SAKARYA UNIVERSITY JOURNAL OF EDUCATION
Original Research Doi: 10.19126/suje.516365

Received: 22.01.2018 Accepted: 29.05.2019
Published: 15.08.2019 August 2019 • 9(2) • 261-281

Adaptation of Application-Based Smartphone Addiction Scale to Turkish Cultures

Yunus ALTUNDAĞ* **Alperen YANDI**** **Ali ÜNAL*****

Abstract. The aim of this study is to adapt the Application Based Smartphone Addiction Scale, which has been developed to determine the smart phone addiction, which is becoming a common problem every day. The study was carried out with 474 students in 2017 - 2018 academic year at Bolu Abant Izzet Baysal University Faculty of Education. In exploratory factor analysis (EFA) for construct validity, the items were collected under a single factor in keeping with the original structure. The rate of explained variance was 52.658%. The eigenvalue of the factor was determined to be 3.159. Factor loadings of the items ranged between 0.531 and 0.835, and all of the error variances were less than 0.05. Asymptotic covariance and correlation matrices and Weighted Least Square (WLS) estimation method were preferred because of the structure of data in Confirmatory Factor Analysis (CFA). T-values of the items were found to be significant at the level of 0.01 (30.522-41.257). Factor loadings of the items were found to be high (0.50-0.81). When the model fit indices were examined, the fit values calculated as $\chi 2/sd = 2.09$, RMSEA = 0.068, GFI = 0.99, AGFI = 0.98, CFI = 0.98, NNFI = 0.96, NFI = 0.96, SRMR = 0.044 indicated acceptable or excellent fit. Cronbach Alpha internal consistency coefficient was found to be 0.81 within the scope of reliability studies. In addition, the test-retest correlation coefficient was found to be 0.92 at four-week intervals. In this study, it has been ensured that this scale related to smartphone addiction, which has recently become a serious problem, has been introduced to national literature.

Keywords: Smartphone addiction, scale adaptation, validity, reliability.

* Orcid ID: http://orcid.org/0000-0003-2748-8862, Dr., Bolu Abant İzzet Baysal University, Faculty of Education, Department of Guidance and Psychological Counseling, yunusaltundag14@hotmil.com
** Orcid ID: http://orcid.org/0000-0002-1612-4249, Dr., Bolu Abant İzzet Baysal University, Faculty of Education, Department of Educational Measurement and Evaluation, alperenyandi@gmail.com
*** Orcid ID: http://orcid.org/0000-0003-4525-3426, Dr., Turkish Directorate of Religious Affairs, beyadalioglu@gmail.com

1. INTRODUCTION

Information and communication tools continue to have more space in our lives day by day. Mobile phones are among the top of these tools. In recent years, these mobile devices, which show serious changes in terms of both physical size and function, are now called smart phones. Smart phones are used in a wide range of applications from games console to computer, television to internet. These applications, which are located in a small device, provide many conveniences to customers from banking transactions to shopping, from entertainment to communication. However, excessive and uncontrolled use of these applications on smartphones may cause some problems. One of these problems is smart phone addiction.

The use of smartphones has a history of about ten years, and some of the applications included in it are used excessively by the users (Zhao et al., 2016). Excessive and uncontrolled use of these applications in smart phones may lead to smartphone addiction (Altundağ and Bulut, 2017; Parasuraman, Sam, Yee, Chuon and Ren, 2017). In a recent study, the use of Facebook and Whatsapp was associated with problematic smartphone use (Sha, Sariyska, Riedl, Lachmann and Montag, 2018). As a result of uncontrolled use of digital tools such as internet addiction, gaming addiction, social network addiction, smartphone addiction, various types of behavioral addictions are identified. In the final edition of the Diagnostic Evaluation Manual (DSM-V), these addiction types have not been defined, but have been discussed and explored for a long time (Bozkurt, Şahin and Zoroğlu, 2016; Griffiths, 1999; Kuss, Griffiths and Pontes, 2017; Kuss et al., 2018; Widyanto and Griffiths, 2006). Internet Game Addiction, which is included in the appendices in the last edition of DSM-V, is considered to be insufficient although it is accepted as an important development. As a matter of fact, behavioural addiction types do not only consist of internet-based games. In addition, digital games are not only played online, but also played offline.

The existence of smart phones is becoming an important part of our lives due to the convenience and the applications it provides in our lives (Alfawareh and Jusoh, 2014). Addiction of uncontrolled use of these mobile devices can lead to various physical and psychological problems. The researches show that there is a positive relationship between smartphone addiction and loneliness and shyness (Aktas and Yilmaz, 2017; Bian and Leung, 2015), perceived stress (Samaha and Hawi, 2016), state and trait anxiety (Choi et al., 2015). In addition, it has a negative effect on academic performance (Hawi and Samaha, 2016), effective homework and interaction with the environment (Xu, 2015). In another study conducted on university students, it was found that there was a significant difference between the level of excessive use and normal use of smartphone users on the level of depression (Selvaganapathy, Rajappan and Dee, 2017).

