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ORIGINAL RESEARCH

Psychometric Evidence of the Arabic Version of Nomophobia Questionnaire Among Physical Education Students

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Purpose: Nomophobia refers to a psychological state in which individuals experience anxiety or fear at the thought of being disconnected from their mobile phone. The Nomophobia Questionnaire was developed to assess dimensions of nomophobia among native English-speaking populations. The purpose of this study was to adapt and validate the Nomophobia Questionnaire in the Tunisian context based on Western Arabic dialects.

Methods: This cross-sectional design using a non-probability sampling method was conducted from September 05 to October 06, 2022. A total of 644 participants, with an average age of 21.04 ± 1.59 years, completed a sociodemographic questionnaire and an Arabic version of the Nomophobia Questionnaire. Participants were divided into two groups to perform exploratory and confirmatory factor analysis. The first group consisted of 200 students (56% female and 44% male with an average age of 21.10 ± 1.64), with 33% (n = 66) freshmen, 41.5% second-year students (n = 83) and 25.5% (n = 51) of third-year students. The second group was collected one month later in the same establishment and was composed of 444 students (52% men and 48% female with an average age of 21.01 ± 1.57).

Results: The results of the exploratory and confirmatory factor analysis showed that the 20 items and the second order four-factor structure should be retained. Confirmatory factor analysis of the Arabic version of the NMP-Q gave the following statistics: $\chi 2/df$= 1.47; Fit Index = 0.997; Adjusted goodness-of-fit index = 0.996; Tucker-Lewis index = 1.003; Comparative Fit Index = 1; Root mean square error of approximation = 0.000 (90% CI 0–0) and standardized mean residual = 0.030, indicating good model fit. McDonald's ω internal consistency indexes for the four factors, namely giving up convenience, not being able to access information, not being able to communicate, and losing connectedness were 0.821, 0.841, 0.851, and 0.897, respectively. These values demonstrated good scale consistency.

Conclusion: The Arabic Version of the Nomophobia questionnaire has been found to be a reliable and valid psychometric tool, and can be effectively used to measure nomophobia in countries where western Arabic dialects are spoken.

Keywords: validation, mobile, inconvenience, students, sport

Introduction

The mobile phone, initially invented as a tool to make life easier[1] for man by allowing him to contact others, has ceded its place to the smartphone, which is no longer just a communication tool. The smartphone is used both as a data storage space, a camera, a music player, a gaming device, and a means of connecting to the internet. The evolution of technology has made the use of smartphones essential in daily life; however, excessive smartphone use can lead to the development of behavioral addictions such as nomophobia.[2–4]

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The term nomophobia is a combination of the terms "no mobile phone phobia".[5–7] Nomophobia is one of eight internet-induced mental illnesses and is defined as the discomfort, anxiety, and nervousness caused by the separation from a mobile phones.[8–11] Nomophobia may be classified as a situational phobia,[12–14] addictive behavioral disorders,[15–17] or a mobile attachment causing separation anxiety.[18,19]

A recent systematic review on the prevalence of nomophobia[20] revealed percentages of nomophobes ranging from 6% to 73% in various populations. The authors state that between 25.7% and 73.3% of nomophobes have moderate cases, and between 1% and 87% have severe cases. Specifically, in adolescents and young adults nomophobia is more common.[9,21–23] In fact, the prevalence of nomophobia among university students is on the order of 100%. A recent meta-analysis confirmed that 25% of college students had mild nomophobia, over 50% had moderate nomophobia, and about 20% had severe nomophobia.[24] Recent studies suggested that nomophobia influence students' social media usage, attention, motivation, and academic performance.[25]

Studies in Arab countries have found moderate to severe rates of nomophobia in Kuwait (56%, 26%), Saudi Arabia (63%, 22%) and Oman (64% and 20%). For example, a study conducted on 622 Saudi university students[26] (aged 21.8 ± 2.0 years) showed that 22.2% among this population suffered from severe nomophobia.

