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Research Article

Validation of a Spanish Adaption of a Questionnaire for Measuring Nomophobia among University Students

Ramón Ventura Roque Hernández[1] **and Sergio Armando Guerra Moya**[2]

[1]*School of Business, Administration and Social Sciences, Autonomous University of Tamaulipas, Nuevo Laredo, Tamaulipas 88000, Mexico*
[2]*School of Accounting and Administration,, Autonomous University of Nuevo León, San Nicolás de los Garza, Nuevo León 66450, Mexico*

Correspondence should be addressed to Ramón Ventura Roque Hernández; ramonroque@yahoo.com

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Smartphones are highly useful in contemporary society. However, their use can lead to problems, such as dependency and addiction. Nomophobia is a pathological fear of losing connectedness or not being able to access information or communicate with other people. The objectives of this study were to evaluate the four dimensions of the original version of the NMP-Q questionnaire by Yildirim and Correia using the Spanish version of the questionnaire developed by Gutiérrez-Puertas et al. Similarly, this research aims at assessing whether the questionnaire retains its four-dimensional structure when applied to a population of university students in the area of social sciences at a Mexican university. Using confirmatory and exploratory factor analysis techniques, we determined that nomophobia among the study population can be addressed through the first three dimensions of the original questionnaire, namely, not being able to communicate, losing connectedness, and not being able to access information. A fourth dimension, entitled "giving up convenience", is mentioned in the literature. However, in this study, this dimension could not be clearly identified with the indicators included in the original questionnaire and was, therefore, omitted from the resulting questionnaire. Nomophobia is a modern phenomenon that is becoming increasingly prevalent in our society. Therefore, it must be studied and addressed. The nomophobia questionnaire presented in this article is a reliable way of taking measurements, as indicated by the research results. Further research should deepen the study of measuring nomophobia and improve the questionnaire through other indicators and conceptual dimensions that help explain this phenomenon in a precise and reliable way.

1. Introduction

Technology has brought numerous benefits that have changed our daily lives. Indeed, the usefulness of smartphones in modern daily life is undeniable. These phones have become versatile devices with which we can access banking applications, social networks, instant messaging, email, games, and the web, among many other possibilities, in addition to making traditional voice calls. Smartphones have significant utility in the lives of human beings. However, their use can lead to problems, such as dependency and addiction [1]. These problems derived from the use of smartphones have increased in recent years and have been identified as dangerous because they can lead to antisocial behavior. In fact, smartphone addiction has been regarded as any other addiction to dangerous substances and even as a public health problem [2]. However, Smartphone addiction is not currently accepted in the DSM-V. This field is still emerging, and researchers and practitioners have yet to meet a consensus.

Nomophobia is the fear of losing mobile connectedness [3], the fear of being without a cell phone [1], the fear of being without one's phone [4], or even the modern fear of not being able to access information and/or communicate with other people [5]. Nomophobia is, then, a pathological fear [6]. Some symptoms often associated with nomophobia

Table 1: Four dimensions of Nomophobia in NMP-Q instrument.

Dimension	Definition Yildirim and Correia [3]	Example
Not being able to communicate	"Feelings of losing instant communication with people and not being able to use the services that allow for instant communication"	Not being able to receive text messages and calls.
Losing connectedness	"Feelings of losing the ubiquitous connectivity smartphones provide and being disconnected from one's online identity"	Not being able to stay up-to-date with social media.
Not being able to access information	"Discomfort of losing pervasive access to information through smartphones"	Not being able to look information up on the smartphone when desired.
Giving up convenience	"Feelings of giving up the convenience smartphones provide"	Running out of battery on the smartphone.

Table 2: Previous work in which three dimensions were found for measuring nomophobia.

Authors	Language	Dimensions of nomophobia related to questions in the original NMP-Q instrument.
Elyasi et al. [13]	Persian	D1: Q10-Q15 D2: Q16-Q19 D3: Q1-Q9
Farchakh et al. [12]	Arabic	D1: Q10-Q13, Q15 D2: Q5-Q9, Q14, Q16-Q20 D3: Q1-Q4
Adawi et al. [7]	Italian	D1: Q10–Q15 D2: Q6–Q8, Q16-Q20 D3: Q1–Q5, Q9

Table 3: Participant characteristics.