In internet addiction, which is considered a subtype of behavioural addiction, Grifitts (1999) acknowledges that there are basically six components. He describes these components as relapse, conflict, withdrawal symptoms, tolerance, mood change, and attention-grabbing. Note that the person thinks about the time when he/she is not

online; When a person is online, he/she becomes indifferent when he/she is online, a change in mood, a growing number of people being tolerated online, symptoms of irritability or pessimism when he/she is deprived of the Internet or has been prevented from using the Internet. The re-use and use of more than before, relapse, and finally the use of excessive and uncontrolled internet use of the person's close environment and his inner world, the debate or fights also refers to conflict (Griffiths, 2000). These criteria are also adapted to smartphone addiction, which is another form of behavioural addictions (Csibi, Griffiths, Cook, Demetrovics and Szabo, 2018). As a matter of fact, in this adapted scale there are six items to measure these criteria (Csibi et al., 2018; Lin et al., 2018). Therefore, the criteria of Griffiths (1999; 2000) were taken into consideration in this short form which was developed to measure smartphone addiction. In addition, the basic reason for expressing smartphone addiction as application-based is that addiction is due to the applications in the device rather than the device (Csibi et al., 2018). The items of the scale which are being adapted are listed below. When the items of the scale are examined, it is seen that item 1 is related with attention drawing, 2nd item conflict, 3rd item mood change, 4th item tolerance, 5th item withdrawal and Article 6 relapse.

M1. My smartphone is the most important thing in my life.

M2. Conflicts have arisen between me and my family (or friends) because of my smartphone use.

M3. Preoccupying myself with my smartphone is a way of changing my mood (I get a buzz, or I can escape or get away, if I need to).

M4. Over time, I fiddle around more and more with my smartphone

M5. If I cannot use or access my smartphone when I feel like, I feel sad, moody, or irritable.

M6. I try to cut the time I use my smartphone, I manage to do so for a while, but then I end up using it as much or more than before.

The aim of this study is to adapt the Smartphone Application-Based Addiction Scale (SABAS) which is based on the internet addiction model of Griffiths (1999). In this way, it has been aimed to gain a useful, short and functional measurement tool which will contribute to measuring and understanding smart phone addiction which is a common problem and an important research subject in recent years. This scale, which was originally developed on the Hungarian culture (Csibi, Demetrovics and Szabo, 2016), is intended to be introduced to the culture of our country from the adaptation study on British culture (Csibi et al., 2018).

2. METHOD

In this section, the model of the research, the working group, the adaptation scale and the steps followed in the adaptation process are given.

2.1 Research Model

Scale adaptation was performed within the scope of the research. Multicultural studies replace by monoculture studies because of the reasons that the psychological constructs are universal and increment of large-scale applications organized by the countries have different cultural specifies.

With this change, the need for internationally proven measuring tools has increased (Hu and Oakland, 1991). The validity and reliability studies of a measurement tool in different cultures are carried out by following certain steps related to the scale adaptation process. The scale adaptation process is a set of systematic studies to prove whether the measurement tool developed in a culture can be applied in a different culture with a different structure than the developed culture (Öner, 2008). In this study, the adaptation of the Application Smartphone Based Addiction Scale (SABAS) to the Turkish culture was conducted.

2.2 Research Group

The students who participated in the 2017-2018 academic year at the Faculty of Education of Bolu Abant İzzet Baysal University participated in the study. A total of 474 students from seven different undergraduate programs were reached. However, the data of four people were excluded from the data set after the outlier's analysis. Cronbach Alpha Internal Consistency analyses and criterion validity analyses were performed with the remaining 470 participants. In addition, different study groups were used for construct validity of the scale. For exploratory factor analysis (EFA) 235, confirmatory factor analysis (CFA) 235 data were used. Test-retest analysis was conducted with 66 participants at four-week intervals. Data were also collected from 43 students in the last year of English Language Teaching for linguistic equivalence at three-week intervals. The frequency and percentage of gender, age and grade levels of these students are presented in Table 1.

Table 1.

Statistics of variables

	Variables	Variable Subcategory	Frequency	Percent
All Participant	Gender	Male	113	23.840
		Female	361	76.160
		Total	474	100.000
	Grade Level	1st Grade	158	33.333
		2nd Grade	83	17.511
		3rd Grade	76	16.034
		4th. Grade	157	33.122

		Total	474	100.000
	Age	18 to 20	219	46.203
		21 to 23	220	46.414
		24 and up	35	7.384
		Total	474	100.000
Study Group for EFA	Gender	Male	64	27.2
		Female	170	72.3
		Total	235	100.0
	Grade Level	1st Grade	74	31.5
		2nd Grade	45	19.1
		3rd Grade	35	14.9
		4th. Grade	75	31.9
		Total	235	100.0
Study Group for CFA	Gender	Male	47	20.0
		Female	188	80.0
		Total	235	100.0
	Grade Level	1st Grade	82	34.9
		2nd Grade	35	14.9
		3rd Grade	36	15.3
		4th. Grade	82	34.9
		Total	235	100.0

When the demographic information in Table 1 is examined, it is seen that the majority of the students participating in the study are women (76.160%). On the other hand, it was found that the first grade (33.333%) and fourth grade (33.122%) levels were very close to each other. In addition, when the age levels were examined, it was revealed that the two categories included a similar number of students. These categories are subcategories of students between the ages of 18-20 (46.203%) and those between the ages of 21-23 (46.414%). While the age range of the participants in the data set used for EFA ranged from 18 to 30 years, the number of female participants was 170 (72.3%) and the number of men was 64 (27.2%). Similarly, the age range in the CFA group ranged from 18 to 28, with the number of female participants being 188 (80%). It was seen that the grade levels of the participants in the EFA and CFA dataset were similar. In

addition, the study group for which data were collected for linguistic equivalence was 4th grade English Teaching Department, and 30 (69.76%) were female and 13 (30.23%) were male. For the test-retest reliability analysis, all 66 participants consisted of first-year students. 41 (62.13%) of the participants were female and 25 (37.83%) were male.

