of possibilities, along with its ease transportation (Yildrim and Correia 2015). However, this massive use is not risk-free, fundamentally when it becomes excessive and interferes with other domains of the individuals' lives or induces negative emotions.

The majority of self-report instruments related to the problematic use of smartphones was developed based on the addiction literature, specifically in the behavioural and technological addiction. Nevertheless, behaviours or symptoms associated to mobile phones' use, such as stress and nervousness when access to the mobile phone is somehow impossible, are distinctive from addiction symptoms. Panova et al. (2018) state that there is not sufficient support to confirm the existence of smartphone addiction and suggest using other terms such as "problematic use" of mobile phones.

Within this theoretical framework, a self-report instrument focusing on smartphones' use is the Nomophobia Questionnaire (NMP-Q) (Yildrim and Correia 2015). These authors implemented a mixed-method study, aiming to qualitatively explore the dimensions of nomophobia and used these results as a basis for the development of the items comprising the NMP-Q. The NMP-Q revealed a four-factor structure: (1) Not being able to communicate (6 items), (2) Losing connectedness (5 items), (3) Not being able to access information (4 items), and (4) Giving up convenience (5 items), showed a Cronbach alpha of 0.95 and its convergent validity was also supported.

The NMP-Q Spanish version (González-Cabrera et al. 2017) was studied in a sample comprising 306 students (13 to 19 years old). A four-factor structure was replicated and a Cronbach alpha of 0.95 was found for this version (González-Cabrera et al. 2017). The NMP-Q is also available in Italian (Adawi et al. 2018) and its study was conducted in a sample of 403 individuals showing a three-factor structure and a Cronbach alpha of 0.95. Moreover, Lin et al. (2018) published data on the Persian version of the NMP-Q. These authors confirmed the four factor structure through Rasch analyses and confirmatory factor analysis in a sample of 3,216 Iranian adolescents, but items 9 and 14 were removed due to low factor loadings. A Cronbach alpha of 0.92 was found for the NMP-Q Persian version. Also, Ma and Liu (2018) translated the NMP-Q to Chinese and explored its factor structure in a sample of 966 college students. Similarly to the other aforementioned versions, the four-factor solution was replicated and a Cronbach alpha of 0.94 was found.

Considering that, to our knowledge, an European Portuguese version was not available, the aim of this study was to adapt the Nomophobia Questionnaire (NMP-Q-PT) to the Portuguese language and investigate its factor structure and

indicators of reliability and validity for the scores of this questionnaire in an adult general population sample. Given that the original version and several NMP-Q other languages versions showed a four-factor solution we hypothesised that the same would be the case for the Portuguese version. Additionally, differences between men and women concerning nomophobia scores were explored as well as the associations between age, years of education and nomophobia scores.

Methods

Participants

The sample comprised 500 subjects, 368 women (73.6%) and 132 men (26.4%). Participants' mean age was 22.95 ($SD = 5.36$) years old (ranging from 18 to 59 years old). The majority of participants were single ($n = 469$; 93.8%), followed by married ($n = 27$; 5.4%), and divorced ($n = 4$; 0.8%). Regarding years of education, participants presented a mean of 14.58 years ($SD = 2.07$).

Instruments

Nomophobia Questionnaire (NMP-Q; Yildrim and Correia 2015). The NMP-Q is a self-report instrument consisting of 20 items that assess 4 dimensions (1) Not being able to communicate (e.g., "I would be worried because my family and/or friends could not reach me") that indicates feelings of failing to communicate and being prevented to be reached by other people; (2) Losing connectedness, (e.g., "I would be nervous because I would be disconnected from my online identity"), associated with feelings of missing omnipresence and connectivity and being detached from online identity, particularly in social media or networks; (3) Not being able to access information (e.g., "I would be annoyed if I could not look information up on my smartphone when I wanted to do so"), related to the discomfort of missing widespread access to information; and (4) Giving up convenience (e.g., "Running out of battery in my smartphone would scare me"), related to feelings of convenience provided by smartphones and the desire to own them. All 20 items are answered using a 7-point Likert scale (1 = "Totally disagree" to 7 = "Totally agree"). A nomophobia index ranging from 20 to 140 is obtained by summing the answers to each item. Higher scores are indicative of higher nomophobia severity. In the current study the Portuguese version was used (the adaptation to the European Portuguese language process is described in the procedures section).

