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Psychometric Properties of a Turkish Version of the Nomophobia Scale for the Nine-Eighteen Age Group

Emine Zahide Özdemir¹, Murat Bektaş²

¹Dokuz Eylül University Faculty of Nursing, Department of Health Sciences Institute, İzmir, Turkey

²Dokuz Eylül University Faculty of Nursing, Department of Nursing Faculty, İzmir, Turkey

ABSTRACT

Aim: As a situational phobia, nomophobia is the fear experienced in the absence of a cell phone. Nomophobia leads to situations that negatively affect children's health. The aim of this study is to conduct validity and reliability studies for the Turkish version of the Nomophobia scale.

Materials and Methods: The study was conducted with volunteer students from three secondary schools and two high schools whose parents' approval was acquired. Expert opinions, a pilot study, and a calculation of validity and reliability stages were applied. For data analysis, the Shapiro-Wilk normality test, Content Validity index, Pearson correlation analysis, Cronbach's alpha coefficient, confirmatory factor analysis, explanatory factor analysis, and t-tests were used.

Results: This study included 818 voluntary child participants. Of the participants, 56.7% were girls. In all, 91.5% of the participating children were connected to the Internet on their mobile phones, and 67.2% had their own computer. The age range of participants was 9-18 years, and their average age was 14.1±2.32 years. The scale accounts for 57.8% of the total variance. Cronbach's alpha for the whole scale was identified as 0.90. As a result of confirmatory factor analysis, the factor coefficient was over 0.30, and the fit indices were over 0.90.

Conclusion: The Turkish version of the NMP-Q is reliable and valid for the 9-18 age group.

Keywords: Nomophobia, mobile phones, children, Turkey

Introduction

Mobile phones have become a technology that almost everyone owns. According to data from the Household Use of Information Technologies Research conducted in Turkey, 96.8% of households have mobile phones (1). The frequency of cell phone usage, in a similar way to adults, is gradually increasing among children. The increased duration of time spent by children with information and communication technologies results in new risks and opportunities. In particular, the use of mobile phones is becoming increasingly popular not only for communication but also for facilitating access to the Internet and social networks (2). Children in

Turkey generally start using cell phones at about the age of nine (3). Due to the popularity of mobile phones, many problems have emerged due to their excessive use (4).

A major problem observed among mobile phone users is nomophobia (5,6). Derived as an acronym from the English expression "no mobile phone phobia," nomophobia is defined as the fear of being without a mobile phone. The tempting environment provided by mobile phones takes the place of cell phones, and becoming used to this environment constitutes the reason for such fears (6).

Symptoms of nomophobia include having a mobile phone kept on continuously, excessive use, a feeling of

Address for Correspondence

Emine Zahide Özdemir PhD (c), Dokuz Eylül University Faculty of Medicine, Department of Health Sciences Institute, İzmir, Turkey
Phone: +90 530 114 13 87 E-mail: ezahideozdemir@gmail.com ORCID: orcid.org/0000-0002-4292-8849

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anxiety when one's phone is out of network coverage, constantly checking messages or missed calls, Ghost Vibration syndrome, and a habit of continuously looking at one's mobile phone screen (7,8).

In particular, nomophobia is common among adolescents who start using technology at an early age. This group have been called "Generation Z," "Digital Natives," or the "Net Generation" (9,10). For Generation Z, technology is "an indispensable part of them" (11). Issues such as abstraction from life, shunning social relationships, a reduced attention span, increased irritation, and reduced sleep quality and tolerance are notable (12,13). However, no tools were available to define factors negatively affecting adolescents' health concerning this issue. Valid and reliable measurement tools are needed to determine the current situation, to develop active programs accordingly, and to measure the effectiveness of these initiatives. For this reason, the objective of this study was to adapt the Nomophobia scale developed for young adults aged 9-18 into Turkish and to conduct validity and reliability analyses for it.

Materials and Methods

Research Type

This research was a methodological, descriptive, and cross-sectional study intended to conduct validity and reliability studies on the Turkish version of the Nomophobia scale for children aged 9-18.

Research Population and Sample

This study was conducted in three secondary schools and two high schools between January 2018 and March 2018. In validity and reliability studies, while determining the number of samples, the literature refers to the rule of 5s, 10s, and 100s. It is emphasized that for a researcher to conduct factor analysis, he should survey at least five people per item (14). For scale development studies, the literature has reported that a sample size of less than 100 people is insufficient, medium if 200 people, good if 300 people, very good if 500 people, and perfect if 1,000 people are sampled (15). A total of 818 children who volunteered to participate and who filled out the form completely were included in the study.