2.3 Data Collection Tools

Within the scope of the research, the Smartphone Application-Based Addiction Scale (SABAS) developed by Csibi et al. (2016) on Hungarian Culture and adapted to British culture by Csibi et al. (2018) was adapted to our culture. Csibi et al. (2018), with the participation of 240 individuals in the 18-69 age range, used a six-item, one-dimensional scale form with different measurement tools. In the scope of this study for SABAS, the principal component analysis was taken as a factorization technique and the factor analysis revealed that the items were collected under a single factor, the Eigen value of this factor was 3.13 and this factor explained 52.38% of the variance related to the variable. In the internal consistency analyses for the scale, Cronbach Alpha reliability coefficient was calculated as 0.81. The correlation between the scale and the nomophobia scale was found to be 0.626 and significant, and it was concluded that the criterion validity was sufficient.

In this study, the Nomophobia scale, which was adapted by Yıldırım, Sumuer, Adnan and Yıldırım (2016), was also used to determine the criterion validity of SABAS in Turkish culture. In the adaptation study, it was revealed that the Nomophobia Scale gives valid and reliable results in Turkish culture. Nomophobia Scale, which is a 7-point Likert scale and is a four-dimensional measurement tool, measures the anxiety of individuals' deprivation from mobile devices. In this study, the Nomophobia scale was used for criterion validity in accordance with the original study in which the scale was taken for the adapted SABAS.

2.4 Process

In the adaptation process, 13 steps proposed by Hambleton and Patsula (1999) were tried to be followed. Some of these steps have not been performed or combined. The proposed 13 steps in this context are described in Table 2.

Table 2.

Steps of adaptation process

Number	Steps of adaptation process
1	Deciding whether to develop a new scale or adapt an existing scale would be more useful.
2	Ensure that the scale has structural linguistic and cultural equivalence.
3	Selection of highly qualified translators.
4	Translation and adaptation of the scale to the target language.

5	Review the adapted version of the scale and make necessary emendation.
6	Determining a statistical pattern to find the relationship between the original and the target language form scores.
7	Performing a pilot application of the adapted version of the scale on a small group.
8	Ensure that linguistic equivalence between the original and target language forms
9	The pilot application with a larger group to represent the population
10	Examining the reliability and validity of the scale.
11	A handbook should be prepared for the reporting of the process and for the researchers will use the adapted scale.
12	Giving the necessary training to for the researchers will use the measurement tool
13	Maintaining the currency of the scale with new studies.

Of the 13 steps described in Table 2, the last two steps were not performed. It is planned that the studies related to these two steps will be handled in the wider research processes. The remaining 11 steps were followed in the process. The results of these steps are given in detail under the title of findings.

2.5 Data Analysis

Within the scope of the research, data analyses were performed by following the steps below:

1. In the process of deciding the linguistic equivalence of the adapted scale, examining the normality of the scores obtained from two different applications according to the determined pattern.

2. Determining the relationship between two application scores by using the correlation coefficient preferred according to the results of the assumption of normality.

3. Analysis of missing data for scores obtained from the final form application.

4. Converting item scores obtained from the final form application to standard z scores.

5. Exclusion of individuals who are determined as outliers after the conversion process.

6. Normality examinations of the scores which obtained by using the scale preferred for criterion validity study.

7. To check the criterion validity of the adapted scale with appropriate correlation coefficient calculations.

8. Testing exploratory factor analysis (EFA) assumptions within the context of validity studies.

a. Adequacy of s ample

b. Appropriateness of data for factorization

c. Multiple collinearity and singularity.

d. Examination of correlations between items – comparison was made between correlation and unit matrix.

9. Performing exploratory factor analysis (EFA)

10. Perform confirmatory factor analysis (CFA).

11. Calculation of Cronbach Alpha coefficient after validity analysis.

12. Examining the normality of the scores obtained by applying the final form at two different times for examination test-retest reliability.

13. Examining the test-retest reliability of the scale by using appropriate correlation coefficient preferred according to the results of the assumption of normality.

Significance level was taken as 0.05 in all analyses. In the interpretation of reliability coefficients, 0.70 level was used as the criterion for qualifying the adapted scale as a "reliable measuring instrument" (Nunnally, 1987; Cortina, 1993). Normality tests made at the level of item, skewness and kurtosis coefficients were within ± 2 range and it was interpreted as normal distribution (Field, 2009; George and Mallery, 2010). On the other hand, Kolmogorov Smirnov or Shaphiro Wilks test was used for normality analyses performed at scale level. The selection of these two tests was decided according to the number of students participating in the application being greater than 50. Kolmogorov Smirnov test was used in cases larger than the specified level and Shaphiro Wilks test was used in cases where it was smaller. All of these analyses were performed using SPSS 20.0 and Lisrel 8.72 package programs.

3. FINDINGS

Under this title, the procedures performed in the 11 steps followed in the adaptation process are presented separately.

3.1 Deciding whether to develop a new scale or adapt an existing scale would be more useful.

When the studies in the literature were considered within the scope of the research, scales developed or adapted on smartphone addiction were found. However, it was determined that there is no scale based on the applications that are considered as a factor increasing the addiction to smart phones. In addition, the validity and reliability study of this scale based on the theoretical basis of Griffiths (1999) was conducted in different cultures such as Hungarian (Csibi et al., 2016), British (Csibi et al., 2018) and

Iran (Lin et al., 2018). In this context, it was decided that the adaptation of a scale previously developed in a different culture would be more appropriate in terms of time and cost, and the permission required for the adaptation to the culture of our country was obtained by contacting the corresponding author for the development of the scale.

3.2 Ensure that the scale has structural linguistic and cultural equivalence.

The application-based smartphone addiction that is discussed in the scope of this study has a universal feature. Considering this feature, it can be argued that the only situation that differentiates between cultures is the applications that vary according to cultural structures or socio-economic conditions of the countries. Although different applications are being used or produced, it is an indisputable fact that individuals start living dependent on smartphones at this point. Therefore, it can be interpreted that this characteristic is equivalent in different cultures. Since there is no specific item about the application belong to different culture on the scale adapted in this study, it is possible to infer that there is equivalence between the original scale language and the target language.