Depression, Anxiety and Stress Scales-21 (DASS-21; Lovibond and Lovibond 1995; Portuguese version by Pais-Ribeiro et al. 2004). The DASS-21 comprises 3 subscales that assess depression (e.g., "I found it difficult to work up the initiative to do things"), anxiety (e.g., "I felt scared without any good reason"), and stress (e.g., "I found it difficult to relax") symptoms. In the DASS-21 original version Cronbach's coefficient values for the depression, anxiety, and stress subscales were of 0.94, 0.87, and 0.91, respectively (Lovibond and Lovibond 1995). The DASS-21 Portuguese version also revealed good internal consistency (Cronbach alphas of 0.84, 0.80, and 0.87, for the depression, anxiety and stress subscales). In this study, the Cronbach alpha values were 0.90 (depression), 0.86 (anxiety) and 0.91 (stress).

The Smartphone Addiction Scale-Short Version (SAS-SV; Kwon et al. 2013; Portuguese version by Borda D'Água 2017) is a unidimensional self-report instrument designed to measure smartphone use impact on health and social impairment, isolation and tolerance. The SAS-SV encompasses 10 items (e.g., "Feeling inpatient and fretful when I am not holding my smartphone"). The original version showed a Cronbach alpha of 0.91 (Kwon et al. 2013). The Portuguese version revealed a Cronbach alpha of 0.86 (Borda D'Água 2017). In the current study a Cronbach alpha of 0.89 was found.

Procedures

The translation of the NMPQ-PT from the English version to the Portuguese language was completed in several steps, after obtaining the authors' original version authorization. In a first step, an English native speaker, fluent in Portuguese and acting as a language teacher, translated the original NMP-Q items to Portuguese. In a second step the researchers (Portuguese native speakers speaking English fluently) translated back the items to English and verified each item content similarity (back translation) (Erkut 2010). Minimal differences between the original and translated versions were identified and minor changes were made so that the items corresponded as closely as possible to the original questionnaire. This version of the Portuguese questionnaire (Annex 1) was administered to a group of 10 undergraduate students who were asked to complete the questionnaire and comment on whether the instructions and the items were clear and easy to understand. No difficulties or inconsistencies were reported by these individuals. The previously described procedures followed the recommendations of Hambleton et al. (2005) and of the International Test Commission (2017).

The study was approved by the Ethical Committee of the Instituto Superior Miguel Torga. Participants' recruitment was carried out in Instituto Superior Miguel Torga classes by the second author (convenience sample). Additionally, the study was disseminated through social media (snowball sampling). An access link was made available for online data collection (https://goo.gl/forms/fz14HKxZNPZzM6pc2). Informed consent was mandatory before completing the self-report measures, either in a paper–pencil format and

online platform. Data collection took place from January 31st to September 30th 2018 and was accomplished in line with the Declaration of Helsinki (World Medical Association 2001).

Statistical Analyses

Psychometric analyses were conducted with IBM SPSS Statistics 24 (IBM 2016). Confirmatory factor analysis (CFA) was performed using the AMOS software (Arbuckle 2006). The NMP-Q-PT structure adequacy was tested through a CFA, with Maximum Likelihood as the estimation method. The following goodness-of-fit indices were considered: the normed chi-square goodness-of-fit (χ^2/df), the Comparative Fit index (CFI), the Goodness of Fit Index (GFI) and the Tucker and Lewis Index (TLI). The Root-Mean Square Error of Approximation (RMSEA) was also analysed. The Expected Cross-Validation Index (ECVI) was used for the models' comparison. The CFI, the GFI and the TLI are indicative of an adequate model fit to the data when values are between 0.90 and 0.95 (Hooper et al. 2007). Values lower that 0.10 are considered acceptable for the RMSEA, with 95% confidence interval (Hair et al. 1998). The local adjustment indices were also assessed and considered adequate when values equal or superior to 0.40 were found (Tabachnick and Fidell 2007). Cronbach alpha values were used for the assessment of internal consistency. Alpha values superior to 0.70 denote good internal consistency and superior to 0.90 excellent internal consistency (Kline 2000). The computation of the composite reliability (CR) and of the average variance extracted (AVE) was also conducted to further determine construct reliability and convergent validity. A Composite Reliability Calculator was used (estimates CR based on standardized factor loadings and error variances) (Raykov 1997). AVE results were calculated manually through the computation of AVE formula (Fornell and Larcker 1981). Pearson correlation coefficients were examined to explore relationships with other measures. The correlation analysis between the NMPQ-PT and the SAS-SV was conducted in a subsample of 203 participants. According to Cohen et al. (2003), the effect sizes may be: small ($r = 0.10$ to 0.29), moderate ($r = 0.30$ to 0.49), large ($r = 0.50$ to 0.69), very large ($r = 0.70$ to 0.89), nearly perfect ($r \geq 0.90$), and perfect ($r = 1$).