Educational program	Bachelor of information technologies ($n = 98$) Bachelor of administration ($n = 78$)
Gender	Women ($n = 81$) Men ($n = 95$)
Age	Mean = 21.2 years, standard deviation = 2.79 Median = 21 years, interquartile range = 2.00

include excessive smartphone use, anxiety about losing cell coverage, continually checking messages or missed calls, and the feeling that the phone is ringing or vibrating [7]. According to Jahagirdar et al. [8], nomophobia and other disorders have emerged "from the excessive use of mobiles". As such, nomophobia is a modern phenomenon on the rise [9] and an emerging area of research [10]. This term derives from the phrase "No-mobile-phone phobia" and was coined in 2008 by an English organisation evaluating cell phone user anxiety [11].

In recent years, nomophobia has been measured using the NMP-Q questionnaire originally designed in English by [3]. This instrument contains 20 questions distributed in four dimensions, namely, not being able to communicate, losing connectedness, inability to access the connection, and giving up convenience (see Table 1).

This instrument has been translated into various languages such as Arabic [12], Farsi [9, 13], Portuguese [14], Italian [7], Chinese [15, 16], and European Spanish [6, 17], and [18]. Some translations of the original NMP-Q instrument have proved valid when using or adapting three of the originally defined dimensions (see Table 2).

The objectives of this study were to evaluate the four dimensions of the original version of the questionnaire by [3] using the Spanish version of the questionnaire developed by [17] to assess whether the questionnaire retains its four-dimensional structure when applied to a population of social sciences students at a Mexican university.

The following section addresses the method. Then, the results and their discussion are shown. Lastly, conclusions and future perspectives are presented.

2. Materials and Methods

2.1. Participants. In total, 176 university students from two academic programs (Bachelor of Information Technology and Bachelor of Administration) participated in this study. All participants belonged to the Department of Social Sciences of a public state university in Mexico and were officially enrolled in the 2022 January-May semester. Participant characteristics are outlined in Table 3. A convenience sample method was used for this study.

2.2. Questionnaire. The instrument used in this study is the questionnaire translated by [17], which was provided by them at the request of the authors of this article. This questionnaire is a Spanish version of the original NMP-Q questionnaire developed by [3] in English (see Table 4).

To conduct this research, an online version of the questionnaire was implemented using Microsoft Forms. The respective hyperlink was sent to students through the Microsoft Teams institutional platform. Four teachers sent the invitations to the students of the two academic programs. Participation in the study was voluntary and without any compensation or incentive. The students who answered the questionnaire gave their informed consent to contribute their answers. They were guaranteed anonymity, confidentiality, and respect in the treatment of their responses.

2.3. Data Analysis Techniques. Data were analyzed using JAMOVI 2.2.5.0 software. First, we explored the participants' responses. There were no missing or invalid values as the electronic questionnaire was configured to force the

Table 4: Nomophobia questionnaire in English [3].

Factor	Item identifier	Question
Factor 3 – Not being able to access information	Q1	I would feel uncomfortable without constant access to information through my smartphone.
	Q2	I would be annoyed if I could not look information up on my smartphone when I wanted to do so.
	Q3	Being unable to get the news (e.g., happenings, weather, etc.) on my smartphone would make me nervous.
	Q4	I would be annoyed if I could not use my smartphone and/or its capabilities when I wanted to do so.
Factor 4 – Giving up convenience	Q5	Running out of battery on my smartphone would scare me.
	Q6	If I were to run out of credits or hit my monthly data limit, I would panic.
	Q7	If I did not have a data signal or could not connect to Wi-Fi, I would constantly check to see if I had a signal or could find a Wi-Fi network.
	Q8	If I could not use my smartphone, I would be afraid of getting stranded somewhere.
	Q9	If I could not check my smartphone for a while, I would feel a desire to check it.
If I did not have my smartphone with me,		
Factor 1 – Not being able to communicate	Q10	I would feel anxious because I could not instantly communicate with my family and/or friends.
	Q11	I would be worried because my family and/or friends could not reach me.
	Q12	I would feel nervous because I would not be able to receive text messages and calls.
	Q13	I would be anxious because I would not be able to keep in touch with my family and/or friends.
	Q14	I would be nervous because I would not know if someone had tried to get a hold of me.
	Q15	I would feel anxious because my constant connection to my family and friends would be broken.
Factor 2 – Losing connectedness	Q16	I would be nervous because I would be disconnected from my online identity.
	Q17	I would be uncomfortable because I would not be able to stay up-to-date with social media and online networks.
	Q18	I would feel awkward because I would not be able to check my notifications for updates from my connections and online networks.
	Q19	I would feel anxious because I could not check my email messages.
	Q20	I would feel weird because I would not know what to do.