Sample Inclusion Criteria Included the Following:

- Children in the age range of 9-18 years
- Ownership of a mobile phone
- Verbal and written consent received from both the child and parent respectively.

Data Collection Tools and Characteristics

Data in the study was collected using the sociodemographic data collection form and the Nomophobia scale.

Sociodemographic Data Collection Form:

Sociodemographic features such as "age, gender, grade, status of having their own computer, status of having a cell phone of their own" among the children were included on this form.

Nomophobia Scale: The scale was developed by Yildirim and Correia (16) to measure university students' nomophobic behaviors, and its validity-reliability study for Turkish university students was conducted by (17). The scale consists of 20 items discussing four aspects of nomophobia, as well as four sub-dimensions, including six items addressing "inability to communicate" (10th, 11th, 12th, 13th, 14th, and 15th items), five items addressing "losing adherence" (16th, 17th, 18th, 19th, and 20th items), four items addressing "inability to access information" (1st, 2nd, 3rd, and 4th items), and five items addressing "giving up convenience" (5th, 6th, 7th, 8th, and 9th items). The lowest score that can be obtained from the scale is 20, and the highest score is 140. A score of 20 points shows an absence of nomophobia; 21-60 points show mild nomophobia; 60-100 points show moderate nomophobia; and 100-140 points show the presence of severe of nomophobia. All items were graded using a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Original scale reliability coefficients (α) were found as follows: 0.90 for "unable to communicate," 0.74 for "losing adherence," 0.94 for "unable to access information," 0.91 for "giving up convenience," and 0.92 as the reliability coefficient of the overall scale. According to results of the confirmatory factor analysis, it was found that $\chi^2= 2.86$, Root Mean Square Error of Approximation (RMSEA)= 0.08, Comparative Fit index (CFI)= 0.92.

Due to problems caused by nomophobia, it has become a subject of interest in the literature. The Nomophobia Scale was also adapted for Spanish (18), Persian (19), and Italian (20) culture.

The original scale sample was applied to university students with a mean age of 20 years. Its Turkish version was applied to individuals aged 17-34 years with an average age of 20.02±1.65, its Spanish version was applied to individuals aged 13-19 years with an average age of 15.41±1.22, its Persian version was applied to individuals aged 13-19 years, and its Italian version was applied to individuals with an average age of 27.91±8.63 years (6,17,19-21).

Research Steps

Expert Opinion Stage: To determine the scales' scope of validity, researchers have suggested referring to at least three expert opinions (14,22). The opinions of a total of eight experts, including two psychologists, four academic members of pediatric nursing departments, and two academic members of psychiatry nursing departments were collected using scales. The scale form was given to experts, and they were requested to submit scores between 1 (not appropriate) and 4 (completely appropriate) to assess the compliance of scale items. Points were assessed using the scope of Validity index. According to these expert opinions, the items are understandable, and there is no need for wording or grammatical changes.

Preliminary Stage: It was suggested, after receiving expert opinions, to apply the scale to a sample consisting of 10-20 people not included in the sample but bearing similar characteristics to those participants who would be part of the main sample population (14,22). The draft was revised using expert opinions and was given to 10 non-participants who complied with the sample characteristics. As no negative feedback was received relating to the clarity of the items; it was decided to apply the scale to the larger group.

Reliability Analysis: To analyze the total score for the scale and its sub-dimensions, Pearson correlation analysis was used, and by considering a correlation value of 0.20, nonconforming items were removed from the scale (14,22). Cronbach's alpha coefficient was calculated to determine internal consistency for the scale and its sub-dimensions (14,22).

Validity Analysis: Descriptive factor analysis was applied to determine the item-factor relationship, and confirmatory factor analysis was conducted to calculate whether items and sub-dimensions explain the scale's original structure (14,22). It was planned to remove items with factor loads below 0.30.