Results

Preliminary Analysis

Skewness and Kurtosis' values indicated the items did not reveal a significant bias to normal distribution, with Skewness values ranging from − 0.21 to 1.52 and Kurtosis values ranging from − 1.91 to 1.75. The large sample size allowed the use of a CFA. Outliers removal would not improve the model fit.

NMP-Q-PT Confirmatory Factor Analysis

A unidimensional model of the NMP-Q-PT (Model 1) was tested and showed a poor fit to the data: $\chi^2/170 = 16.50$; $p \ll 0.001$, CFI = 0.70; GFI = 0.551; TLI = 0.66; RMSEA = 0.118 [90% CI 0.117–0.118; $p \ll 0.001$]. An uncorrelated four-factor model, where covariances between the four nomophobia factors were fixed to 0 (Model 2) showed a significant normed chi-squared goodness-of-fit ($\chi^2/164 = 3.99$; $p < 0.001$). Other fit indices were as follows: CFI = 0.94; GFI = 0.88; TLI = 0.94. Additionally, the RMSEA value was 0.08 [90% CI 0.07–0.08; $p \ll 0.001$]. Moreover, a hierarchical model with one second-order factor explaining the four nomophobia factors (Model 3; Fig. 1) was calculated and showed an adequate fit to the data: $\chi^2/166 = 4.09$; $p \ll 0.001$, CFI = 0.994; GFI = 0.888; TLI = 0.993; RMSEA = 0.008 [90% CI 0.007–0.009; $p \ll 0.001$]. This higher order model was therefore chosen as the most adequate to represent the theoretical model allowing, not only the assessment the nomophobia different dimensions, but also a global score of nomophobia.

As for the local adjustment (Table 1), standardized regression weights varied from 0.52 (item 19) to 0.95 (item 13), and squared multiple correlations varied between 0.27 (item 19) and 0.92 (item 13).

Item Analyses, Reliability and Validity

Means, standards deviations, item-total correlations and Cronbach alpha if item deleted for the NMP-Q-PT items were analysed and results are presented in Table 1. Item-total correlations ranged from .50 to .81. The Cronbach alpha found for the NMP-Q-PT total score was .96. Additionally, the exclusion of any item would not increase the scale reliability. The NMPQ-PT total score revealed a CR of .98. Cronbach's alphas values, CR and AVE results for the NMP-Q-PT four factors are presented in Table 2.

The comparison of the AVE of each factor with the squared correlation between the factors was used to address discriminant validity. The squared correlations between the factors ranged from .32 to .56 and AVE results were higher than these squared correlations, denoting the four factors have adequate discriminant validity.

The NMP-Q-PT total score and dimensions associations with other measures are presented in Table 3. The NMP-Q-PT total score presented positive small associations with symptoms of depression, anxiety and stress, as measured by the DASS-21. Results also demonstrated that the NMP-Q-PT dimensions revealed small positive