3.3 Selection of highly qualified translators.

Before the translation process of the scale, individuals who were experts in foreign language (English) and Turkish and who worked in BAIBU were identified. After the preliminary interviews were made with these experts, the process was continued by receiving that they could participate in the study.

3.4 Translation and adaptation of the scale to the target language.

Two different stages were performed in the translation process of the step. The first is the forward translation, which is the process of translating the scale into the target language. In the forward translation stage, the scale was translated into Turkish by two different foreign language experts. Then, in the second step of the back-translation step, the Turkish version of the scale was crossed between the two experts and translated back to English.

3.5 Review the adapted version of the scale and make necessary emendation.

Following the forward and backward translation stages, the original form of the scale and the translated forms based on the Turkish culture and language structure were reviewed by two Turkish language experts who were competent in terms of foreign languages and the most appropriate expressions were selected and finalized. Following the forward and backward translation stages, the original form of the scale and the form translated based on the Turkish culture and language structures were reviewed by two Turkish language experts who were competent in terms of foreign languages.

3.6 Determining a statistical pattern to find the relationship between the original and the target language form scores.

Bilingual group design was determined for the linguistic equivalence study of the scale. In this design, a single group which is determined to be at the appropriate level in terms of original and target language is applied at different times. By applying the scale at different times, remembering of the items about the structure is prevented.

3.7 Performing a pilot application of the adapted version of the scale on a small group.

The Turkish version of the scale, which was finalized for the control of the linguistic equivalence, was applied with the participation of 43 students who are 4th grade in Department of Foreign Education Language BAIBU Faculty of Education. Firstly, the Turkish Form was given to the students and 3 weeks later the English form was given, and linguistic equivalence studies were started by examining the correlation between the scores obtained from each application.

3.8 Ensure that linguistic equivalence between the original and target language forms

With the pilot application, it was checked whether there are parts that are not understood in the final form of the scale. In addition, the correlation coefficient between the scores obtained at different times from the forms in two different languages was calculated and the linguistic equivalence was interpreted. Shaphiro Wilks test was performed before correlation analysis. The results of the Shaphiro Wilks test are presented in Table 3. According to the results of this test, the application scores of the forms in both languages show normal distribution. In line with this result, the results of Pearson Moment Correlation Coefficient, which is the parametric correlation coefficient showing the relationship between the two application scores, are given in Table 3.

Table 3.

Linguistic equivalence analysis results

		Turkish	English
Turkish	Pearson Moment Correlation Coefficient	1	0.916**
	p		0.000
	N	43	43

Results of Shaphiro Wilks Test:

Deng(43)=0.974; p>.05

Dtr(43)=0.981; p>.05

**p<0.01

The correlation coefficient (high level and positive direction) given in Table 3 shows that the scale provides linguistic equivalence. According to this result, it was decided that the translation process is appropriate, and the Turkish form of the scale can be applied.

3.9 The pilot application with a larger group to represent the population

Following the linguistic equivalence of the scale, since the target group was university students, a larger application was realized accordingly. 474 students from BAIBU Faculty of Education, whose characteristics are mentioned under the research group title, participated in this application.

3.10 Examining the reliability and validity of the scale.

In this section, the findings of the steps after step 2 mentioned under the title of data analysis are explained respectively.

Examining the missing data and outliers

Before the analysis of reliability and validity were carried out, analysis of missing data and outliers were performed for data set consist of scores obtained from 474 students. After the examinations, it was found that there is no missing data in the data set. In analysis of outliers, item scores transformed to z standard scores were examined and four students whose standard scores was determined to be out of ± 3.290 were excluded from the data set. The analysis was continued with scores obtained from 470 students.

Examining criterion validity of the scale

In the criterion validity study, which was conducted by using the total scores of SABAS and Nomophobia Scale (Yıldırım et al., 2016), firstly the normality of total scores was examined. Sperman Rho Correlation Coefficient was preferred because of non-normal distribution of scores of SABAS. Results of correlation analysis are given in Table 4.

Table 4.

Results of criterion validity examination

		SABAS	Nomophobia
SABAS	Sperman Rho Correlation Coefficient	1.000	0.584**
	p		0.000
	N	470	470

Results of Kolmogorov Smirnov Test:

Dutisq (470)=0.036; p<.05

Dnomophobia(470)=0.081; p>.05

**p<0.01

The results in Table 4 are consistent with the criterion validity results given in the original study. In the original study, a significant medium level positive correlation was found between the two scale total scores (rxy = 0.626). Also in this study, a significant medium level positive correlation (rxy = 0.584) was found between the two scale total scores.

Examining construct validity of the scale

In the process of collecting evidence for the construct validity of the scale, exploratory and confirmatory factor analysis were performed respectively. Before performing analysis, the assumptions common for both analysis and specific for analysis, were checked. The results of these examination of assumptions are as follows:

a. Adequacy of Sample: According to the studies in the literature, there are different opinions about adequacy of the sample size for EFA and CFA. Accordingly, there are opinions that the sample of 200 participant is moderately sufficient for EFA and CFA and that the proportion of number of participants to the number of items should be 5 or 10 (Kline, 1998; Lee, 2007; Tabachnick and Fidell, 2007). For the first of these two criteria, sample size (NEFA = 235; NCFA = 235) was moderately sufficient. On the other hand, in terms of the second criterion (6-item scale), the sample size is accepted. As a matter of fact, this decision was supported by the results of Kaiser-Meyer-Olkin sample adequacy test performed before EFA. The value calculated from this test shows that the sample adequacy of 0.817 is “very good” (KMO> 0.80).

