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Original Article

Cross Cultural Adaptation and Psychometric Evaluation of the Short Version of Smart Phone Addiction Scale in the Persian Language

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Abstract

Objective: The addiction pattern of smartphone usage has increased concerns about potential complications. The Smartphone Addiction Scale (SAS), a self-administered questionnaire, evaluates smartphone usage and dependency. The study's purpose was to translate and culturally adapt the SAS short-version into the Persian language (SAS-SV-Pr), and evaluate its psychometric properties.

Method: The SAS-SV translation used standardized procedures that involved double-forward and backward translations. A convenience sample, from three medical universities in the city of Teheran (n = 250 students), was recruited to complete the SAS-SV and the Internet Addiction Test (IAT). The content validity index (CVI) and the floor and ceiling effect were considered to evaluate content validity. To evaluate internal consistency and test-retest reliability, Cronbach's Alpha and the Intra-class Correlation Coefficient (ICC2.1) were utilized respectively. Criterion validity was measured by calculating Pearson's correlation coefficient for the total scores of SAS-SV-Pr and IAT (Pearson's r correlation coefficient). Construct validity was evaluated using exploratory factor analysis (EFA) and ratified with confirmatory factor analysis (CFA).

Results: During translation and cultural adaptation, only minor wording changes were performed. The correlation between the SAS-SV-Pr and IAT was good (r = 0.57), which determined validity. There was high internal consistency (α = 0.88), split-half reliability (0.84), composite reliability (CR) (0.78) and test-retest reliability (ICC (2.1) = 0.89). Subsequent EFA demonstrated an ambiguous factor structure, being border-line between one- and two-factors, which explained 50.28% of total variance. The CFA confirmed that the two-factor solution was preferred. Our data did not show floor or ceiling effects.

Conclusion: The Persian SAS-SV is a two-factor structure outcome measure to evaluate the dependency of smartphone users. It has demonstrated satisfactory psychometric properties for validity, reliability and factor structure, and is suitable for screening and research aims among Persian subjects.

Key words: *Addiction; Psychometrics; Persian; Smartphone; Validation*

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The smartphone, as a type of mobile device, is used globally for communication in multiple formats. It also provides a diverse range of applications (Apps) that are advantageous and facilitate the modern way of life (1). Some new and convenient smartphone Apps include bank transaction Apps, game counsel Apps, computing characters, television program Apps, virtual reality applications, Apps for entertainment purposes, social and network media Apps, and Apps for internet access (2). The smartphone is one of the most common devices used to access the Internet in the majority of countries, with the highest number being in China, India, and the United States. The proportion of smartphone users has continuously expanded worldwide because of its advantages, affordability and convenience, so that from 2016 to 2020, the user rate increased from 2.5 to 3.5 billion, almost one third of world's population (3). In 2019, China had more smartphone users than any country in the world at over 850 million. Iran is the world's twelfth highest smartphone user with over 45 million users in 2019, with a 20-fold increase on the two million users noted in 2013 (3).

Smartphone use provides multiple benefits and enjoyment for individuals and society; but, as with other new technology and devices, use can become excessive, uncontrolled and addictive. In this situation, such use becomes associated with negative effects such as poor psychological health due to anxiety and depression (4), poor performance, less attention during work (5), musculoskeletal disorders (6), and disturbances in social interaction (7). These factors can interfere with work, daily activities, and relationships (8). The most common social problems, as a result of smartphone addiction, can be signified as cravings, tolerance, withdrawal, disturbance in performing daily activities, and a preference of cyberspace-oriented relationships. These attributes are discussed in the research related to the development of the Smartphone Addiction Scale (SAS) (9).

The SAS was first presented by Kwon *et al.* (10) in 2013 as a validated self-diagnostic scale to help identify smartphone addicts, and distinguish those at risk of device dependency and identify the level of this dependency (10). Following its introduction, other self-report tools were developed and validated to further this area of research into social behavior and addiction. In a systematic review article by Harris *et al.* (11), the specific scales that are developed and validated to assess pathological smartphone use and smartphone dependency are categorized. This included the Smartphone Addiction Inventory (SPAI) provided by Lin *et al.* (12), the SAS by Kwon (10), Problematic Mobile Phone Use (PUMP) by Merlo (13), the updated Problematic Mobile Phone Use Questionnaire (PMPU-Q-R) by Kuss (14) and the Smartphone Addiction Proneness scale (SAPS) by Kim *et al.* (15). Theoretically the bases of these scales are mostly similar and were extracted from earlier questionnaires; that is, from the Diagnostic and Statistical Manual of Mental Disorders, fourth Edition (DSM-IV), for gambling disorders or the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V) for substance abuse (11).