Tunisia has one of the highest mobile phone subscriber rates in Africa with more than 15.6 million mobile lines in use. There were around 9.8 million internet users in 2021, and 86% of them use a smartphone.[27]

To assess mobile phone-related behaviours, a set of instruments has been validated in this context such as: Cellular Phone Dependence,[28] the Mobile Phone Problem Use Scale,[29] The Cell-Phone Over-Use Scale,[30] the Mobile Phone Addiction Scale,[31] the Mobile Phone Involvement Questionnaire,[32] the Problematic Use of Mobile Phone Scale,[33] and the Smartphone Addiction Scale–Short Version.[34] The development of the majority of these instruments was based on the behavioral addiction literature. However, the symptoms of nomophobia differ from those of addiction. To assess nomophobia, Yildirim and Correia developed the Nomophobia-Questionnaire (NMP-Q) based on the qualitative generation of nomophobia dimensions resulting from a mixed-method study.[35] NMP-Q is a 7-point likert scale ranging from 1 = "Strongly disagree" to 7 = "Strongly agree". It has 20 items divided into four factors: (1) "not being able to communicate", (2) "losing connection", (3) "not being able to access information" and (4) "forgoing convenience".

This instrument is widely used to assess nomophobia worldwide. From this perspective, several studies have focused on the cross-cultural validation of NMP-Q: in Spain,[36–38] in Italy,[39,40] in Portugal,[41,42] in China,[43,44] in Germany,[45] in Greece,[46] Brazil,[47] Indonesia,[48] Iran,[49–51] Turkey.[52]

Nomophobic symptoms are very prevalent in university students and often affect their academic performance. Tunisians mainly and frequently use communication technologies in their university studies.[53,54] To our knowledge, the literature addressing the potential risk of nomophobia among students is limited in Tunisia. Moreover, no nomophobia measurement instrument was found to assess the concept in Tunisia.

Given the widespread use of the NMP-Q and existing evidence of its psychometric properties as a means of measuring nomophobia in different cultural contexts, the objective of this research is to adapt this instrument in the Tunisian context based on western dialects.

In fact, based on where they are spoken, Arabic dialects can be broadly categorized into two groups: eastern dialects (Levantine Arabic, Gulf Arabic, and Egyptian Arabic), and western dialects (Maghreb Arabic),[55] especially Tunisian Arabic, which has been profoundly influenced by a variety of tongues, including Berber, Turkish, Italian, Spanish, and French. It is differentiated from contemporary standard Arabic and even other Arabic varieties by having different grammar, syntax, intonation, and lexicon.[56,57]

Materials and Methods

Data Collection and Procedures

This cross-sectional design using a non-probability sampling method was conducted from September 05 to October 06, 2022. The data was collected among two convenience samples from high institute of physical education and sports of Kef after classroom. Since the questionnaire is intended to collect information from a large number of people in a period of time[58], twenty minutes was given to the students to answer.

In the 2021/2022 academic year, there were a total of 298,805 Tunisian students enrolled in higher education in Tunisia.[59] The sampling method used suggested a minimum sample size of 377, assuming a response rate of 50%, a margin of error of 5% with a confidence interval of 95%.

The inclusion criteria concern each student who is registered on the university database, who attends classes regularly and speak Arabic as their mother tongue. However, postgraduate students (master and doctorate) were excluded from the study in view of their irregular courses and belonging to another cultural context (coming from other countries).

The total number of participants was 644 (50.6% female) with an age arranged between 19 and 25 years old (M = 21.04; SD = 1.59). They included first-year (n = 191, 29.7%), second-year (271.42.1%) and third-year (182.28.3%) students.

The first sample comprised 200 students including 33% (n = 66) of first-year students, 41.5% second-year students (n = 83) and 25.5% (n = 51) third-year students, 112 females (56%) and 88 males (44%), aged 21.10 ±1.64, while the second sample was collected one month later in the same institution. It included 444 students (230 male and 214 female) aged 21.01±1.57. Their education level was: 125 students in the first year (28.2%), 188 second-year students (n = 42.3%) and 131 students in the third year (29.5%). The data collection tool consisted of two parts including the socio-demographic characteristics and the NMP-Q.

Instrument

An adapted version of NMQ[35] was used to collect the data. The tool is made up of 20 items rated on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The total score ranges between 20 and 140 points (20 absence, 21–59 mild, 60–99 moderate, and 100–140 severe). The questionnaire evaluates four dimensions: (1) Not being able to access the information (4 items): the hassle of losing immediate access to information through the smartphone and of searching for the desired information at that moment. (2) Giving up comfort (5 items): feelings inherent to the comfort and psychological tranquillity provided by having control over the smartphone, related to its battery, coverage, and credit. (3) Not being able to communicate (6 items): feelings about the loss of immediate communication. (4) loss of connection (5 items): emotions associated with the loss of ubiquity after losing connectivity.