participant to answer all responses using the appropriate response scales. Subsequently, a confirmatory factor analysis (CFA) was performed with the four factors of the original questionnaire and their respective questions. The following adjustment indicators were analyzed: Chi-square (Xi^2), the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Standardised Root Mean Squared Residual (SRMR), the Root Mean Square Error of Approximation (RMSEA), the Akaike Information Criterion (AIC), and the Bayesian Information Criterion (BIC). When reviewing them, we found that the model could be improved. For this reason, we continued investigating the factorial structure of the responses, albeit now without a predetermined fixed scheme, that is, introducing the 20 questions of the original questionnaire in an exploratory factor analysis (EFA) using, for this purpose, the minimum residual and the Oblimin rotation methods. The criterion based on parallel analysis was used to determine the number of factors. Bartlett's sphericity tests and the Kaiser-Meyer-Olkin (KMO) test for sampling adequacy were also performed twice, eliminating two questions that presented problems related to a low factorial load in the first instance and eliminating three questions whose factorial loads placed them in a factor that did not correspond to the original structure of the questionnaire in English in the second instance. Then, the indicators of the models were compared, and the indicator with the best fit was chosen. The resulting model retained the first three factors of the original questionnaire in English without changes and did not include the fourth factor. With this three-factor model, the values of Cronbach's alpha and McDonald's omega scores were calculated. Lastly, a confirmatory analysis was performed to verify the proposed structure of the three-factor model.

2.4. Reference Values Used in This Study. RMSEA values lower than 0.05 were considered a good fit; values ranging from 0.05 to 0.08, an acceptable fit; values ranging from 0.08 to 0.10, a marginal fit; values higher than 0.10, a poor

Table 5: Characterisation of the sample data.

Question	Mean	Standard deviation	Asymmetry	Kurtosis	Item-total correlation
Q1	4.09	1.39	-0.51224	0.34504	0.492
Q2	4.46	1.6	-0.4112	-0.2233	0.557
Q3	3.61	1.45	-0.00245	-0.0806	0.607
Q4	4.16	1.52	-0.40108	-0.20626	0.585
Q5	4.52	1.65	-0.37473	-0.48847	0.56
Q6	4.44	1.65	-0.42596	-0.39899	0.583
Q7	4.38	1.55	-0.34853	-0.41204	0.618
Q8	4.26	1.69	-0.42443	-0.55357	0.622
Q9	3.68	1.63	0.02538	-0.56511	0.574
Q10	3.95	1.55	-0.07185	-0.46019	0.7
Q11	4.57	1.6	-0.61835	-0.00974	0.669
Q12	4	1.62	-0.13744	-0.55248	0.778
Q13	4.4	1.54	-0.49117	-0.06519	0.715
Q14	4.24	1.65	-0.25684	-0.52213	0.736
Q15	4.06	1.57	-0.1315	-0.37731	0.763
Q16	3.24	1.55	0.19683	-0.38178	0.74
Q17	3.17	1.54	0.32772	-0.44872	0.71
Q18	3.27	1.53	0.20045	-0.45762	0.696
Q19	3.5	1.55	0.02315	-0.42023	0.59
Q20	3.56	1.69	-0.02657	-0.83992	0.619

Table 6: Results of the exploratory factor analysis.

Model	Explained variance	RMSEA	RMSEA I.C. 90%		TLI	BIC	Model test		
			Lower limit	Upper limit			Xi^2	d.f.	p
M1	59.4%	0.0814	0.0690	0.0947	0.902	-399	289	133	<.001
M2	61.6%	0.0812	0.0669	0.0964	0.914	-306	221	102	<.001
M3	65.6%	0.0710	0.0515	0.0908	0.948	-207	119	63	<.001

fit [19]. SRMR values were also considered appropriate when lower than 0.05 [20] and acceptable when lower than 0.08 [16]. CFI and TLI values were considered acceptable when higher than 0.90 [16] and good when higher than 0.95 [21]. The AIC and BIC values were used to compare the models. The model with the lowest AIC value is preferred because this model has the best fit [22]. BIC values are interpreted in this same way [23]. For Cronbach's alpha, higher values express higher reliability. Values between 0.70 and 0.90 are considered 'satisfactory to good' [23].