The SAS, however, remains the screening instrument most frequently used in recent studies, and has been translated into various languages such as Turkish (1), Malay (16), Arabic (2) and Persian (17). A further advantage of the SAS is the presentation and validation of the shortened version (SAS-SV) which screens for problems related to smartphone overuse syndromes such as control loss, withdrawal, disregard, disruption, tolerance and preoccupation (18). Another advantage of the SAS-SV was the suggested cut-off point to detect the person at the risk of smartphone addiction, which is not provided in other questionnaires (19). Developing or adapting a useful, simple, short, fast-completion, and functional Patient Reported Outcome Measure (PROM) helps clinicians and researchers identify and screen subjects for smartphone addiction (1). The Turkish (20), Italian (21), Spanish-French (18), Chinese (22), Brazilian (23), and Arabic (2) adaptations of the SAS-SV have been produced and are reported in the literature; however, there is no Persian SAS-SV. Additionally, to our knowledge, no Persian version has been developed for the SPAI or SAPS.

Consequently, the major purposes of the current study include: a) performing translation and related cultural adaptation of the SAS-SV for Persian subjects; b) psychometric property evaluation, which includes evaluation of reliability and validity, in a young adult student population.

Materials and Methods

This study was cross-sectional and was conducted over two phases: first, translation and cross-cultural adaption; then, psychometric evaluation including validation through face, content, criterion and factor structure evaluation, where criterion validity considered the Internet Addiction Test (IAT) (24) as the external standard. For evaluation of reliability, test-retest and internal consistency analysis were performed.

Instruments

Two questionnaires were provided to all subjects for completion, the SAS-SV and the IAT.

Smartphone Addiction Scale-Short Version (SAS-SV): The SAS-SV is a short form of the original SAS developed by Kown *et al.* The SAS-SV is a self-reported scale with 10 items on a six-point Likert-scale (anchored negatively at ''Strongly Disagree'' = 1, and positively at ''Strongly Agree'' = 6) where greater pathological smartphone use is indicated by a higher score, and the same scaling is utilized as the original SAS (9). The total score range is 10-60 and the original short form was extracted from the 33 items of the original version which was developed by an expert panel and based on the content validity index (CVI) scores. The original short

version presented a single factor structure for the scale but did not complete a confirmatory factor analysis (CFA) or Rasch analysis (9). The original short version reported 31-points as the cut-off for men and 33-points for women in order to identify problematic use of smartphones (9).

Internet Addiction Scale (IAT): the common widely used tool for measuring Internet addiction is the IAT, which was established by Kimberly Young to evaluate problems that resulted from excessive use of the internet (25). The IAT instrument covers the level of effect that Internet use has on the daily routine of an individual as well as on their social interaction, sleeping quality, feelings and productivity. The IAT has 20 items, on a five-point Likert-scale (1-5), where a higher mean score indicates greater internet dependency. The IAT has a total score range of 20-100, and mean scores above 50 and 80 are considered as moderate and severe addiction, respectively (25). The Persian IAT was published in 2015 and was shown to be valid using both internal consistency (Cronbach's alpha = 0.917) and reliability (r = 0.884) (24).

Translation and cross-cultural adaptation

To begin the study, the investigators obtained permission from the developer of the measure to use it. The translation with cultural adaptation was conducted in line with the reported guidelines and previous published research on health status measures (26, 27).

The original questionnaire was forward-translated into the Persian language by two separate translators who were native Persian-speakers; one was aware of the study and was familiar with medical concepts, the other translator had no background in medicine. The resulting forward translations were discussed by the research team and both translators, with a synthesis being formed. The consensus version was back-translated into the English language by two further independent translators whose native language was English. In an expert-panel that consisted of a methodologist, two Psychiatrists, an occupational therapist, a psychologist and the four translators, any discrepancies were discussed. A pre-final consensus Persian version of the SAS-SV was achieved (28). The obtained version was then tested on a pilot cohort of 20 smartphone users through a short interview in order to detect any difficulties in comprehension or any confusing items, to find possible alternative words, and to assess face validity through evaluating readability, feasibility, clarity of language, interpretation, appearance style format and cultural relevance. Most users found the items of the questionnaire easy to read, with good appearance, easy to understand and interpretable to their conditions; but some minor revisions were suggested which were applied prior to the final established SAS-SV-Pr.