Translation

The adaptation of the NMQ was in accordance with the "Guideline Checklist on Translation and Adaptation of Scales" of the International Test Commission.

We adopted a rigorous translation method for the Nomophobia Questionnaire (NMQ), involving three language experts affiliated with the study setting. The process included a forward-backward translation,[60] where the instruments were translated from English to Arabic and then back to English to ensure its reliability.

Semantic equivalence rules and protocols were strictly followed throughout the translation process to ensure efficiency and accuracy. Furthermore, three experienced researchers proficient in both Arabic and English, as well as knowledgeable in psychometrics and psychology, conducted additional testing on the instrument. Discrepancies between the two versions were thoroughly discussed item-by-item to ensure clarity and adequacy in measuring the scale dimensions, while maintaining the essence of the original version.

Moreover, an independent government-registered official language translation firm evaluated the Arabic-translated instruments to ensure accuracy and consistency with the study's translation experts. The penultimate step consisted in validating a final version by all the group members. Subsequently, a pilot test was conducted on university students to first examine the tool adapted in Arabic. Figure 1 shows the diagram of the adaptation and translation procedure of the nomophobia scale.[61]

Ethics Statement

The research was given the go-ahead by the Institute of Sport and Physical Education of Kef, Jendouba University, Tunisia, which has its own local ethics committee (code 14–2023).