2.5. Explanation of the Data Analysis Techniques and Reference Values. According to [24], confirmatory factor analysis (CFA) is used when expecting a factorial structure of a data set and previous evidence supports this structure. Thus, CFA is applied to determine how well a latent variable model fits observed data. In contrast, exploratory factor analysis (EFA) answers the question of how many factors underlie a set of observable indicators and what structure the relationship between factors and indicators adopts.

[25] explain that, in EFA, the Bartlett's sphericity test evaluates the assumption of a correlation between the variables to assess whether the technique should be used. With the same objective, the Kaiser Meyer Olkin (KMO) Index evaluates the strength of the relationship between items based on partial correlations.

According to [21], the indices used to evaluate the goodness-of-fit of the models can be classified into absolute and incremental. Absolute indices, such as SRMR and RMSEA, assess how well a predefined model reproduces the data from a sample. Incremental indices, such as CFI and TLI, improve the fit when comparing the target model with a more restrictive base model. Accordingly, in the comparison model, the observed variables are not correlated.

In turn, [26] explains that discrepancy indices, such as AIC and BIC are used to select the simplest model that accurately describes the observed data. [27] add that both indices determine the statistical adequacy. [22] state that AIC is used to test the difference between the models. Thus, AIC indicates whether the models differ significantly and identifies the model with the best fit.

Table 7: Reliability of the dimensions of the questionnaire.

	Original questionnaire in English. [3] (Cronbach's alpha values)	Questionnaire in Spanish (Spain). [17] (Cronbach's alpha values)	Questionnaire in Spanish [18] (Cronbach's alpha values)	Questionnaire in Portuguese [14] (Cronbach's alpha values)	Questionnaire in Farsi [9] (Cronbach's alpha values)	Model derived in this study (M3) Alpha = Cronbach's alpha w = Omega's coefficient.
Factor 1(Q10-Q15) Not being able to communicate	0.939	0.840	0.91	0.96	0.86	Alpha = 0.935, $w = 0.935$
Factor 2(Q16-Q20) Losing connectedness	0.874	0.874	0.85	0.89	0.70	Alpha = 0.907, $w = 0.912$
Factor 3(Q1-Q4) Not being able to access information	0.827	0.744	0.86	0.88	0.91	Alpha = 0.796, $w = 0.797$
Factor 4 giving up convenience (Q5 – Q9)	0.819	0.714	0.77	0.87	0.89	Not included
Questionnaire total	0.945	0.928	Not provided	0.96	0.92	Alpha = 0.931, $w = 0.933$

Table 8: Factor loads and uniqueness of each question in model 3.

Question	Factor			Uniqueness
	1 –Not being able to communicate	2 – Losing connectedness	3 – Not being able to access information	
Q13	0.951			0.172
Q11	0.895			0.27
Q15	0.793			0.216
Q14	0.749			0.312
Q10	0.672			0.398
Q12	0.642			0.268
Q17		0.955		0.127
Q18		0.873		0.214
Q16		0.782		0.246
Q20		0.641		0.505
Q19		0.629		0.5
Q2			0.824	0.349
Q4			0.63	0.504
Q1			0.619	0.572
Q3			0.566	0.508

Table 9: Correlations between factors.

Factor	1	2	3
1 – Not being able to communicate	—	0.55	0.562
2 – Losing connectedness		—	0.447
3 – Not being able to access information			—

3. Results and Discussion

Table 5 outlines the statistical parameters of the participants' responses $(n = 176)$.

Confirmatory analysis, which was performed to assess whether the structure of the original questionnaire should be maintained with the dataset of this study, produced the following results: $X^2 = 411$, $df = 164$, $p < .001$, CFI = 0.898, TLI = 0.88, SRMR = 0.0638, RMSEA = 0.0925 (90% confidence interval: from 0.0813 to 0.104), AIC = 11101, and BIC = 11310.

CFI and TLI were lower than 0.90; SRMR was higher than 0.05, and RMSEA was very close to 0.10, thus indicating that a better fit model could be derived. For this reason, we continued our research in this regard. Then, an exploratory factor analysis (EFA) was performed to find the optimal structure for the data collected, giving rise to Model 1 (M1, see Table 3). Three factors were identified, which corresponded to the first three factors of the original questionnaire in English. However, there were problems identifying factor 4, whose questions 8 and 9 were dispersed in factors 1 and 2 and presented loads lower than 0.45, whereas questions 5, 6, and 7 were located in factor 3 with loads lower than 0.6, thus affecting the indicators of the model and explaining only 59.4% of the variance.