Statistical Analysis

For data analysis, the Shapiro-Wilk normality test was applied to determine the percentage and average for descriptive statistics and whether data were distributed normally. The Content Validity index was applied for the compliance analysis of the expert opinions. Pearson correlation analysis was applied for the item-total score analysis of the scale and its sub-dimensions. Cronbach's alpha coefficient was applied to determine the internal consistency of the scale and its sub-dimensions and

exploratory factor analysis (EFA) was applied to determine item-factor relationships. Confirmatory factor analysis was conducted to determine whether items and sub-dimensions explained the original structure of the scale. A t-test was applied for comparison of similar groups. Pearson correlation analysis was applied to determine the relationships among factors of the scale; t-test and Pearson correlation analysis were conducted in invariance-dependent groups based on time. Pearson correlation analysis was conducted to assess the relationships among score averages of the scale and Visual Analog scale. In the data assessment, the margin of error was considered to be $p=0.05$.

Research Ethics

Written consent was received from parents and verbal permission was received from the children. Permission to use the scale was obtained via e-mail.

Results

Overall, 7.9% of the children ($n=64$) attended the fifth grade; 18% ($n=144$) attended the sixth grade; 9.7% ($n=79$) attended the seventh grade; 12.3% ($n=100$) attended the eighth grade; 16.1% ($n=131$) attended the ninth grade; 10.9% ($n=89$) attended the tenth grade; 15.5% ($n=126$) attended the eleventh grade; and 9.5% ($n=77$) attended the twelfth grade. Additionally, 56.7% of the children were female, and 43.3% were male. Most of the children (91.5%) connected to the internet via their mobile phones, and 67.2% had their own computers. The age of the participants ranged from 9-18 years, and their average age was 14.1 ± 2.32 years.

Content Validity

The Content Validity index as per item (I-CVI) was 0.99-1.00, and the Content Validity index on the scale (S-CVI) basis was 0.99.

Explanatory Factor Analysis

As a result of EFA, Kaiser-Meyer-Olkin (KMO) was identified as 0.928, and the Bartlett test yielded a result $\chi^2= 6,631.247$. As a result of EFA, it was determined that the scale consisted of four sub-dimensions. The scale accounts for 57.8% of the total variance. The 'inability to communicate' sub-dimension accounted for 37.1% of the total variance, the 'losing online connection' sub-dimension accounted for 9.1%, the 'loss of comfort' sub-dimension accounted for 6.5%, and the 'inability to access information' sub-dimension accounted for 5.1%.

It was determined that the factor loads of items included in the 'inability to communicate' sub-dimension ranged from 0.60 to 0.83; the factor loads of items in 'losing online

connection' ranged from 0.58 to 0.71; the factor loads of items in the 'loss of comfort' sub-dimension ranged from 0.40 to 0.75; and the factor loads of items in the 'inability to access information' sub-dimension ranged from 0.58 to 0.81 (Table I).

Confirmatory Factor Analysis

As a result of applying confirmatory factor analysis (CFA), fit indices were identified as follows: $\chi^2= 662.30$, $df= 162$, $\chi^2/df= 4.08$, RMSEA= 0.061, GFI= 0.93, IFI= 0.97, NFI= 0.97, NNFI= 0.97, CFI= 0.97, RFI= 0.96, and AGFI= 0.90. It was determined that the factor loads of items in the 'inability to access information' sub-dimension ranged from 0.67 to 0.81; the factor loads of items in the 'loss of comfort' sub-dimension ranged from 0.60 to 0.75; the factor loads of items in the 'inability to communicate' sub-dimension ranged from 0.74 to 0.83; and the factor loads of item in the 'losing online connection' sub-dimension ranged from 0.66 to 0.77 (Figure 1).

Table I. Explanatory factor analysis

Items	Sub-dimensions			
	Inability to Communicate	Losing Online Connection	Demising Comfort	Inability to Access Information
m11	0.83			
m13	0.80			
m10	0.71			
m15	0.69			
m14	0.63			
m12	0.60			
m16		0.71		
m18		0.70		
m17		0.67		
m19		0.65		
m20		0.58		
m5			0.75	
m6			0.66	
m7			0.60	
m9			0.55	
m8			0.40	
m2/sqm				0.81
m1				0.77
m4				0.61
m3				0.58