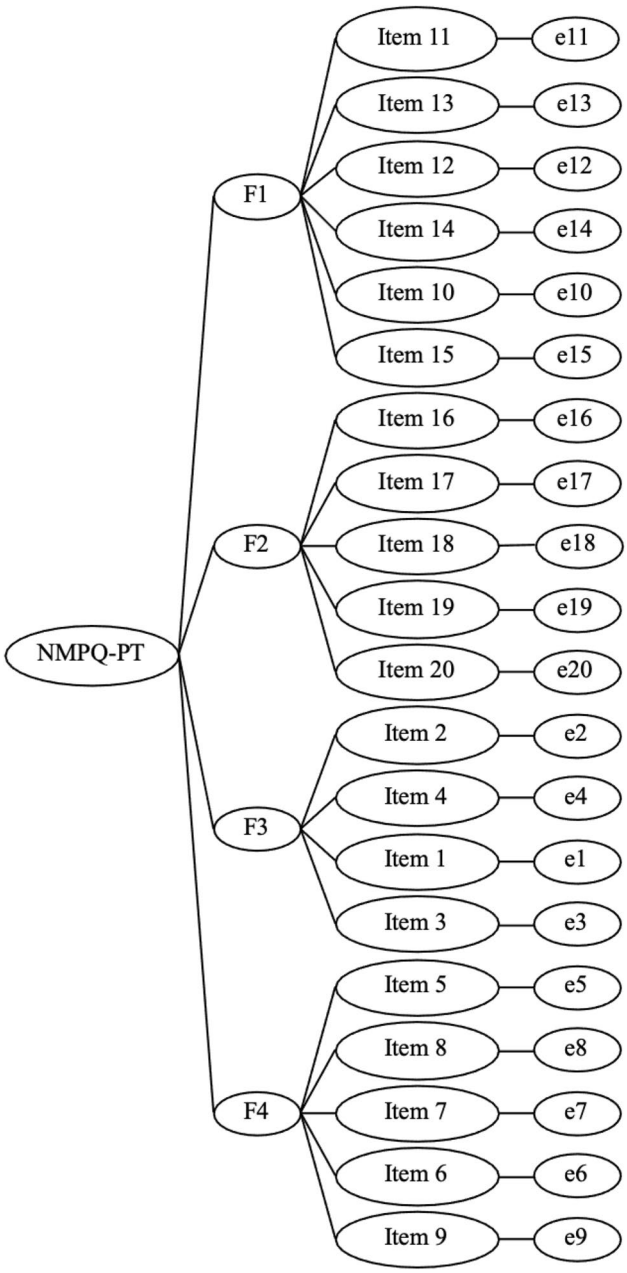

Fig. 1 CFA hierarchical model with one second-order factor explaining the four NMP-Q-PT factors

correlations with these symptoms. NMP-Q-PT total score showed a very large correlation with the Internet Addiction Scale (SAS-SV), and all the factors revealed a large correlation with the SAS-SV.

Moreover, there was no association between NMP-Q-PT total score, each of the four factors, and age ($p > .050$). Regarding years of education, a significant negative correlation was found with the NMP-Q-PT ($r = -.11$; $p = .015$). Table 4 presents sex differences regarding NMP-Q-PT total score and factors.

Table 1 NMP-Q-PT descriptives, corrected item-total correlations and standardized regression weights

Items	*M*	*SD*	Corrected item-total correlation	Standardized regression weights
Factor 1				
Item 10	3.93	1.81	.78	.88
Item 11	4.39	1.76	.72	.88
Item 12	3.85	1.81	.81	.91
Item 13	4.07	1.78	.80	.95
Item 14	3.79	1.84	.80	.88
Item 15	3.68	1.82	.75	.87
Factor 2				
Item 16	2.05	1.44	.71	.89
Item 17	2.15	1.49	.69	.92
Item 18	2.18	1.50	.69	.90
Item 19	2.43	1.61	.50	.52
Item 20	2.35	1.63	.68	.75
Factor 3				
Item 1	3.83	1.66	.63	.81
Item 2	3.97	1.74	.66	.87
Item 3	3.20	1.67	.64	.76
Item 4	3.87	1.75	.68	.80
Factor 4				
Item 5	2.80	1.76	.68	.74
Item 6	2,11	1.46	.72	.81
Item 7	2.67	1.71	.70	.78
Item 8	3.33	1.88	.70	.74
Item 9	3.47	1.81	.74	.76

Significant differences were found between male and female participants regarding the NMP-Q-PT total score and subscales except for Factor 2 (Losing connectedness), with women showing higher scores.

Discussion

The aim of the current study was to adapt and validate the Portuguese version of the NMP-Q. According to the International Test Commission recommendations (2017), the linguistic equivalence between the English language version and the European Portuguese version was reached.

In order to test the NMP-Q-PT structure three models were tested through CFA. Model 1 was a single factor solution that revealed a poor fit to the data. Model 2 (an uncorrelated four-factor model, based on the NMP-Q original version, where covariances between the four nomophobia factors were fixed to 0) and Model 3 (a hierarchical model with one second-order factor explaining the four nomophobia factors) showed similar fit results. Considering that it might be useful to capture a global sense of nomophobia,

Table 2 Correlations between the NMP-Q-PT factors, NMP-Q-PT total score, Cronbach α, composite reliability (CR) and average variance extracted (AVE)

	F 1	F 2	F 3	F 4	NMP-Q-PT	Cronbach α	CR	AVE
F 1		.56**	.60**	.72**	.88**	.96	.96	.88
F 2			.59**	.75**	.82**	.89	.90	.76
F 3				.65**	.80**	.88	.89	.78
F 4					.91**	.87	.88	.72
NMP-Q-PT						.96	.98	–

**$p < .001$

Table 3 Correlations between the NMP-Q-PT (total score and dimensions), the DASS-21 subscales and the SAS-SV

	DASS depression ($N = 500$)	DASS anxiety ($N = 500$)	DASS stress ($N = 500$)	SAS-SV ($n = 203$)
NMP-Q-PT total	.23**	.27**	.28**	.70**
F1-not being able to communicate	.14**	.20**	.23**	.55**
F2-losing connectedness	.25**	.25**	.23**	.67**
F3-not being able to access information	.19**	.22**	.23**	.51**
F4-giving up convenience	.25**	.29**	.27**	.69**