b. The appropriateness of the data for factorization: The anti-image covariance matrix was examined to check whether the data were appropriate for the factorization. If the diagonal values of this matrix are greater than 0.500, the data is appropriate for factorization. All the diagonal values of the anti-image matrix range from 0.449 to 0.795. Accordingly, it can be asserted that the data are appropriate for factorization.

c. Multicollinearity and singularity: Correlation coefficients between items were calculated to check whether there was a multiple relationship between the items. In addition, the obtained determinant value was checked. If the determinant value calculated for correlation coefficients is greater than .00001, it indicates that there is no multiconnection problem. The correlation coefficient obtained between the items should be less than 0.900. In the analysis, the correlation coefficients between items ranged between 0.650 and 0.208. In addition, the determinant value was determined as 0.120. According to these results, it can be said that there is no multicollinearity problem.

d. Examining of the difference from unit matrix: The Barlett Sphericity test was used to investigate whether the correlation matrix differs from the unit matrix. The relationship between variables obtained with this test shows that the data is appropriate for factor analysis. According to the Barlett Sphericity test, the correlation matrix differs significantly from the unit matrix, $\chi 2$ (15) = 489.901; p <0.050.

Performing Exploratory Factor Analysis

After examination of the assumptions, EFA was performed on the data set. The results obtained from the EFA are presented in Table 5.

Table 5.

Results of Exploratory Factor Analysis

Item number	Component (Factor) 1
i1	0.531
i2	0.567
i3	0.730
i4	0.801
i5	0.827
i6	0.835
Eigenvalue = 3.159	
Total variance explained= %52.658	

According to the results of the EFA presented in Table 5, item factor loadings range from between 0.531 and 0.835. This result shows that factor loadings of all items are quite sufficient (> 0.400). In addition, the total variance explained by the single factor is 52.658%. When all these results are considered, it can be asserted that the single factor structure of the original scale also explored for Turkish culture. When the error variance matrices provide checking the factor analysis were examined, it was concluded that all the values on this matrix were greater than 0.050. This result indicates that the factor analysis process is appropriate. The scree plot obtained as a result of EFA is given in Figure 1.

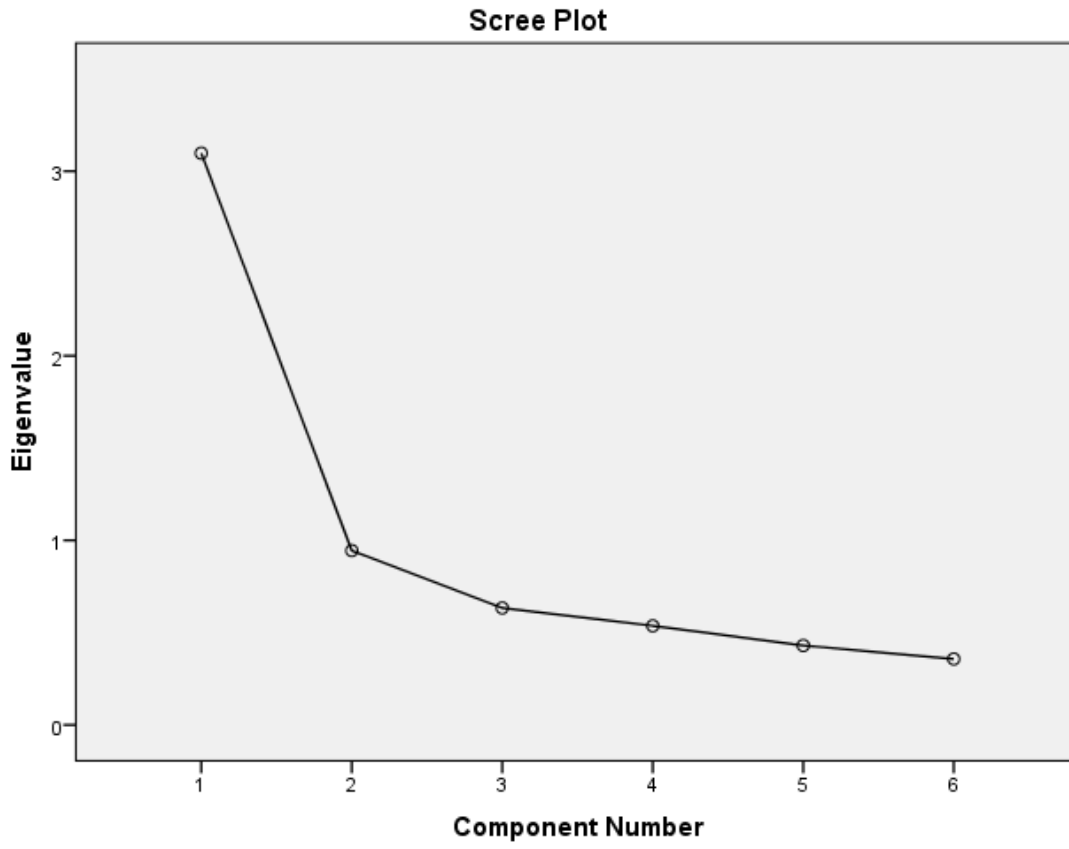

Figure 1. Scree Plot obtained from EFA.

The single factor structure of the scale for Turkish culture is supported with the scree plot. In the scree plot, the breakpoint is the eigenvalues shown in the y-axis. Accordingly, only one factor with an eigenvalue above 1 was determined.