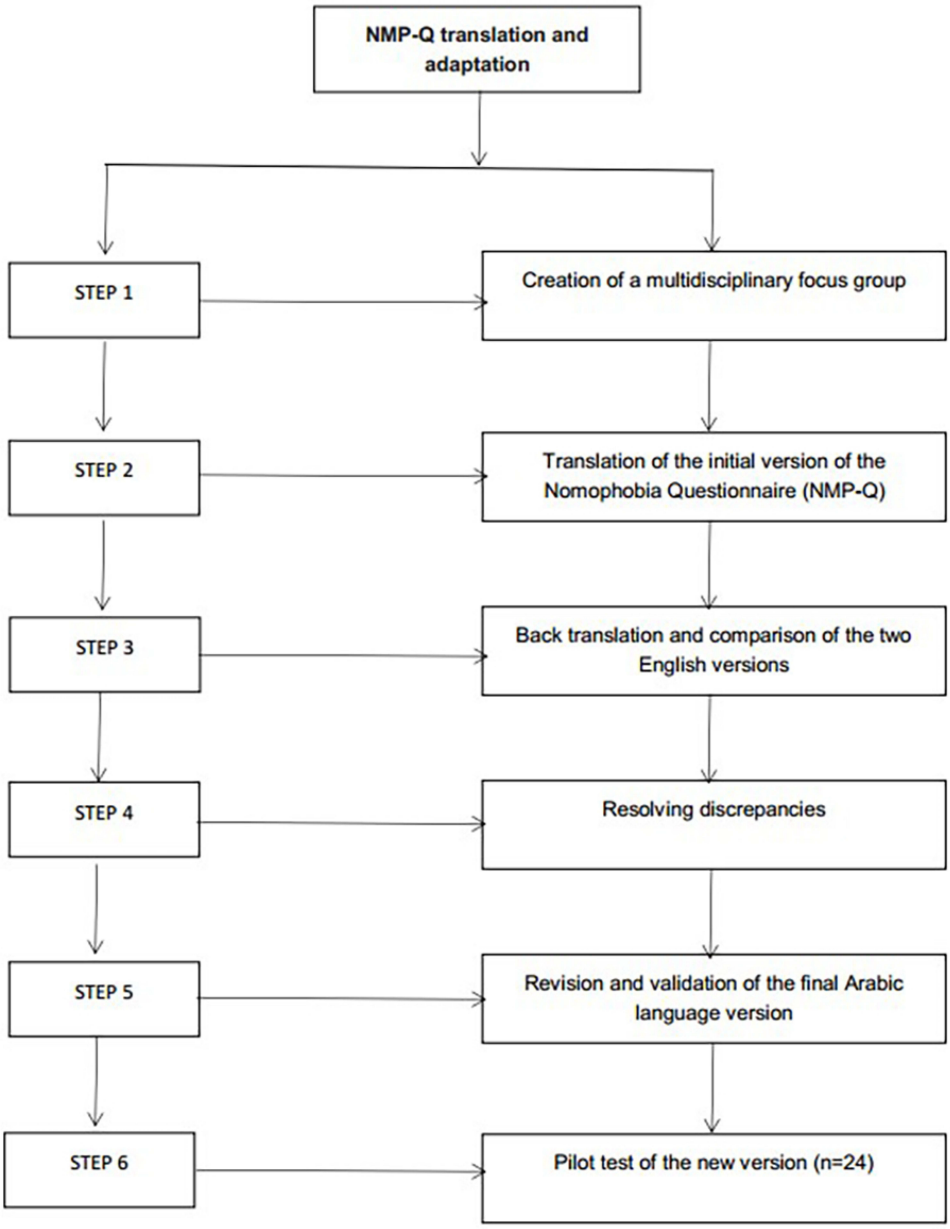

Figure 1 Chart Flow of the translation and adaptation of the Arabic NMP-Q.

The present study was carried out in accordance with the ethical principles of the 2013 Helsinki declaration and its subsequent amendments. All students who participated in this study were volunteers, received information about the purpose of the study and its conduct and gave their consent before participating.

Statistical Analysis

Statistical analysis was performed using RStudio version 2022.12.0 for Windows. We used a set of packages to analyze the data. "EFAtools" and "Psych" packages were used to perform the descriptive statistics, while the "Lavaan" package was used for the confirmatory factor analysis. The exploratory factor analysis was performed with principal axis factoring and Promax rotation and Kaiser normalization. The Kaiser-Meyer-Olkin (KMO) measure, the Bartlett's test and the parallel analysis were employed to examine the sampling adequacy for each variable. KMO must be bigger than 0.50 for the factorial solution to be accepted. Additionally, the significant chi-square value of the Bartlett sphericity test was used

to test the adequacy of the factorial solution. The factors were extracted if the eigenvalues were larger than 1 and the number of factors in the scree plot was retained following the R algorithm. Moreover, an item was eliminated if its factor loading on the relevant factor was less than 0.50.

During the exploratory and confirmatory phases, the univariate normality of the data was evaluated using skewness and kurtosis tests. It was determined that asymmetry values were greater than 7 or kurtosis values were greater than 3 constituted non-Gaussian data, and that these values have low psychometric sensitivity. Multivariate normality was analysed by Mardia's coefficients. The structure of the NMP-Q in the confirmatory sample was performed by a second order confirmatory factor analysis (CFA), and diagonally weighted least squares (DWLS) were used in this study as an estimator procedure (57). Model fit was established by examining multiple indices, including (1) the X2, (2) the X2/DF, (3) the Relative fit index (RFI) (4) the Incremental Fit Index (IFI), (5) the Parsimony-Adjusted Measures Index (PNFI), (6) the goodness-of-fit index (GFI), (7) the adjusted goodness-of-fit index (AGFI), (8) the comparative fit index (CFI), (9) the Tucker–Lewis index (TLI), (10) the root means square error of approximation (RMSEA), and (11) the standardized root mean residual (RMR). The X2 should not be significant; however, this criterion is highly criticized on large samples, whereas the X2/DF is widely used and should be less than or equal to 2.[62] According to the recommendations of,[63] GFI, IFI and AGFI must have values greater than 0.90 to accept the model. RFI, TLI and CFI values greater than 0.95 represent a good model fit. While RFI must be greater than 0.70, RMSEA should be <0.06 for a good model fit and <0.08 for an acceptable model fit.[63]

During the phase of confirmatory analysis, the Mardia coefficient of multivariate normality was also calculated. Calculating the average variance extracted (AVE) and comparing the square roots of the AVE values to the correlation coefficients were used to evaluate the convergent and discriminant validity, respectively.

Results

The Bartlett's test of sphericity was significant ($\chi^2(190) = 2388.09$, $p < 0.001$). Also, the overall KMO value was marvellous (0.914). Hence, there is a high probability that our data is suitable for factor analysis.