**$p < .001$

Table 4 Sex differences in NMP-Q-PT total score and dimensions

	Men ($n = 132$)		Women ($n = 368$)		$t(498)$	p
	M	*SD*	*M*	*SD*		
NMP-Q-PT total	57.95	24.11	66.34	25.03	− 3.34	.001
F1-not being able to communicate	20.58	9.77	24.84	9.67	− 4.33	< .001
F2-losing connectedness	10.98	6.19	11.24	6.46	−.40	.690
F3-not being able to access information	13.70	5.66	15.29	5.88	− 2.73	.008
F4-giving up convenience	12.69	6.89	14.98	6.99	− 3.24	.001

additionally to each of the four dimensions, the model presenting a second-order latent factor was chosen as more adequate. Overall, the four factor structure proposed by Yildirim and Correia (2015) was replicated in the Portuguese version. A similar structure was also found in the Spanish (González-Cabrera et al. 2017), the Persian version (Lin et al. 2018), and Chinese version (Ma and Liu 2018). In the Italian version a three factor solution was suggested, with the "Giving up convenience" and "Losing connectedness" dimensions merging as a single factor (Adawi et al. 2018). However, it should be taken into account that in the Spanish and the Italian studies the NMP-Q factor structure was analysed through exploratory factor analyses whereas in the current study a confirmatory factor analysis was conducted. The NMP-Q-PT second-order model also showed similar fit indexes to the ones found for the Persian version (Lin et al. 2018) and the Chinese version (Ma and Liu 2018).

Regarding reliability, the item-total correlations confirmed the adequacy of the items. The four dimensions and the global NMP-Q-PT score presented good internal consistency, with Cronbach alpha coefficients similar to the ones found in the original version (Yildirim and Correia 2015), and other languages versions (González-Cabrera et al. 2017; Adawi et al. 2018; Lin et al. 2018; Ma and Liu 2018). Additionally, the composite reliability was high for the four factors, and the AVE was also adequate, indicating the convergent validity of the factors. The scale also presented adequate discriminant validity.

Furthermore, the NMP-Q-PT revealed good concurrent and divergent validities. It was strongly associated with a measure of smartphone addiction, this last being a similar construct. This finding suggests that higher levels of smartphone addiction, defined as a non-chemical behavioural addiction involving human–machine interaction (Griffiths 1996), may lead to higher proneness to show nomophobic symptoms. In addition, small positive correlations were found between NMP-Q-PT and symptoms of depression, anxiety and stress. These findings were similar to what Lin et al. found in the NMP-Q Persian version (Lin et al. 2018). Particularly in terms of anxiety and stress symptoms, it can be hypothesized that nomophobia captures very specific and contextualized interactions of subjects with their

smartphones that go beyond more general anxiety and stress feelings.

Concerning gender differences, women showed higher scores than men regarding a nomophobia total score and three of the nomophobia dimensions, what is in accordance with previous studies (González-Cabrera et al. 2017; Ma and Liu 2018; Yildirim et al. 2016; SecurEnvoy 2012). Nevertheless, no differences were found between men and women concerning the "Losing connectedness" dimension. This points to the fact that both men and women present similar feelings of missing omnipresence and connectivity and being detached from online identity, especially in social media or networks. Furthermore, in the current study there was no significant association between the NMP-Q-PT total score and age. Although Adawi et al. (2018) report no significant association between age and nomophobia and Yildirim et al. (2016) found no significant differences in nomophobia between youngers (age ≦ 20) and elders (age > 20), other studies indicate that younger subjects are more at risk of showing nomophobia symptoms (González-Cabrera et al. 2017; SecurEnvoy 2012). However, it is worth of note that these studies were conducted in samples of adolescents (González-Cabrera et al. 2017) or report that younger subjects are aged between 14 and 16 years old, and in the Portuguese version study participants were older than 18 years old. In addition, a small significant negative association was found between the NMP-Q-PT total score and years of education. It can be hypothesized that schooling may allow subjects not to get so disturbed in case they are unable to use their smartphone but this relationship requires further investigation.

Several limitations should be noted when examining the NMP-Q-PT results. The cross sectional design did not allow to address test-retest reliability of the NMP-Q-PT and this should be explored in future studies. The exposure to these devices (how much time participants spend on smartphone use per day) was not addressed and this may have an effect on the results. Besides, given that the current sample was a convenience sample, the representativeness in terms of the smartphone use cannot be assured. Moreover, given that nomophobia may be seen as a specific phobia (although not established as a clinical entity), NMP-Q-PT sensitivity to therapeutic change may also be a relevant topic to focus in future studies.