Performing Confirmatory Factor Analysis

Firstly, in order to determine the estimation method to be used in the confirmatory factor analysis process, the skewness and kurtosis coefficients of the items were examined. According to the results, the skewness coefficients of the items were -0.243 - 1.203; kurtosis coefficients range between -0.916 - 0.773. Considering the skewness and kurtosis coefficients, it was interpreted that the score distributions of all items were distributed normally. Since Likert type data is assumed as continuous data (Wang and Wang 2012), maximum likelihood estimation method is often preferred for CFA when the items scores provide normal distribution. However, likert type data is ordinal structure so the matrices used in CFA should be determined according to this situation. Weighted Least Squares (WLS) method is proposed as an estimation method in such data of ordinal structure (Jöreskog and Sörbom, 1999; Floara and Curran, 2004). WLS estimation method uses asymptotic covariance and correlation matrices in the analysis

process (Jöreskog and Sörbom, 1999). In the light of all this information, WLS was chosen as the estimation method in the CFA process considering the accuracy of the results obtained in the study. Fit indexes, item factor loadings explained variance ratios and t values are presented. Fit indexes obtained as results of CFA are given in Table 6.

Table 6.

Fit indexes result obtained by CFA

Fit Index	Excellent	Admissible	Value	Decision
RMSEA	0.00 ≤ RMSEA < 0.05	0.05 ≤ RMSEA ≤ 0.08	0.092	Poor
CFI	0.95 ≤ CFI ≤ 1.00	0.90 ≤ CFI < 0.95	0.95	Excellent
GFI	0.95 ≤ GFI ≤ 1.00	0.90 ≤ GFI < 0.95	0.99	Excellent
AGFI	0.90 ≤ AGFI < 1.00	0.85 ≤ AGFI < 0.90	0.97	Excellent
SRMR	0.00 ≤ SRMR ≤ 0.05	0.05 < SRMR ≤ 0.10	0.067	Admissible
NFI	0.95 ≤ NFI ≤ 1.00	0.90 ≤ NFI < 0.95	0.93	Admissible
TLI/NNFI	0.97 ≤ NNFI ≤ 1.00	0.95 ≤ NNFI < 0.97	0.92	Poor
$\chi 2$ /sd	0 ≤ $\chi 2$ /sd ≤ 2	$\chi 2$ /sd ≤ 8df	2.96	Excellent

When the fit indexes given in Table 6 are examined, it is determined that the scale structure is confirmed by most fit indexes. However, as the results of the RMSEA and TLI fit indexes indicate poor fit, it was decided to examine the modifications proposed by the program. According to the proposed modifications, it is seen that the relationship between the error variances of items 1 and 2 will provide a reduction of chi-square value of 10.00. No other modification was proposed. By examining the expressions in the items, it was decided that these two items error variances were related, and the modification was carried out. Fit indexes obtained after the modification is presented in Table 7.

Table 7.

Fit indexes result of carried out modifications

Fit Index	Excellent	Admissible	Value	Decision
RMSEA	.00 ≤ RMSEA < .05	.05 ≤ RMSEA ≤ .08	0.068	Admissible
CFI	.95 ≤ CFI ≤ 1.00	.90 ≤ CFI < .95	0.98	Excellent
GFI	.95 ≤ GFI ≤ 1.00	.90 ≤ GFI < .95	0.99	Excellent
AGFI	.90 ≤ AGFI < 1.00	.85 ≤ AGFI < .90	0.98	Excellent

SRMR	.00 ≤ SRMR ≤ .05	.05 < SRMR ≤ .10	0.044	Excellent
NFI	.95 ≤ NFI ≤ 1.00	.90 ≤ NFI < .95	0.96	Excellent
TLI/NNFI	.97 ≤ NNFI ≤ 1.00	.95 ≤ NNFI < .97	0.96	Admissible
χ 2 /sd	0 ≤ χ 2 /sd ≤ 2	χ 2 /sd ≤ 8df	2.09	Admissible

The fit indexes presented in Table 7 indicate that the one-dimensional structure of the scale was confirmed after the modification between items 1 and 2. For all fit indexes, model fit is at least acceptable. Most of fit indexes showed excellent fit. Accordingly, it is possible to say that the one-dimensional structure of the scale was confirmed in Turkish culture. Factor loadings explained variance ratios and t values of the items are reported in Table 8.

Table 8.

Item parameters results obtained by CFA

Item number	t value	Factor Loading	R^2
i1	31.826	0.570	0.320
i2	30.522	0.500	0.250
i3	41.257	0.580	0.340
i4	37.060	0.810	0.650
i5	33.430	0.770	0.590
i6	31.630	0.750	0.570

According to the item parameters reported in Table 8, all t values of the items were found to be significant at the level of 0.01 (t> 2.58). The item multiple correlation coefficient squares (R2) ranged from 0.250 to 0.650. The variance explanation ratios of each item in the latent variable are between 29% and 66%. The path diagram for the last model is shown in Figure 1.

