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Validity of the Greek NMP-Q and Sociodemographic Determinants of Nomophobia Among University Students

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ABSTRACT

Nomophobia is defined as the fears caused to individuals by the lack of access or use their smartphone. The aim was to make a cultural adaptation and validation of the Greek version of the Nomophobia Questionnaire (NMP-Q) as well as to explore nomophobia's association with several sociodemographic determinants among university students. The original NMP-Q was translated from English into Greek language using both backwards and forwards processes. The underlying factor structure of questionnaire was investigated through exploratory and confirmatory factor analysis. Multiple regression analyses were used to determine the associations between nomophobia scales and specific characteristics of the university students. Exploratory and confirmatory factor analysis revealed a four-factor structure. Moreover, a second-order factor was identified as a total nomophobia scale. All factors presented adequate psychometric properties in accordance to the original NMP-Q. Multiple regression models showed significant associations of nomophobia scales with sociodemographic characteristics as gender, age, father's education and daily smartphone usage.

1. Introduction

Mobile technology has been expanding rapidly around the world. According to a recent Statista report, "*in 2020 the number of mobile users worldwide was around 6.95 billion, with forecasts suggesting an increase to 7.1 billion by 2021. In 2024, the number of mobile users is projected to reach 7.41 billion worldwide*" (Statista, 2020). Even from the dawn of the 21st century, it has been characterized as a "non-drug" addiction (Madrid, 2003).

Among the OECD countries, internet access through smartphones reached 72.4% in 2013 compared to 32.4% in 2009 (OECD, 2014). In Greece, according to the most recent survey in 2020, the vast majority of the population (96%) used internet, with the mobile phone being the first preferred device (91%) for access, followed by laptop (56%). Additionally, 81% of the participants were users of social media, while 44% spent more than 1 hr per day (Focus Bari, 2020).

Under this spectrum, the dependency on smartphones led to the emergence of a relatively new term under the name of nomophobia. Nomophobia (NO MObilePHOne phoBIA) is denoted as a discomfort or anxiety caused by the lack of access to mobile phone and feeling lost in its absence (Hooper & Zhou, 2007; King et al., 2010). The prevalence of nomophobia ranges between 75% and 100% in both developed and developing countries among young adults (Ozdemir et al., 2018; Qutishat et al., 2020). Nomophobia has been associated with several sociodemographic and psychosocial characteristics (i.e., gender, age, father's education, daily smartphone usage, stress, extraversion, emotional instability, low self-esteem, lack of discipline) (Argumosa-Villar et al., 2017; Demir, 2019; Ozdemir et al., 2018) and has been regarded as an alarming public health problem (Rodríguez-García et al., 2020).

The aforementioned evidence led to the need for a scale development assessing the severity and dimensions of nomophobia. The most widespread and translated scale is the Nomophobia Questionnaire (NMP-Q) which was first conducted, in the USA, among undergraduate students (Yildirim & Correia, 2015). The questionnaire has been translated and validated in several languages such as, Chinese (Gao et al., 2020), Indonesian (Rangka et al., 2018), Italian (Adawi et al., 2018), Persian (Elyasi et al., 2018), Arabic (Al-Balhan et al., 2018), Spanish (Gutiérrez-Puertas et al., 2016) and Portugese (Galhardo et al., 2020).

In Europe there is scarce evidence exploring the prevalence of nomophobia and its consequences (Aguilera-Manrique et al., 2018; Goncalves et al., 2020; Gutiérrez-Puertas et al., 2019). In Greece, no scientific evidence exists either on the presence of nomophobia among young adults, or the factors/characteristics that are associated with it.

Therefore, the aim of the present study was to make a cultural adaptation and validation of the Greek version of the NMP-Q as well as to explore nomophobia's association

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with sociodemographic determinants among university students.