To sum, the NMP-Q-PT may be seen as a reliable and valid instrument to be used in research settings, for example, in studies addressing the exploration of vulnerability factors or the impact of nomophobia in health or psychological functioning. Another application may be in clinical work or educational settings, contributing to the screening of nomophobia or to the design of specific interventions (e.g., prevention programs) targeting this topic. The use of the NMP-Q-PT can also be extended to other countries where Portuguese is the official language [Portuguese is the third most spoken European language (Observatório da Língua Portuguesa 2018)]. Furthermore, the availability of self-report measures in different languages also promotes cross cultural research and the current findings add support for the robustness of the NMP-Q factor structure.

Annex 1

NMP-Q-PT

(Yildirim and Correia 2015; Versão Portuguesa de A. Galhardo, D. Loureiro, E. Raimundo, I. Massano-Cardoso, and M. Cunha 2019)

Indique o quanto concorda ou discorda com cada uma das seguintes afirmações em relação ao seu *smartphone*	Discordo totalmente 1	2	3	4	5	6	Concordo totalmente 7
1. Sentir-me-ia desconfortável se não tivesse acesso constante a informação através do meu *smartphone*							
2. Sentir-me-ia irritado se não pudesse pesquisar informação no meu *smartphone* quando quisesse							
3. Não poder ter as notícias (ex., acontecimentos, estado do tempo, etc.) no meu *smartphone* deixar-me-ia ansioso							
4. Ficaria irritado se não conseguisse usar o meu *smartphone* e as suas funcionalidades quando quisesse							
5. Ficar sem bateria no meu *smartphone* far-me-ia ficar com medo							

Indique o quanto concorda ou discorda com cada uma das seguintes afirmações em relação ao seu *smartphone*	Discordo totalmente 1	2	3	4	5	6	Concordo totalmente 7
6. Se ficasse sem crédito no meu *smartphone* ou atingisse o limite dos dados móveis mensais, entraria em pânico							
7. Se não tivesse um sinal de rede ou *Wi-Fi*, estaria constantemente a verificar se já tinha sinal ou se conseguia encontrar uma rede *Wi-Fi*							
8. Se não conseguisse usar o meu *smartphone*, teria medo de ficar sem recursos num sítio qualquer							
9. Se não me fosse possível ver o meu *smartphone* durante algum tempo, sentiria necessidade de o fazer							
10. Sentir-me-ia ansioso, porque não conseguiria comunicar imediatamente com a minha família e/ou amigos							
11. Ficaria preocupado porque a minha família e/ou amigos não me poderiam contactar							
12. Sentir-me-ia nervoso porque não conseguiria receber mensagens e chamadas							
13. Sentir-me-ia ansioso porque não seria capaz de manter contacto com a minha família e/ou amigos							
14. Ficaria nervoso porque não saberia se alguém me tinha tentado contactar							
15. Sentir-me-ia ansioso porque a minha ligação constante com a minha família e amigos estaria interrompida							
16. Ficaria nervoso porque estaria desligado da minha identidade *online*							
17. Sentir-me-ia desconfortável porque não conseguiria estar atualizado nas redes sociais e nas redes *online*							
18. Sentir-me-ia incomodado por não poder ver as minhas notificações para atualizações dos meus contatos e redes sociais							
19. Sentir-me-ia ansioso porque não aceder aos meus *e-mails*							
20. Sentir-me-ia estranho porque não saberia o que fazer							

Total scores ranged between 20 and 135, with $M = 64.12$, $SD = 25.04$

Acknowledgements The authors would like to thank all participants for their collaboration.

Author Contributions All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Daniela Loureiro, Elsa Raimundo and Ana Galhardo. The first draft of the manuscript was written by Ana Galhardo, Ilda Massano-Cardoso and Marina Cunha and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Funding There was no funding for this study.

Compliance with Ethical Standards

Conflict of interest The authors state that there are no known conflicts of interest.

References

Adawi, M., Bragazzi, N. L., Argumosa-Villar, L., Boada-Grau, J., Vigil-Colet, A., Yildirim, C., et al. (2018). Translation and validation of the Nomophobia Questionnaire in the Italian language: Exploratory factor analysis. *JMIR mHealth and uHealth, 6*(1), e24. https://doi.org/10.2196/mhealth.9186.

Arbuckle, J. L. (2006). *Amos 7.0 user's guide*. Chicago: SPSS.