Parallel analysis was performed using 1000 simulated random data sets and the Eigenvalues were found using EFA with means as decision rules suggested four-factor solution as seen in the screen plot (Figure 2). The first factor explained

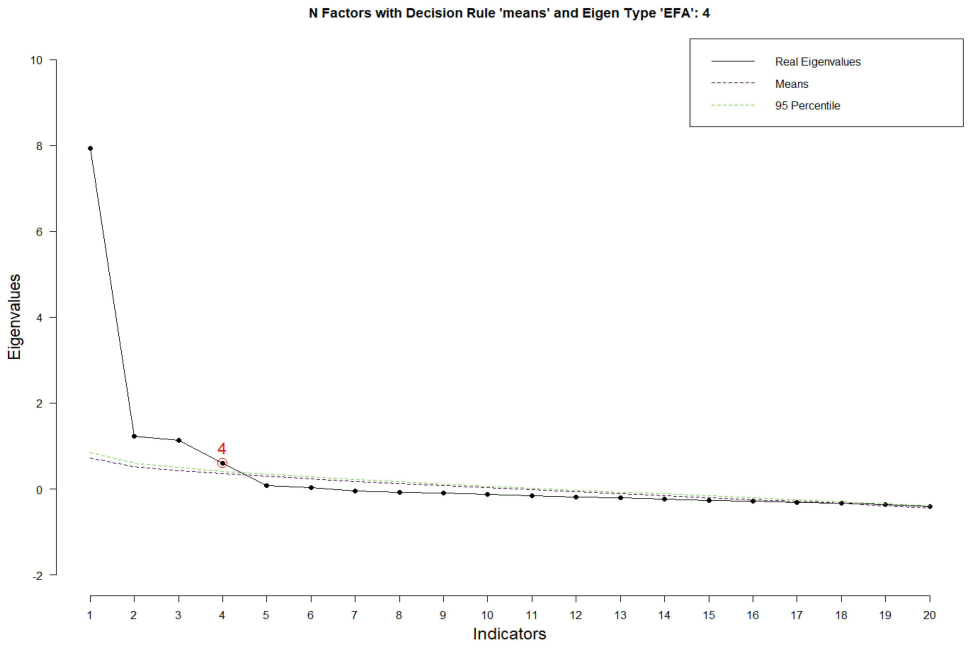

Figure 2 Scree plot of the Arabic NMP-Q.

79.35% of the total variance; the second factor explained 12.26%. The third and fourth factors explained 11.38% and 5.99% of the total variance, respectively (Table 1).

Reliability

As seen in Table 2, the McDonald's ω internal consistency indices for the four factors were 0.821 for giving up convenience (GUC), 0.841 for not being able to access information (NBAAI), 0.851 for not being able to communicate (NBAC) and 0.897 for losing connectedness (LC). These values indicated a good consistency of the 4 factors of the

Table 1 The Factor Loadings of the Arabic NMP-Q

	F3	F1	F2	F4
I1	0.26	0.25	0.33	0.75
I2	0.20	0.23	0.22	0.66
I3	0.23	0.19	0.20	0.52
I4	0.19	0.18	0.29	0.59
I5	0.67	0.15	0.16	0.26
I6	0.65	0.26	0.15	0.10
I7	0.62	0.12	0.20	0.13
I8	0.55	0.10	0.14	0.16
I9	0.67	0.32	0.13	0.13
I10	0.78	0.19	0.17	0.19
I11	0.22	0.19	0.75	0.13
I12	0.06	0.25	0.63	0.24
I13	0.20	0.07	0.50	0.21
I14	0.29	0.20	0.70	0.26
I15	0.19	0.19	0.77	0.22
I16	0.25	0.83	0.27	0.17
I17	0.26	0.75	0.27	0.18
I18	0.22	0.75	0.15	0.15
I19	0.06	0.38	0.04	0.13
I20	0.29	0.84	0.24	0.20

Table 2 Internal Consistency of the Arabic NMP-Q

Estimate	McDonald's ω	Cronbach's α	Guttman's λ6	Average Inter Item Correlation	Mean	Sd
NBAAI	0.841	0.834	0.809	0.557	13.075	5.012
GUC	0.821	0.820	0.793	0.479	16.320	5.826
NBAC	0.851	0.845	0.841	0.485	20.320	6.379
LC	0.897	0.883	0.888	0.605	18.130	7.058

scale. Also, Cronbach's α values were good with a minimum value of 0.820 for GUC. For Gutmann's λ6 index, the scores varied from 0.793 to 0.888 for the second and the fourth factor, respectively.