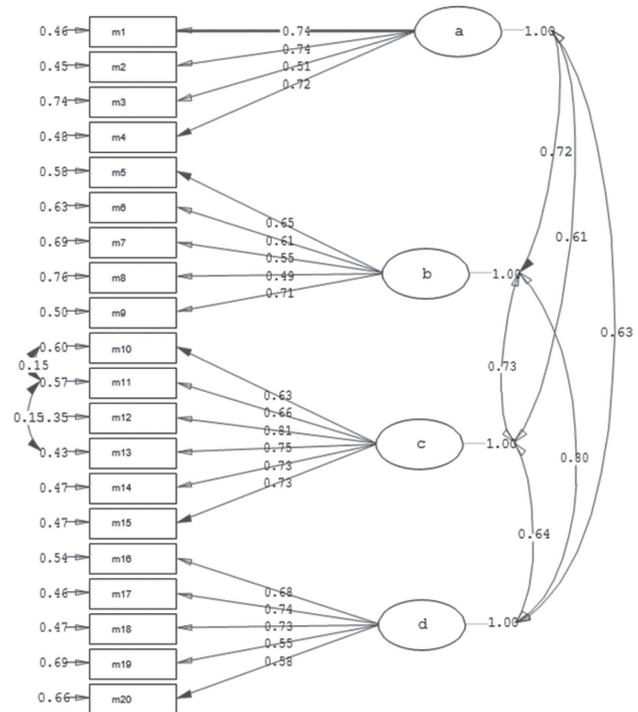
Reliability Analysis

Cronbach's alpha for the whole scale was identified as 0.90. Cronbach's alpha for the lower dimensions was 0.76 for the 'inability to access information' sub-dimension, 0.74 for the 'loss of comfort' sub-dimension, 0.87 for the 'inability to communicate' sub-dimension, and 0.78 for the 'losing online connection' sub-dimension. As a result of the two split-half analysis scale, the Cronbach's alpha value for the first half was identified as 0.83, and the Cronbach's alpha value for the second half was identified as 0.86. Spearman-Brown and Guttman split-half coefficients were both identified as 0.85 (Table II).

Table II. Reliability analysis of scale and sub-scale scores (n=818)

Subscale	Cronbach α	M \pm SD	Min-Max
Inability to access information	0.76	13.27 \pm 6.17	4-28
Loss of comfort	0.74	16.40 \pm 7.59	5-35
Inability to communicate	0.87	21.99 \pm 10.09	6-42
Losing online connection	0.78	11.91 \pm 6.85	5-35
Total	0.90	63.69 \pm 24.96	20-140

M: Mean, SD: Standard deviation, Min: Minimum, Max: Maximum, n: Number



Chi-Square=6622.30, df=162, p-value=0.0000, RMSEA=0.061

Figure 1. Confirmatory Factor Analysis of Nomophobia scale for 9-18 age children

The total score of scale items and their correlations were determined to vary between 0.46 and 0.73. It was found that item-subscale correlations varied between 0.44 and 0.59 for the 'inability to access information' sub-dimension, between 0.48 and 0.60 for the 'loss of comfort' sub-dimension, and between 0.52 and 0.71 for the 'inability to communicate' sub-dimension (Table III).

Table III. Characteristics of items in scale scores (n=818)

Subscales	Items	Item-total score correlations (r)*	Item-subscale score correlations (r)*
Inability to access information	1	0.53	0.52
	2	0.51	0.49
	3	0.43	0.44
	4	0.59	0.59
Loss of comfort	5	0.54	0.54
	6	0.53	0.55
	7	0.46	0.48
	8	0.47	0.49
	9	0.61	0.60
Inability to communicate	10	0.55	0.55
	11	0.51	0.52
	12	0.73	0.71
	13	0.60	0.59
	14	0.61	0.61
	15	0.61	0.59
Losing online connection	16	0.54	0.54
	17	0.56	0.55
	18	0.55	0.55
	19	0.46	0.47
	20	0.52	0.55

*Significant at <0.001 level

Discussion

When the Content Validity index was applied, content validity indices were above 0.80 on an item and scale basis. There was a high level of compliance among the experts that items for this age range sufficiently represented the desired field (23,24). These results supported the content validity of the scale.

Construct Validity of the Scale

In the literature, to conduct factor analysis, the Bartlett Sphericity test value must be statistically significant, and