Bianchi, A., & Phillips, J. G. (2005). Psychological predictors of problem mobile phone use. *CyberPsychology & Behavior, 8*, 39–51.

Borda D'Água, J. R. M. (2017). Relação entre a dependência do *smartphone*, os traços de personalidade e a satisfação na relação amorosa. (Unpublished master's thesis). Instituto Superior da Psicologia Aplicada, Lisboa.

Bragazzi, N. L., & Del Puente, G. (2014). A proposal for including nomophobia in the new DSM-V. *Psychology Research and Behavior Management, 7*, 155–160. https://doi.org/10.2147/PRBM.S41386.

Bragazzi, N. L., Del Puente, G., Adavastro, G., Pompei, V., Siri, A., Rania, N., et al. (2016). Translation and validation of the Nomophobia Questionnaire (NMP-Q) in Italian language: Insights from factor analysis. *European Psychiatry, 33*, S390.et al

Choi, S., Kim, D. J., Choi, J. S., Ahn, H., Choi, E. J., Song, W. Y., et al. (2015). Comparison of risk and protective factors associated with smartphone addiction and Internet addiction. *Journal of Behavioral Addictions, 4*(4), 308–314. https://doi.org/10.1556/2006.4.2015.043.

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences*. Hillsdale: Erlbaum.

Dixit, S., Shukla, H., Bhagwat, A. K., Bindal, A., Goyal, A., Zaidi, A. K., et al. (2010). A study to evaluate mobile phone dependence among students of a medical college and associated hospital of central India. *Indian Journal of Community Medicine, 35*(2), 339. https://doi.org/10.4103/0970-0218.66878.

Erkut, S. (2010). Developing multiple language versions of instruments for intercultural research. *Child Development Perspectives, 4*(1), 19–24. https://doi.org/10.1111/j.1750-8606.2009.00111.x.

Forgays, D. K., Hyman, I., & Schreiber, J. (2014). Texting everywhere for everything: Gender and age differences in cell phone etiquette and use. *Computers in Human Behavior, 31*, 314–321. https://doi.org/10.1016/j.chb.2013.10.053.

Fornell, C., & Larcker, D. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39–50.

González-Cabrera, J., Leon-Mejía, A., Pérez-Sancho, C., & Calvete, E. (2017). Adaptation of the Nomophobia Questionnaire (NMP-Q) to Spanish in a sample of adolescents. *Actas Españolas de Psiquiatría, 45*(4), 137–144.

Hair, J. F., Tatham, R. L., & Black, W. C. (1998). *Multivariate data analysis* (5th ed.). London: Prentice-Hall.

Hambleton, R. K., Merenda, P. F., & Spielberger, C. D. (2005). *Adapting educational and psychological tests for cross-cultural assessment*. Mahwah, NJ: L. Erlbaum Associates.

Hooper, D., Coughlan, J., & Mullen, M. R. (2007). Structural equation modeling: Guidelines for determining model fit. *Electronic Journal on Business Research Methods, 6*(1), 53–60.

IBM Corp. (2016). *IBM SPSS Statistics for Windows, Version 24.0*. Armonk, NY: IBM Corp.

International Test Commission. (2017). *The ITC guidelines for translating and adapting tests* (2nd ed.). www.InTestCom.org.

Jenaro, C., Flores, N., Gómez-Vela, M., González-Gil, F., & Caballo, C. (2007). Problematic internet and cell-phone use: Psychological, behavioral, and health correlates. *Addiction Research and Theory, 15*, 309–320. https://doi.org/10.1080/16066350701350247.

Jeong, S. H., Kim, H., Yum, J. Y., & Hwang, Y. (2016). What type of content are smartphone users addicted to? SNS vs. games. *Computers in Human Behavior, 54*, 10–17. https://doi.org/10.1016/j.chb.2015.07.035.

King, A., Valença, A., Silva, O., Baczynski, T., Carvalho, R., & Nardi, E. (2013). Nomophobia: Dependency on virtual environments or social phobia? *Computers in Human Behavior, 29*(1), 140–144. https://doi.org/10.1016/j.chb.2012.07.025.

King, A. L. S., Valença, A. M., Silva, A. C., Sancassiani, F., Machado, S., & Nardi, A. E. (2014). "Nomophobia": Impact of cell phone use interfering with symptoms and emotions of individuals with panic disorder compared with a control group. *Clinical Practice and Epidemiology in Mental Health, 10*, 28–35. https://doi.org/10.2174/1745017901410010028.