2. Methods

2.1. The nomophobia questionnaire (NMP-Q)

The original NMP-Q is divided into three sections: (a) the socio-demographic characteristics, (b) the smartphone use and (c) the nomophobia questionnaire (Yildirim & Correia, 2015). The latter includes 20 items with a 7-point Likert Scale from 1 "strongly disagree" to 7 "strongly agree". Therefore, the total score ranges from 20 to 140 with greater scores indicating severe nomophobic symptoms. More specifically, scores ≤20 indicate "absence of nomophobia," >20–<60 "mild level of nomophobia," ≥60–<100 "moderate level of nomophobia" and ≥100 "severe level of nomophobia". From the exploratory analysis of the NMP Questionnaire four dimensions emerged: (1) "not being able to communicate" (items 10–15) (i.e., *I would feel anxious because my constant connection to my family and friends would be broken*), (2) "losing connectedness" (items 16–20) (i.e., *I would be uncomfortable because I could not stay up-to-date with social media and online networks*), (3) "not being able to access information" (items 1–4) (i.e., *I would be annoyed if I could not use my smartphone and/or its capabilities when I wanted to do so*) and (4) "giving up convenience" (items 5–9) (i.e., *If I were to run out of credits or hit my monthly data limit, I would panic*).

The NMP-Q was translated from English into Greek language using both backwards and forwards process (Medical outcomes Trust, 1997). Specifically, two independent bilingual health professionals translated the questionnaire into the Greek language (forward translation) and afterwards they worked together to conclude to a 100% agreement of the final translation. This version was then translated into the English language (backward translation) from an English native speaking health professional, who was not aware of the original English NMP-Q version. Very few differences were observed and appropriate changes were made for the items to be very close to those of the original English version.

For the pre-test part, the pre-final version was administered to 30 undergraduate students, since it is suggested as the ideal minimum number of persons to be tested (Perneger et al., 2015). The sample of the pilot testing was not included in the final study sample. The questions were easy and clear to understand and no comprehension problems were reported. Therefore, the final Greek version NMP-Q was developed and administered, along with several other questions regarding socio-demographic characteristics (i.e., age, gender, parents' educational background) and smartphone use (i.e., hours, calls, messages and e-mails per day).

2.2. Study sample and procedure

In the present cross-sectional study, 1058 university students participated between the ages 18 and 25 years. The study sample was retrieved from all faculties of the University of West Attica. The University, located in the metropolitan area of Athens, is the third largest University in Greece consisting of 6 faculties and 27 departments.

The questionnaire was anonymous and it was administered during lecture time. Due to COVID-19 restrictions, the study researcher gave all the information needed for the completion of the questionnaire online, through the Microsoft Teams platform, which facilitates synchronous remote lectures. The questionnaires were collected electronically.

2.3. Bioethics

The study was approved by the research committee of the University of West Attica and was carried out in accordance with the Declaration of Helsinki (1989). The students were informed about the aim and procedures of the study and their informed consent was acquired.

2.4. Data analyses

Data analyses were undertaken by exploratory (EFA) and confirmatory factor analysis (CFA). In EFA principal components analysis (PCA) with varimax rotation was performed while the adequacy of PCA was tested by a confirmatory factor model.

Initially, the study sample was randomly divided into two equal sized subsets and a PCA was carried out on the 20 items of the first subset (n_1=530). The Kaiser-Meyer-Olkin (KMO) measure along with Bartlett test of sphericity was used to assess the sampling adequacy for PCA (Bartlett, 1954; Kaiser, 1974). The factor's extraction was done on the basis of the comprehensive consideration of eigenvalues and the explained total variance. The number of factors extracted was determined by the values of associated eigenvalues (greater than 1). Moreover, a visual inspection of the scree plot of the analysis was helpful in the final decision of the factors retained.

The factors extracted from the PCA were tested in the second subset (n_2=528) through a CFA, with Maximum Likelihood as the estimation method (Arbuckle, 2014). The suitability of the model was evaluated by the normed chi-square goodness of fit (χ^2/df), the Comparative Fit Index (CFI), and the Tucker-Lewis Index (TLI). The Root Mean Square Error of Approximation (RMSEA) and the Standardized Root Mean Square Residual (SRMR) were also taken into account. The CFI and TLI are indicative for the adequacy of the model when values are greater than 0.90. RMSEA values (with 95% confidence interval) lower than 0.10, were considered acceptable, whereas SRMR values lower than 0.05 were also acceptable (Browne & Cudek, 1993; Hu & Bentler, 1999). The convergent and discriminant factorial validity were evaluated by Average Variance Extracted (AVE) (Fornell & Larcker, 1981) and the Heterotrait-Monotrait Ratio (HTMT) (Henseler et al., 2015).