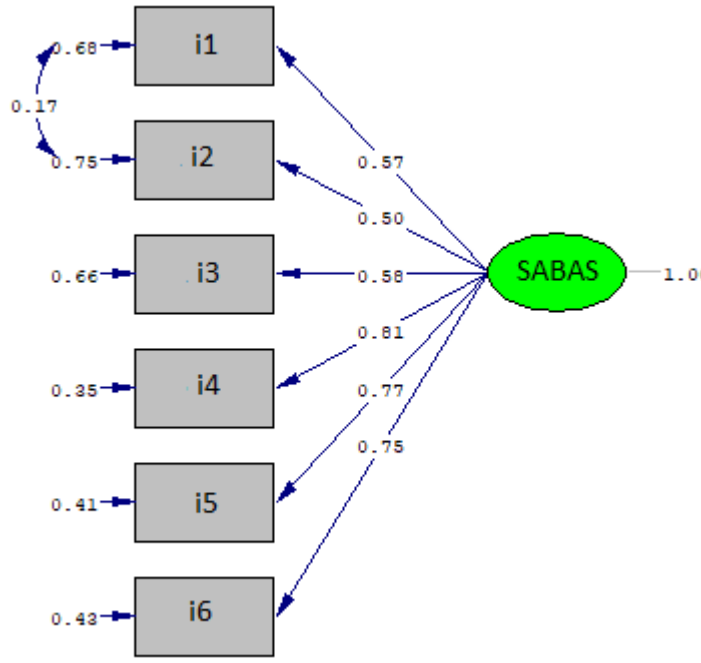

Figure 2. Path diagram of SABAS

When the path diagram given in Figure 2 is examined, it is concluded that the standardized factor loadings of the items range between 0.500 and 0.810. The highest loading was calculated for item 5. The lowest loading was determined for item 2.

Calculation of Cronbach Alpha coefficient

The Cronbach's Alpha coefficient was calculated as 0.810 for the six-item one-dimensional scale. This result is the same as the one obtained in the development of the scale. Moreover, this coefficient indicates that the internal consistency of the scale is sufficient (> 0.70).

Calculation of Test-retest reliability coefficient

For the test-retest reliability analysis of the scale, two applications were performed with the participation of 66 students at 4-week intervals. The correlation coefficient was calculated between the pre- and post-application scores obtained. For this purpose, firstly the normality of the scores obtained from two different applications were examined by Kolmogorov Smirnov test. According to the results of this test, both application scores show normal distribution. In line with this result, the relationship between two application scores was calculated by using Pearson Moments coefficient which is the parametric correlation coefficient. The results of test-retest reliability are presented in Table 9.

Table 9.

Results of Test-retest reliability coefficient

		Pre-Application	Post Application
Pre-Application	Pearson Moment Correlation Coefficient	1.000	0.925**
	p		0.000
	N	66	66
Dpre(66)=0.074; p>.05			
Dpost(66)=0.073; p>.05			

**p<0.01

The results presented in Table 9 show that the stability of the scale is high. In other words, the relationship between the pre and the post application was significant high positively. This result shows that the application scores move in the same direction and in a similar amount. According to Cronbach Alpha and test-retest reliability coefficients, it can be asserted that the scale gives reliable results in the target culture.

As a result of the reliability and validity analyses, the adaptation process of the SABAS was completed. According to this, it has been shown that the scale structure, which is a one-dimensional and consist of 6-item in the original culture, is reliable in other words the scale has high internal consistency and stability in Turkish culture. According to results of the criterion and construct validity studies, the scale was proved to be a valid structure in Turkish culture.

4. CONCLUSION AND DISCUSSIONS

In order to adapt the application-based smartphone addiction scale to our country's culture, some validity and reliability analyses were conducted within the scope of this study. Cronbach Alpha internal consistency coefficient of the scale was found to be 0.810. This result was the same as the internal consistency coefficient obtained from the British culture in the original study (Csibi et al., 2018) and it was interpreted that the reliability of the scale was sufficient (Nunnally, 1987; Cortina, 1993). In addition, the test-retest measurement with 66 participants at 4-week intervals revealed a significant, positive and high correlation between pre- and post-measurements at the level of 0.925. In terms of construct validity of the scale, EFA was performed first. The EFA yielded a one-dimensional structure similar to the results of the original study (Csibi et al., 2016; Csibi et al., 2018). Factor load values ranged from 0.531 to 0.835, and the explained variance was 52.658%. These values are accepted as sufficient for the factor structure of the scale (Thompson, 2004; Kline, 2014). In addition, the results of the CFA related to

the factor structure of the scale were considered to be excellent or acceptable fit indices (Hooper, Coughlan & Mullen, 2008; Tabachnick and Fidell, 2007). In addition, as in the original scale, the correlation analysis with Nomophobia scale for evidence of criterion validity showed a positive and significant correlation between the two scales at the level of 0.584. According to this result, it can be said that the criterion-related validity of the scale is high.

According to the model that Griffiths (1999, 2000) explained behavioural addiction, it was seen that SABAS which was developed on Hungarian culture (Csibi et al., 2016) and adapted in British culture (Csibi et al., 2018) can be used in our country's culture. In addition, the scale was found to be a valid and reliable tool that can be used in Iranian culture in its original form (Lin et al., 2018). When the validity and reliability results were evaluated in general, it was seen that the one-dimensional application-based smartphone addiction scale had valid and reliable results.

References

Aktaş, H., & Yılmaz, N. (2017). Üniversite gençlerinin yalnızlık ve utangaçlık unsurları açısından akıllı telefon bağımlılığı. *International Journal of Social Sciences and Education Research*, *3*(1), 85-100.

Alfawareh, H. M., & Jusoh, S. (2014). Smartphones usage among unıversıty students: Najran Unıversıty case. *International Journal of Academic Research*, *6*(2). 321-326

Bian, M., & Leung, L. (2015). Linking loneliness, shyness, smartphone addiction symptoms, and patterns of smartphone use to social capital. *Social Science Computer Review*, *33*(1), 61-79.

Bozkurt, H., Şahin, S., & Zoroğlu, S. (2016). İnternet bağımlılığı: Güncel bir gözden geçirme. *Journal Of Contemporary Medicine*, *6*(2), 1-13.

Choi, S. W., Kim, D. J., Choi, J. S., Ahn, H., Choi, E. J., Song, W. Y., ... & Youn, H. (2015). Comparison of risk and protective factors associated with smartphone addiction and Internet addiction. *Journal of Behavioral Addictions*, *4*(4), 308-314.