Kline, R. B. (2000). *Principles and practice of structural equation modelling* (2nd ed.). New York: The Guilford Press.

Kwon, M., Kim, D. J., Cho, H., & Yang, S. (2013). The smartphone addiction scale: Development and validation of a short version for adolescents. *PLoS ONE, 8*(12), e83558. https://doi.org/10.1371/journal.pone.0083558.

Leung, L. (2008). Linking psychological attributes to addiction and improper use of the mobile phone among adolescents in Hong Kong. *Journal of Children and Media, 2*, 93–113. https://doi.org/10.1080/17482790802078565.

Lin, C. Y., Griffiths, M. D., & Pakpour, A. H. (2018). Psychometric evaluation of Persian Nomophobia Questionnaire: Differential item functioning and measurement invariance across gender. *Journal of Behavioral Addictions, 7*(1), 100–108.

Lovibond, P., & Lovibond, H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with Beck Depressive and Anxiety Inventories. *Behaviour Research and Therapy, 33*(3), 335–343.

Ma, J., & Liu, C. (2018). Evaluation of the factor structure of the Chinese version of the nomophobia questionnaire. *Current Psychology*. https://doi.org/10.1007/s12144-018-0071-9.

Mail Online. (2008). Nomophobia is the fear of being out of mobile phone contact – And it's the plague of our 24/7 age. Retrieved January 08, 2020, from https://www.dailymail.co.uk/news/article-550610/Nomophobia-fear-mobile-phone-contact--plague-24-7-age.html.

Merlo, L. J., Stone, A. M., & Bibbey, A. (2013). Measuring problematic mobile phone use: Development and preliminary psychometric properties of the PUMP scale. *Journal of Addiction*. https://doi.org/10.1155/2013/912807.

Nielsen, P., & Fjuk, A. (2010). The reality beyond the hype: Mobile Internet is primarily an extension of PC-based Internet. *The Information Society, 52*(3), 243–249. https://doi.org/10.1080/01972243.2010.511561.

Observatório da Língua Portuguesa. (2018). O português é a terceira língua europeia mais falada no mundo. Retrieved from https://observalinguaportuguesa.org/o-portugues-e-a-terceira-lingua-europeia-mais-falada-no-mundo/.

Pais-Ribeiro, J., Honrado, A., & Leal, I. (2004). Contribuição para o estudo da adaptação portuguesa das escalas de ansiedade depressão stress de Lovibond e Lovibond. *Psychologica, 36*, 235–246.

Panova, T., & Carbonell, X. (2018). Is smartphone addiction really an addiction? *Journal of Behavioral Addictions, 7*(2), 252–259. https://doi.org/10.1556/2006.7.2018.49.

Raykov, T. (1997). Estimation of composite reliability for congeneric measures. *Applied Psychological Measurement, 21*(2), 173–184.

SecurEnvoy. (2012). 66% of the population suffer from nomophobia the fear of being without their phone. Retrieved from https://www.securenvoy.com/en-gb/blog/66-population-suffer-nomophobia-fear-being-without-their-phone.

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistic* (5th ed.). New York: Allyn and Bacon.

Tavolacci, M. P., Meyrignac, G., Richard, L., Dechelotte, P., & Ladner, J. (2015). Problematic use of mobile phone and nomophobia among French college students. *European Journal of Public Health, 25*(suppl 3), 206.

Toda, M., Monden, K., Kubo, K., & Morimoto, K. (2004). Cellular phone dependence tendency of female university students. *Japanese Journal of Hygiene, 59*, 383–386.

van Velthoven, M. H., Powell, J., & Powell, G. (2018). Problematic smartphone use: Digital approaches to an emerging public health problem. *Digital Health, 4*, 1–9. https://doi.org/10.1177/2055207618759167.

Walsh, S. P., White, K. M., & Young, R. M. (2010). Needing to connect: The effect of self and others on young people's involvement with their mobile phones. *Australian Journal of Psychology, 62*, 194–203. https://doi.org/10.1080/00049530903567229.

World Medical Association. (2001). World Medical Association Declaration of Helsinki. Ethical principles for medical research involving human subjects. *Bulletin of the World Health Organization, 79*(4), 373–374.

Yildrim, C., & Correia, A. (2015). Exploring the dimensions of nomophobia: Development and validation of a self-reported questionnaire. *Computers in Human Behavior, 49*, 130–137. https://doi.org/10.1016/j.chb.2015.02.059.

Yildirim, C., Sumuer, E., Adnan, M., & Yildirim, S. (2016). A growing fear: Prevalence of nomophobia among Turkish college students. *Information Development, 32*(5), 1322–1331.