For this reason, we performed another EFA, eliminating questions 8 and 9 because they had the lowest factor load. This analysis gave rise to Model 2 (M2, see Table 6). The percentage of explained variance increased to 61.6%, and TLI and RMSEA also improved slightly (see Table 3).

An additional EFA was performed to generate a third model (M3, see Table 6) in which the first three factors of the original questionnaire remained unchanged, thus eliminating all questions of the fourth factor (Q5 to Q9). Bartlett's sphericity test was significant ($p < .001$); the KMO index was 0.915, and the model explained 65.6% of the variance. Cronbach's alpha values for each factor are presented in Table 7 and compared with other published versions of this questionnaire. The loads of the questions in each factor are outlined in Table 8, whereas the correlations between the three factors studied are outlined in Table 9. The interfactor correlations were all lower than 0.6. Conversely, the explained variance of factor 1, 'not being able to communicate', was 27.7%; that of factor 2, 'losing connectedness' was 24.2%, and that of factor 3, 'not being able to access information' was 13.7%. In total, the three factors explained 65.6% of the variance.

The CFA performed on model 3 (M3) led to the following results: CFI = 0.940, TLI = 0.928, SRMR = 0.0555, RMSEA = 0.0864 (90% confidence interval: 0.0709 to 0.102), AIC = 8092, and BIC = 8244. These indicators are better than those of the CFA of the original questionnaire in English, which had four factors, thus showing that model 3 is better than the original model.

The results of this study indicate that the questionnaire for measuring nomophobia with four dimensions proposed by [3] and translated into Spanish by [17] could be used in the population of Mexican university students in the field of social sciences. However, using only the first three dimensions improves the quality and adjustment indicators of the questionnaire. Thus, in this study, the use of the following dimensions is proposed: (1) not being able to communicate (Q10–Q15), (2) losing connectedness (Q16-Q20), and (3) not being able to access information (Q1-Q4). These three

dimensions remain intact with respect to the original instrument.

A literature review shows that our study corroborates research by [12, 13], and [7] because these authors also proposed measuring nomophobia using three dimensions and not four, as established by the original instrument. Accordingly, the fourth factor, 'giving up convenience', (Q5-Q9), which was excluded from our questionnaire proposal, had the lowest Cronbach's alpha values in the questionnaires by both [3, 17, 18], and [14], possibly indicating that questions 5-9 are likely dispersed or not strongly identified in other study populations, as found in the studies by [6, 9]. These authors reported problems in questions 7 and 9, respectively, as in the studies by [7, 13], and [12], in which questions 5 and 9 were mixed with others corresponding to other dimensions.

Our study had limitations related to convenience sampling, which only included undergraduate students in the fields of Information Technology and Administration. The inherent characteristics of this sector of the population could have influenced the fact that the fourth dimension of the original questionnaire was not consistent in our work. However, further research is required to determine this. In addition, our study did not include a translation process but rather used a previously published Spanish version of the questionnaire.

4. Conclusions

Nomophobia is a modern phenomenon that is becoming increasingly prevalent in our society. Therefore, it must be studied and addressed. The nomophobia questionnaire presented in this article is a reliable way of taking measurements, as indicated by the research results. In addition, other versions of this questionnaire have been validated in various languages. This study showed that nomophobia can be analyzed using three dimensions, not being able to communicate, losing connectedness, and not being able to access information. A fourth dimension, entitled 'giving up convenience' is reported in the literature. However, in this study, this dimension could not be clearly identified with the indicators included in the original questionnaire. For this reason, 'giving up convenience' was omitted from the final questionnaire. Nevertheless, this omission may not be valid in other study populations, as indicated by the existing body of theory. However, each population has its own background of culture, customs, and practices, and this may affect the identification of the dimensions in the questionnaire. Further research should deepen the study of measuring nomophobia and improve the instruments through other indicators and conceptual dimensions that help explain this phenomenon in a precise and reliable way. For example, we plan to explore the fear of losing the smartphone hardware and other related scenarios as well as the fear of not being able to use the smartphone due to getting a virus or being hacked. However, more qualitative and quantitative work is needed to further refine and justify these directions.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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