Internal consistency and reliability of the total nomophobia scale and the four subscales were estimated by

Table 1. Distribution of study subjects by gender, age and mobile use variables.

	N	%
Gender		
Men	307	29
Women	751	71
Age		
18–19	404	38.2
20–21	362	34.2
22+	292	27.6
Mobile use	Mean value	St.Deviation
Hours/day	3.5	1.4
Calls/day	6.5	6.6
Messages/day	23.5	18.1
Emails/day	7.8	3.5

calculating the Cronbach alpha (Cronbach, 1951) and the composite reliability ω coefficients (Raykov, 2001). The minimum acceptable values for both were set at 0.7.

Furthermore, multiple regression analyses were performed to investigate the sociodemographic determinants of nomophobia. Five regression models were developed with outcome variables the nomophobia scales. The independent variables in these models are basic sociodemographic characteristics and some mobile use variables of the study subjects.

All statistical analyses were performed using SPSS v.25 (IBM Corporation) and AMOS v.23 (Arbuckle, 2014).

3. Results

A total of 1058 students completed the NMP-Questionnaire; of them 307 (29%) were males and 751 (71%) were females. The mean age of participants was 20.4 years. In terms of daily mobile phone use, the average usage time was 3.5 hr, while the average number of phone call, messages and emails per day (made and received) were 6.5, 23.5 and 7.8 respectively (Table 1). Particularly, regarding daily usage time, 6% of participants spent less than 2 hr on their mobile phones, 23.6% spent between 2 and 4 hr, 25.4% between 4 and 6 hr, 20% between 6 and 8 hr and 25% spent more than 8 hr.

The mean scores (±SD) of the NMP-Q items are displayed in the Table 2. According to the skewness [ranging from −0.996 to 1.080] and kurtosis [ranging from −1.127 to 0.604] coefficients, NMP-Q data are considered as normally distributed (Kim, 2013).

3.1. Exploratory factor analysis

Prior to the PCA run on the first half sample, the appropriateness of the method was checked based on the Bartlett's test and Kaiser-Meyer-Olkin (KMO) index. Bartlett's test resulted in a p value < 0.001 and was therefore considered significant. Moreover, the KMO of sampling adequacy equaled 0.93. Since the KMO index was greater than 0.6, the data were judged suitable for an exploratory factor analysis.

Four factors describing 66.8% of the total variance were extracted from the first PCA run. Factors with eigenvalues greater than 1 (8.67, 1.97, 1.71, 1.00 respectively for the first four ones) were considered important and therefore were retained because they account for a sufficient large amount of variance (Tabachnick & Fidell, 2019). In addition, the scree plot of the analysis supported a four factor solution as an acceptable structure (the eigenvalues began to fall below 1 after the forth factor).

Having defined the number of factors retained, a second running of PCA was conducted to improve the interpretability of the analysis. This was done through a varimax rotation of the initial factors. After rotation, the four extracted factors explained 21.99%, 19.45%, 13.72% and 11.59% of the total variance. Each item was loaded on a single factor and there was no significant cross-loading on other factors except item N9 which has large loadings on factors 1, 2 and 4. This structure, comprising 20 items falling into 4 factors, is identical to the original factor extraction in a slightly different order (Yildirim & Correia, 2015). Factor I was defined by "not being able to communicate" (items: 10,11,12,13,14,15), Factor II by "not being able to access information" (items: 16,17,18,19,20), Factor III by "giving up convenience" (items: 1,2,3,4) and Factor IV by "losing connectedness" (items: 5,6,7,8,9) (Table 2)

3.2. Confirmatory factor analysis (model M1)

Confirmatory factor analysis was performed on the (second) evaluation sample (n_2=528). The analysis was undertaken to test the factor structure on the observed inter-correlations among items. Each item was allowed to load only on its hypothesized factor, the factors were assumed to be related and no covariation among the errors was allowed. Figure 1 shows the standardized loadings and inter-factor correlations for the four-factor model. Bootstrap standard errors of coefficients and 95% CI for the standardized loadings (Efron, 1987) were also used to minimize the departure from multivariate normality. All loadings were positive and significant, since neither of the 95% confidence intervals include null value (Table 2). All six inter-factor correlation coefficients show positive medium to high significant values (Table 4).