Csibi, S., Demetrovics, Z., & Szabo, A. (2016). Hungarian adaptation and psychometric characteristics of Brief Addiction to Smartphone Scale (BASS). *Psychiatria Hungarica*, *31*(1), 71-77.

Csibi, S., Griffiths, M. D., Cook, B., Demetrovics, Z., & Szabo, A. (2018). The psychometric properties of the smartphone application-based addiction scale (SABAS). *International Journal of Mental Health and Addiction*, *16*(2), 393-403.

Field, A. (2009). *Discovering statistics using SPSS*. Sage publications.

Flora, D. B., & Curran, P. J. (2004). An empirical evaluation of alternative methods of estimation for confirmatory factor analysis with ordinal data. *Psychological Methods*, *9*(4), 466.

George, D., & Mallery, P. (2010). SPSS for Windows step by step. A simple study guide and reference (10th Edit).

Griffiths, M. (1999). Internet addiction: Fact or fiction? T*he Psychologist, 12*(5), 246-250.

Griffiths, M. (2000). Does Internet and computer" addiction" exist? Some case study evidence. *CyberPsychology and Behavior*, *3*(2), 211-218.

Hambleton, R. K., & Patsula, L. (1999). Increasing the validity of adapted tests: Myths to be avoided and guidelines for improving test adaptation practices. *Journal of Applied Testing Technology*, *1*(1), 1-13.

Hawi, N. S., & Samaha, M. (2016). To excel or not to excel: Strong evidence on the adverse effect of smartphone addiction on academic performance. *Computers & Education*, *98*, 81-89.

Hooper, D., Coughlan, J., & Mullen, M. (2008). Structural equation modelling: Guidelines for determining model fit. *Electronic Journal of Business Research Methods*, 6(1), 53-60

Hu, S., & Oakland, T. (1991). Global and regional perspectives on testing children and youth: An empirical study. *International Journal of Psychology*, *26*(3), 329-344.

Jöreskog, K. G., & Sörbom, D. (1999). LISREL 8.30 and PRELIS 2.30. *Chicago: Scientific Software International*.

Kline, P. (2014). *An easy guide to factor analysis*. Routledge.

Kline, R. B. (1998). Software review: Software programs for structural equation modeling: Amos, EQS, and LISREL. *Journal of Psychoeducational Assessment*, *16*(4), 343-364.

Kuss, D. J., Griffiths, M. D., & Pontes, H. M. (2017). Chaos and confusion in DSM-5 diagnosis of Internet Gaming Disorder: Issues, concerns, and recommendations for clarity in the field. *Journal of Behavioral Addictions*, *6*(2), 103-109.

Kuss, D. J., Kanjo, E., Crook-Rumsey, M., Kibowski, F., Wang, G. Y., & Sumich, A. (2018). Problematic mobile phone use and addiction across generations: The roles of psychopathological symptoms and smartphone use. *Journal of Technology in Behavioral Science*, *3*(3), 141-149.

Lee, S. (2007). *Structural Equation Modelling: A Bayesian Approach.* England: John Wiley& Sons, Ltd.

Lin, C. Y., Imani, V., Broström, A., Nilsen, P., Fung, X. C., Griffiths, M. D., & Pakpour, A. H. (2018). Smartphone Application-Based Addiction Among Iranian Adolescents: A Psychometric Study. *International Journal of Mental Health and Addiction*, Online First. 1-16.

Öner, N. (2008). Türkiye'de kullanilan psikolojik testlerden örnekler, bir basvuru kaynagi (2. basim). *Istanbul: Bogaziçi Üniversitesi Yayımevi*.

Parasuraman, S., Sam, A. T., Yee, S. W. K., Chuon, B. L. C., & Ren, L. Y. (2017). Smartphone usage and increased risk of mobile phone addiction: A concurrent study. *International Journal of Pharmaceutical İnvestigation*, *7*(3), 125-131.

Samaha, M., & Hawi, N. S. (2016). Relationships among smartphone addiction, stress, academic performance, and satisfaction with life. *Computers in Human Behavior*, *57*, 321-325.

Selvaganapathy, K., Rajappan, R., & Dee, T. H. (2017). The effect of smartphone addiction on craniovertebral angle and depression status among university students. *International Journal of Intagrative Medical Sciences*, *4*(5), 537-542.

Sha, P., Sariyska, R., Riedl, R., Lachmann, B., & Montag, C. (2018). Linking Internet Communication and Smartphone Use Disorder by taking a closer look at the Facebook and WhatsApp applications. *Addictive Behaviors Reports*, (Online First) doi.org/10.1016/j.abrep.2018.100148.

Tabachnick, B. G, & Fidel, L. S. (2007). *Using Mulivariate Statistics*. MA: Allyn&Bacon, Inc.

Thompson, B. (2004). *Exploratory and confirmatory factor analysis: Understanding concepts and applications.* American Psychological Association.

Wang, J., & Wang, X. (2012). Structural equation modeling: Applications using Mplus. John Wiley & Sons.

Widyanto, L., & Griffiths, M. (2006). 'Internet addiction': a critical review. *International Journal of Mental Health and Addiction*, *4*(1), 31-51.

Xu, J. (2015). Investigating factors that influence conventional distraction and tech-related distraction in math homework. *Computers & Education*, *81*, 304-314.

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

Zhao, S., Ramos, J., Tao, J., Jiang, Z., Li, S., Wu, Z., ... & Dey, A. K. (2016, September). Discovering different kinds of smartphone users through their application usage behaviors. In *Proceedings of the 2016 ACM International Joint Conference on Pervasive and Ubiquitous Computing* (pp. 498-509). ACM.