Confirmatory Factor Analysis

Tests of normality, both univariate and multivariate, were carried out first, before moving on to the confirmatory factor analysis. Mardia tests of multivariate skew and kurtosis highlighted a b1p = 27.6, skew = 2042.43 with probability <= 9.1e-17, and b2p = 454.55, kurtosis = 5.17 with probability <= 2.4e-07. The univariate normality assessment suggested that the item distribution followed a Gaussian distribution (see Table 3), whereas the Mardia coefficient of multivariate normality indicated a non-normal multivariate distribution.[64]

Figure 3 shows the results of the final CFA of the Arabic version of the scale. CFA statistics: $\chi 2(169)=96.457$, p = 0.01; $\chi 2/df=1.47$; Relative fit index = 0.996; Incremental Fit Index (IFI)=1.003, Parsimony-Adjusted Measures Index (PNFI) = 0.886; GFI = 0.997; AGFI = 0.996; TLI = 1.003; CFI = 1.000; RMSEA = 0.000 (90% CI 0–0); RMR = 0.030.

Convergent and Discriminant Validity

The results of convergent validity showed that AVE values ranged from 0.518 for losing connectedness to 0.615 for not being able to communicate. Square root values of AVE reported on the diagonal line were as follows: 0.75 for attention, 0.78 for Focus,

Table 3 Descriptive Statistics and Normality Coefficients of the Arabic NMP-Q

vars	Mean	SD	Skew	Kurtosis
I1	3.69	1.69	0.29	−0.77
I2	3.56	1.60	0.33	−0.72
I3	3.52	1.66	0.39	−0.56
I4	3.61	1.62	0.27	−0.79
I5	3.71	1.72	0.24	−0.84
I6	3.72	1.69	0.30	−0.78
I7	3.66	1.76	0.27	−0.86
I8	3.62	1.77	0.33	−0.83
I9	3.49	1.74	0.35	−0.70
I10	3.57	1.74	0.35	−0.78
I11	3.84	1.65	0.23	−0.75
I12	3.65	1.66	0.23	−0.67
I13	3.66	1.65	0.18	−0.85
I14	3.73	1.71	0.24	−0.81
I15	3.83	1.73	0.18	−0.90
I16	3.72	1.77	0.32	−0.88
I17	3.74	1.74	0.24	−0.83
I18	3.53	1.59	0.33	−0.55
I19	3.55	1.72	0.28	−0.86
I20	3.73	1.73	0.32	−0.81

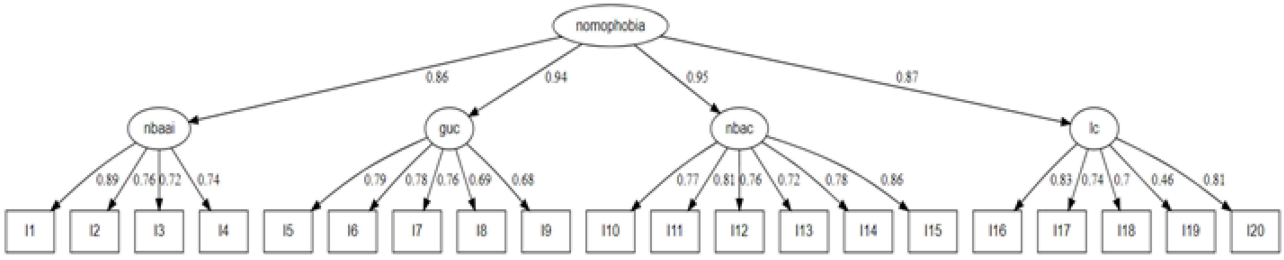

Figure 3 Confirmatory factor analysis of the Arabic NMP-Q.

0.79 for Awareness and 0.79 for the last dimension. The comparison of each square root AVE value with correlation coefficients with the other constructs showed that they were of higher value, demonstrating good discriminant validity.