Several fit indices were examined to evaluate the overall fitness of the model. Chi-square value of model fit was χ^2 =552.1 (df = 164 and p-value < 0.005). However, the inflated χ^2-value is due to large sample size. The ratio of chi-square to degrees of freedom (χ^2/df) was used as a first rough index of model fitting. This ratio must be in the range of 2–3 (Carmines & McIver, 1981). Using this standard, the four-factor structure demonstrated marginally non-acceptable fitting ($\chi^2/df = 3.37$). However, the incremental fit indices, Comparative Fit Index (CFI) and Tucker-Lewis index (TLI) showed acceptable fitting (CFI $= 0.939 > 0.9$ and TLI $= 0.929 > 0.9$).

In addition, the root mean square error of approximation (RMSEA) for the four-factor model was 0.067 (95%CI 0.061–0.073). RMSEA value of 0.05 or less indicates a close fit of the model, whereas a value of 0.08 or less indicates an acceptable error of approximation. Finally, standardised root mean square residual (SRMR) estimate was 0.049, less than 0.08 and showed an acceptable fit again. Taking into account all these five indices it was suggested that the

Table 2. Mean values(SD) for NMP-Q items ($n = 1058$), PCA loadings for the first sample (n_1=530) and CFA standardized loading estimates for the evaluation sample (n_2=528).

	PCA		CFA					
			Model M1: 1st order factor loadings			Model M2: 2nd order factor (NMP-Q Scale) indirect loadings		
				95%-Bootstrap CI[a]			95%-Bootstrap CI[a]	
	Mean (SD)	Factor loadings	Stand. Estimate	Lower	Upper	Stand. Estimate	Lower	Upper
F1 (eigenvalue= 8.67, Not being able to communicate)								
N10	4.87(1.79)	0.818	0.796	0.742	0.836	0.603	0.538	0.663
N11	5.20(1.71)	0.848	0.803	0.762	0.839	0.607	0.548	0.661
N12	4.17(1.80)	0.745	0.813	0.768	0.851	0.616	0.544	0.682
N13	4.51(1.81)	0.840	0.862	0.829	0.889	0.653	0.601	0.712
N14	4.60(1.74)	0.777	0.809	0.770	0.841	0.614	0.558	0.666
N15	3.86(1.82)	0.697	0.796	0.752	0.832	0.604	0.539	0.676
F2 (eigenvalue= 1.97, Not being able to access information)								
N16	2.48(1.64)	0.801	0.843	0.795	0.880	0.656	0.594	0.713
N17	2.91(1.74)	0.806	0.871	0.836	0.900	0.678	0.621	0.730
N18	2.36(1.57)	0.847	0.829	0.784	0.865	0.645	0.589	0.695
N19	2.94(1.76)	0.589	0.588	0.511	0.656	0.457	0.388	0.522
N20	3.12(1.88)	0.678	0.687	0.622	0.744	0.534	0.472	0.603
F3 (eigenvalue= 1.71, Giving up convenience)								
N1	4.82(1.55)	0.785	0.779	0.722	0.827	0.513	0.443	0.584
N2	5.55(1.38)	0.829	0.774	0.722	0.820	0.512	0.449	0.574
N3	3.78(1.77)	0.700	0.711	0.647	0.766	0.469	0.404	0.539
N4	5.37(1.46)	0.705	0.754	0.690	0.806	0.498	0.421	0.564
F4 (eigenvalue= 1.00, Losing connectedness)								
N5	3.62(1.91)	0.712	0.719	0.660	0.768	0.712	0.658	0.763
N6	2.49(1.62)	0.701	0.654	0.584	0.716	0.648	0.575	0.707
N7	3.73(1.89)	0.568	0.770	0.724	0.813	0.763	0.710	0.807
N8	3.87(1.91)	0.686	0.664	0.602	0.720	0.656	0.582	0.717
N9	4.15(1.80)	0.163	0.696	0.638	0.748	0.688	0.617	0.743

[a]95% Bootstrap Confidence Intervals denote $p < 0.05$ significance, since they do not include null value (Bootstrap evaluation samples, $n = 5000$).