the KMO value must be at least 0.60 (23,24). For this study, the Bartlett's sphericity test value was less than $p < 0.05$, and the KMO value was higher than 0.60. These results show that the data are sufficient and appropriate for factor analysis (23-26). The results of this study show similarity with the original scale (6), the Spanish version (18), and the Italian version (20). In the EFA applied, an Eigenvalue of 1 or above was accepted for determining the factor number (26,27). The scale consisted of four sub-dimensions. These sub-dimensions accounted for 57.7% of the total variance. The original scale accounted for 69.6% of the total variance (6), the Spanish version accounted for 66.4% of the total variance (21), and the Italian version accounted for 65.9% of the total variance (20). In this study, the fact that the total variance obtained in this study was over 50% and closer to the total variance obtained in the original and other language versions reveals that the scale, which was developed for an older age group, was also a valid measurement tool for the 9 to 18-year-old age group. These results also support the content validity of the scale. In the literature, it is emphasized that, while deciding under which factor the items will be placed, the factor load should be at least 0.30 or above; meaning that items below this rate should be excluded from the scale (23-26). In this study, it was determined that items in all sub-dimensions had factor loads higher than 0.40, similar to factor loads in the original scale and scales in other languages (Table III) (16,18,20,28). These results showed that the scale had a powerful factor structure.

As a result of CFA, factor loads of the four sub-dimensions varied between 0.60 and 0.83 (Figure 1). The fact that all factor loads were greater than 0.30, fit indices were greater than 0.90, RMSEA was less than 0.080, and χ^2/df was less shows that items in each dimension defined their factors sufficiently. The results of this study were similar with the confirmatory factor analysis results in the Turkish adult and Spanish versions of the scale (17,18). The fact that these research results were found to be close to the adult group supports the structural validity of the scale and also shows that the scale can effectively assess nomophobia in the 9 to 18-year-old age group.

The EFA and CFA results in this study support the structural validity of the scale and reveal that the scale is a valid tool.

Reliability Analysis of Scale

Internal Consistency Analysis of the Scale and Its Sub-dimensions When the Cronbach's alpha coefficient

varies between 0.60 and 0.80, it shows that a scale is quite reliable; and when it varies between 0.80 and 1.00, it shows that a scale is highly reliable (29,30). In these research results, it was determined that the Cronbach's alpha for the whole scale was 0.90, and Cronbach's alpha values for the four sub-dimensions were all above 0.70 (Table I). The Cronbach's alpha value in the original scale was 0.95 (6), 0.92 in the Turkish adult version (17), and 0.95 in the Italian version (20). Internal consistency values obtained in this study showed similarity with those found in the original versions and versions in other languages. These study results have shown that the scale is a measurement tool that can be used safely with the 9 to 18-year-old age group. In the split-half method used in this study, the Cronbach's alpha values for both sections were over 0.80, and there was a strong and significant relationship between the halves. These results provide important evidence supporting the reliability of the scale.

Item-total Score Analysis of Scale and Sub-dimensions

Item-total score and item sub-dimension total score correlations should be greater than 0.20, and preferably as close to 1 as possible, and positive (14). In this study, the item correlations with scale total scores and subscale total scores were above 0.40 (Table II). The item-total score and item-subscale total score correlations in the original scale and versions in other languages were above 0.40 and show similarity with this study's results (16,18,20,28). These results show that each item is highly interrelated with all scales and subscales. This suggests the field to be measured, the scale sufficiently measures nomophobia for the 9 to 18-year-old age group, and the item reliability of scale and sub-dimensions is high.

Conclusion

Consequently, it was determined that the scale had prominent levels of reliability and validity in assessing the level of nomophobia in the 9 to 18-year-old age group. In this study, an objective measurement tool was found to assess the levels of nomophobia among individuals in the 9 to 18-year-old age group. Problems in mobile phone usage behaviors may interrupt adolescents' daily lives and adversely affect their physical and mental health. The increase in nomophobia among adolescents was negatively predicted by cell phone addiction and attention levels (31). In addition, as adolescents' levels of nomophobia increase, depression, a decrease in social relations, and low academic achievement are observed (31,32). Self-esteem, extraversion,

conscientiousness, and emotional stability are identified as important determinants of nomophobia (33). Using this scale, students' nomophobia levels can be determined, and the mechanics of nomophobia can be defined more clearly with further studies. This study may be a guide for determining risk groups, planning preventive studies that focus on these groups, and assessing the effectiveness of these planned initiatives.

Notes

Compliance with Ethical Standards

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or the national research committee and the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Ethics

Ethics Committee Approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or the national research committee and the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Informed Consent: Written consent was received from parents and verbal permission was received from the children. Permission to use the scale was obtained via e-mail.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: E.Z.Ö., Concept: E.Z.Ö., Design: M.B., Data Collection or Processing: M.B., Analysis or Interpretation: E.Z.Ö., Literature Search: E.Z.Ö., Writing: E.Z.Ö.

Conflict of Interest: None of the authors had conflict of interest.

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