Discussion

The objective of this study was to adapt and validate the Nomophobia scale for a population of physical education and sports students in Tunisia. The results of the exploratory and confirmatory factor analysis suggested keeping the 20 items of the questionnaire. In addition, the second-order and four-factor structure turned out to be adequate. Regarding reliability, the instrument presented good internal consistency across three indices. The results also established the discriminant and convergent validity of the instrument.

To the best of our knowledge, this study is the first one to be conducted in Tunisia with the aim to adapt and validate a questionnaire specifically designed to measure nomophobia. Also, our participants were physical education university students and according to Tuco et al[24] university students had a significant prevalence of moderate and severe nomophobia thus in order to prevent and address this issue at educational institutions, interventions are required.

The NMP-Q, created by Yildrim and Correia,[35] is the most used assessment tool to measure and examine nomophobia.[65] An adaptation of the NMP-Q questionnaire using a translated and modified version is supported by expert reviews and psychometric studies. A comparative study of nomophobia among Spanish and Portuguese nursing students showed higher levels of nomophobia among the Portuguese population than the Spanish,[66] the same study revealed a significant difference of nomophobia levels between Turkish and Pakistani university students.[67] Many adaptations and validation studies were conducted all over the globe.

In accordance with our findings, the European Portuguese version of the NMP-Q showed good reliability, construct and concurrent validity. They found that a four-factor model seems to be the more suitable in assessing nomophobia.[41] The same results were found in Spain, where they confirmed that a four-dimensional structure questionnaire could be considered in facilitating the diagnosis of addictive behaviors in relation to mobile phone use.[37] Likewise, the German adaptation of the NMP-Q showed both a hierarchical model with one second-order factor describing the four nomophobia factors and a correlated four-factor model with four factors fitted the data well. So, it is appropriate to take into account four factors and assign nomophobia a single total score.[45]

In the Arabic world, not many sound adaptation studies were conducted and it was done only in two countries which are Kuwait[68] and Lebanon.[69] Unlike our results, the Lebanon version of NMP-Q confirmed a second-order structure with three factors explaining the nomophobia scores. The nomophobia scale's items converged over a solution of three factors with Eigenvalues greater than 1 (Factor 1: emotions related to losing connectedness, Factor 2: being unable to communicate and Factor 3: being unable to access information).

The results of the adaptation of the NMP-Q in Kuwait revealed, after testing three models in confirmatory factor analysis, a one higher order factor (global nomophobia) with four lower order factors (second-order structure).

Limitation and Recommendations

It is important to consider the limitations of the current study. First, this study was conducted in one university and participants from other institutions were not included in our sample.

Second, this study was cross-sectional design using convenience as sampling technique. Future studies should consider more rigorous sampling techniques to improve this methodological weakness. The sample was limited to a single university discipline and a single country. To generalize the use of the adapted instrument, psychometric works in other countries concerned is necessary.

A final limit lies in the concurrent validity of the scale which has not been verified, for example, it is useful to examine the relationships between nomophobia, problematic internet use, gaming disorder and social media addiction.

Future research should also establish the cut-off points of the scale developed to establish the categories of nomophobia in the Tunisian context.

For future research, it is recommended to examine the psychometric properties of the scale in a general population from early adolescence. This can help examine vulnerable clusters in terms of nomophobia.

Finally, given the number of nomophobic people, the validation of this scale in our context is useful for evaluating the results of intervention programs.

Conclusion

In summary, there is a preliminary evidence to suggest that Arabic version of the NMP-Q is a reliable, valid and appropriate instrument for use to assess Nomophobia among Tunisian Arabic-speaking populations. Future research should establish the sensitivity and specificity of the scale.

Abbreviations

NMP-Q, Nomophobia-Questionnaire; KMO, Kaiser-Meyer-Olkin; CFA, confirmatory factor analysis; RFI, Relative fit index; IFI, the Incremental Fit Index; PNFI, the Parsimony-Adjusted Measures Index; GFI, the goodness-of-fit index; AGFI, the adjusted goodness-of-fit index; CFI, the comparative fit index; TLI, the Tucker–Lewis index; RMSEA, the root means square error of approximation; AVE, average variance extracted; GUC, giving up convenience; NBAAI, not being able to access information; NBAC, not being able to communicate; LC, loosing connectedness; RMR, the standardized root mean residual.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

The authors report no conflicts of interest in this work.

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