Table 3. Goodness of fit indices for the study's CFA models.

Model	χ^2 (*df*)	χ^2/df	CFI	TLI	RMSEA	95%CI RMSEA	SRMR	AIC	BIC
M1	552.1(164)[a]	3.37	0.939	0.929	0.067	0.061–0.073	0.0489	644.1	840.5
M2	554.4(166)[a]	3.34	0.938	0.930	0.067	0.061–0.073	0.0494	642.4	830.2

M1: CFA, four 1st order factors.
M2: CFA, four 1st order factors one 2nd order factor.
[a]Model fitting *p*-value < 0.05.

hypothesized four-factor structure represented an adequate model for the data (Table 3).

A supplementary model, similar to the initial 4-factor solution, was fitted in accordance with exploratory factor analysis results. In this analysis item N9 loaded only on F1 and F2. However, in this model the gain of the total fit is negligible, while the content validity of factors F1 and F2 is disturbed.

3.3. Second order factor model (model M2)

A hierarchical model with a second order factor, assumed from high correlation coefficients between the four factors, was fitted. In this model (Figure 1) the initial factors were loaded on a second order one with high (0.66–0.99) and significant ($p < 0.01$) loadings (Table 4). The indirect items loadings on the second order factor were also significant, since neither of the 95% bootstrap confidence intervals include null value (Table 2). This last hierarchical solution, was considered acceptable (χ^2=554.4, $df = 166$, $p < 0.05$, $\chi^2/df = 3.34$, CFI = 0.938, TLI = 0.930, RMSEA = 0.067 and SRMR = 0.0494) while the loss of fit compared to the original model is negligible (ΔCFI= −0.001, ΔTLI= +0.001, ΔRMSEA < 0.001). The increase in AIC and BIC indices values indicate the better fitting of the second order model (Table 3). Furthermore, average variance extracted (AVE) and reliability indices argued for an adequate validity and internal consistency of the NMP-Q second order factor.

3.4. Construct validity

Inspection of maximum likelihood parameter estimates showed that each item loaded strongly and significantly on its hypothesised factor (Table 2).

The convergent factorial validity requires item standardized loadings to be at least 0.70 and the AVE greater than 0.5. From Table 2, it is shown that only one loading (N19) was under 0.6 while four other items were marginally lower than 0.7. AVE values were considered acceptable (over 0.5).

The discriminant aspect of factorial validity was evaluated by the Heterotrait-Monotrait Ratio (HTMT) factors. No ratio exceeded the cut-off 0.85 and therefore the discriminant validity for the four factors was accepted. Regarding the internal consistency, both Cronbach alpha and composite reliability ω coefficients showed very good to excellent values for the four factors (>0.7) (Table 4).

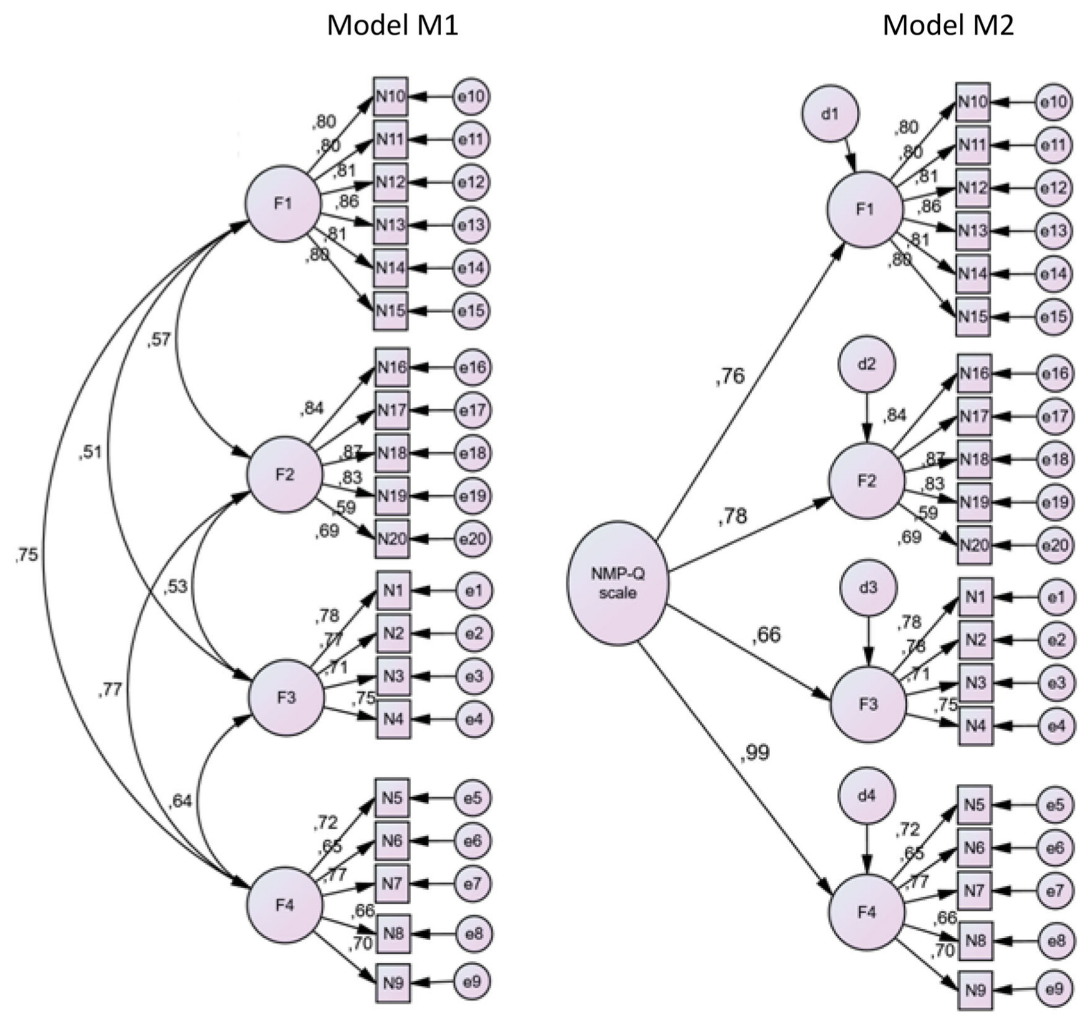

Figure 1. CFA's on second sample ($n_2 = 528$). M1: four 1st order factors and M2: four 1st order factors one 2nd order factor.

Table 4. Factorial validity, inter-factor corellations and reliability coefficients.

	F1	F2	F3	F4	NMP-Q scale
HTMT matrix values and Inter-factor correlations (Model M1)					
F1	1.000[a]	0.570[b]***	0.515[b]***	0.752[b]***	
F2	0.627[a]	1.000[a]	0.533[b]***	0.772[b]***	
F3	0.522[a]	0.581[a]	1.000[a]	0.641[b]***	
F4	0.774[a]	0.817[a]	0.656[a]	1.000[a]	
Reliability coefficients					
AVE	0.720	0.655	0.628	0.550	0.643
cronbach-a	0.936	0.895	0.867	0.854	0.945
ω	0.928	0.887	0.840	0.839	0.956
Loadings of four factors on second order factor (Model M2)					
	0.76**	0.78**	0.66**	0.99**	

[a]HTMT matrix values.
[b]Inter-factor correlations.
**$p < 0.01$; ***$p < 0.001$ (Bootstrap evaluation samples, $n = 5000$).

3.5. Regression analysis

Table 5 provides multiple regression derived coefficients concerning the five nomophobia scales on a series of variables such as gender, age, parents' educational level and daily mobile usage time. Results from these models suggested that increasing NMP-Q scores were associated with females with exception the subscale of "giving up convenience". The total mean NMP-Q score in females was about 5 points higher than males after adjusted for age, parents' educational level and daily mobile usage time ($b = -5.01$, $p = 0.001$). Similar differences between the two genders were observed in the three subscales of NMP-Q ("*Not being able to communicate*" $b = -2.156$, $p < 0.001$, "*Not being able to access information*" $b = -1.584$, $p < 0.001$ and "*Losing connectedness*" $b = -0.77$, $p = 0.019$).

A statistically significant association was also identified between age of participants and nomophobia scales. Total

Table 5. Multiple regression derived coefficients for NMP-Q scales.

Model	*b*	*SE(b)*	Beta	*p* Value
NMP-Q total scale[a]				
Gender *(men vs women)*	−5.010	1.473	−.099	0.001
Age in years	−.743	.346	−.063	0.032
Daily mobile use in hours	4.746	.471	.294	<0.001
Father's education *(graduate vs others)*	−4.203	1.495	−.088	0.005
Mother's education *(graduate vs others)*	.730	1.433	.016	0.611
Not being able to communicate[b]				
Gender *(men vs women)*	−2.156	.599	−.108	<0.001
Age in years	−.383	.141	−.081	0.007
Daily mobile use in hours	1.311	.191	.204	<0.001
Father's education *(graduate vs others)*	−1.547	.608	−.081	0.011
Mother's education *(graduate vs others)*	−.260	.583	−.014	0.656
Not being able to access information[c]				
Gender *(men vs women)*	−1.584	.451	−.104	<0.001
Age in years	−.055	.106	−.015	0.602
Daily mobile use in hours	1.258	.144	.258	<0.001
Father's education *(graduate vs others)*	−.962	.458	−.067	0.036
Mother's education *(graduate vs others)*	.325	.439	.023	0.459
Giving up convenience[d]				
Gender *(men vs women)*	−.500	.453	−.033	0.270
Age in years	−.221	.107	−.061	0.038
Daily mobile use in hours	1.300	.145	.266	<0.001
Father's education *(graduate vs others)*	−1.146	.460	−.079	0.013
Mother's education *(graduate vs others)*	.413	.441	.030	0.349
Losing connectedness[e]				
Gender *(men vs women)*	−.770	.329	−.070	0.019
Age in years	−.084	.077	−.032	0.280
Daily mobile use in hours	.877	.105	.249	<0.001
Father's education *(graduate vs others)*	−.547	.334	−.052	0.102
Mother's education *(graduate vs others)*	.251	.320	.025	0.433

[a]($R_2 = 0.12$, $p < 0.001$).
[b]($R_2 = 0.08$, $p < 0.001$).
[c]($R_2 = 0.09$, $p < 0.001$).
[d]($R_2 = 0.09$, $p < 0.001$).
[e]($R_2 = 0.08$, $p < 0.001$).

NMP-Q score decreased significantly by 0.743 points for each year of age, whereas "*Not being able to communicate*" and "*Giving up convenience*" scales decreased by 0.383 and .221 respectively. No significant association was detected between age and the other two scales of nomophobia "*Not being able to access information" and "Losing connectedness"*.

The parental educational level, as a rough socio-economic variable, affected all nomophobia scales. Parents' education was divided into two categories: university graduates versus others (lower educational levels) and they were used in the regression models as independent variables. After controlling for possible interactions, education levels of both parents were used separately in the analyses. On the basis of the regression results, all nomophobia scales were negatively associated with increased educational level of the father. In the corresponding models, the partial regression coefficients of university graduates compared to others were significantly lower, in absolute terms, with the exception of "*Losing connectedness*" scale).

After controlling for gender, age and parents' education, the total NMP-Q score increased with the excessive mobile phone use by 4.746 points per hour of daily usage ($b = 4.746$, $p < 0.001$). Similar significant increases for each hour of daily use appeared for all subscales of NPM-Q. ("*Not being able to communicate*" $b = 1.311$, $p < 0.001$, "*Not being able to access information*" $b = 1.258$, $p < 0.001$, "*Giving up convenience*" $b = 1.30$, $p < 0.001$ and "*Losing connectedness*" $b = 0.877$, $p < 0.001$).

4. Discussion

In the present validity study a preliminary translation of the original version of the NMP-Q was made, so as to assure congruency with the Greek linguistic and cultural factors. Questionnaire's psychometric properties were tested among 1058 Greek university students. The results of the study indicated that Greek version of NMP-Q is a reliable and valid psychometric instrument regarding nomophobia measurement.

Exploratory factor analysis revealed a four-factor structure (subscales) in agreement with the original questionnaire (Yildirim & Correia, 2015). Confirmatory factor analysis showed that all suggested items have sufficient loadings on the supposed factors (> 0.70). The Cronbach alpha values for each factor were for: (a) 0.936, (b) 0.895, (c) 0.867 and (d) 0.854, close to those of the original NMP-Q, which were 0.939, 0.827, 0.819, and 0.874, respectively. Average Variance Explained (AVE) values and HTTM ratios demonstrated acceptable levels of convergent and discriminant validity for all subscales of the instrument. Additionally, a second-order factor was identified with adequate loadings of the four subscales on it. This factor supports the use of all NMP-Q items as a basis to compute a total nomophobia scale. In addition, the total scale presented a high internal consistency compared to the original NMP-Q (Cronbach alpha values are 0.945 for both questionnaires). In this sense the Greek NMP-Q showed good psychometric properties constituting the first validated self-reported instrument for assessing nomophobia in Greece.

In line with the present study, the translated version of the NMP-Q showed fine reliability and validity in several other countries, for instance, Spain (Gutiérrez-Puertas et al., 2016), Portugal (Galhardo et al., 2020), Iran (Elyasi et al., 2018), China (Gao et al., 2020) and Italy (Adawi et al., 2018). More specifically, the Spanish, Portuguese and Chinese version of NMP-Q showed 4 consequent factors with the original NMP-Q. However, the Italian and Persian version concluded with 3 factors, after the integration of "giving up convenience" and "losing connectedness" dimensions into a single factor. The above mentioned differences between these versions might be due to participants' characteristics, such as different age groups and different cultural backgrounds.

To further explore the relationship between nomophobia scales and several sociodemographic characteristics such as gender, age, parents' educational level and daily mobile usage time, regression analyses were performed. Regarding gender, it was observed that high NMP-Q scores were mainly associated with female students, except the dimension of "giving up convenience". However, the evidence upon gender differences in literature is ambiguous, with some studies aligning with the results of the present study (Alahmari et al., 2018; Demir, 2019; Gao et al., 2020) and others claiming that no gender differences exist (Farooqui et al., 2018; Harish & Bharath, 2018). Another significant association was between age and nomophobia scales. Even though, the overall NMP-Q scale score showed an inverse association between nomophobia and age, no such association was observed in the subscales of "Not being able to access information" and "Losing connectedness". The present study is in consistence with recent findings supporting that differences of nomophobia among young adults of different ages do exist (Bartwal & Nath, 2020). However, it is argued that age is not a significant factor for nomophobic behaviors (Dasgupta et al., 2017; Moreno-Guerrero et al., 2020).

Regarding parental educational level, it was observed that only father's higher education was negatively associated with all nomophobia subscales. Yet, other studies demonstrated either a relationship between maternal educational level or lack of evidence between parental education and nomophobia levels (Gezgin & Çakır, 2016; Uysal et al., 2016; Yildiz Durak, 2019).

As regards the daily smartphone use, a positive association with the total score as well as with all subscales of the translated NMP-Q was revealed. This relationship was also observed in several studies examining the determinants of nomophobia (Adawi et al., 2018; Bajaj et al., 2020; Dasgupta et al., 2017; Gao et al., 2020).

Despite the limitations of the study, questionnaire analysis demonstrated fine reliability and validity results. The study sample was recruited from one university in the capital city of Athens and therefore its representativeness might be questioned. However, the certain university belongs to one of the largest universities in Greece and the sample was obtained from all faculties. Moreover, only university students have been included in the study, which limits the generalizability of the results to other age groups. Nevertheless, it is documented that young adults are more prone to nomophobia.

5. Conclusions

Scientific evidence indicates nomophobia as an emerging behavioral addiction among young adults. The necessity to further explore the impact of nomophobia is obvious, as it is evolving rapidly, worldwide.

Disclosure Statement

No potential competing interest was reported by the author(s).

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