Participants

A convenience sample of 250 medical students were recruited from three different Universities in Tehran, Iran, by one of the authors (HR.M) through the social media since October 2019 to January 2020. An additional 20 smartphone users were recruited for face validity assessment in the pilot study. For evaluation of test-retest reliability, a random sample of smartphone users (n = 50) from the original group completed the scale a second time at an interval of one week. Inclusion criteria included subjects that were smartphone users, aged above 18 years, had good Persian language comprehension and who signed an online consent form.

This study received approval from the University of Social Welfare and Rehabilitation Sciences (USWR) ethics committee (IR.USWR.REC.1399.124).

Statistical Analysis

The statistical procedures for all analyses were performed with IBM SPSS 16, except for confirmatory factor analysis where Lisrel 8.8 was used. The level of statistical significance was set at $\alpha < 0.05$. To quantify the demographic features of participants, descriptive statistics were employed. Frequency, mean, and standard deviations (SD) were determined for the items and total scores. The final Persian short version of the questionnaire was evaluated for psychometric properties including reliability, construct validity (Exploratory Factor Analysis (EFA), CFA), concurrent validity, content validity (CVI), and the presence of any floor and ceiling effects.

Reliability

To determine reliability, four analyses were conducted that included test-retest reliability, Composite Reliability (CR), internal consistency, and Split-half reliability. The Intra-class Correlation Coefficient (ICC2, 1, CI = 95%) was used for test-retest reliability in a sub-group of the total participants (n = 50) who completed the SAS-SV-Pr at baseline and one week later. An ICC value above 0.75 is considered as good-excellent reliability (29).

Internal consistency describes the inter-relation of the items of a questionnaire or its related subscales. Internal consistency was assessed using the Cronbach's alpha (α) coefficient, Split-half reliability (30) and Composite Reliability (CR). These criteria were considered adequate when the obtained value was above 0.70 for α, CR and the Split-half reliability (31-33).

Validity

Content validity

Content validity utilized the CVI at the item (I-CVI) and scale (S-CVI) levels (34) using a four-point Likert scale (1-4) questionnaire in 3-themes: relevance, comprehensiveness and comprehensibility (35). The proportion of expert responses recorded as "quite-relevant" or "highly-relevant" was considered as the I-CVIs, while the average of all I-CVIs reflected the S-CVI. For any I-CVI value > 0.78 and S-CVI values > 0.90, it was deemed that there is evidence of acceptable content validity (34). The presence of any floor and ceiling effect was also considered as an outcome indicating good content validity, where the cutoff for both floor and ceiling effects was determined as the participants' response scores that fall within the 15%

maximum or minimum limits of the total scores (31). The participants with the lowest (10) or highest (60) possible scores prevent the correct measurement of validity and reliability. The floor and ceiling effect was calculated in the total population (n = 250).

Concurrent Validity

In general, validity is considered as a scale's ability to measure what it is intended to measure. In this study, the IAT was used to evaluate the SAS-SV's concurrent validity against that of a recognized criterion standard, the IAT, where Pearson's correlation coefficient between the scores of each scale was calculated.

Construct validity

Construct validity in this study was evaluated through factor analysis where the scales' factor structure was assessed through an initial EFA with maximum likelihood extraction (MLE). The data's normality was determined from calculations of both Kurtosis (±7) and skewness (±3). Distribution of missing data was checked through determination of multiple imputations with the participants' mean score response used to replace any missing values (36).

Extracted factors were rotated by varimax rotation (37). The sampling adequacy for each variable was determined from the Kaiser-Meyer-Olkin (KMO) value with the data's Factor Analysis suitability verified through Bartlett's test of sphericity ($P < 0.001$). The acceptable limit of KMO is 0.7 (38). Three a-priori criteria were employed for factor extraction where a minimum of two were required: the inflection point of the scree plot with Eigenvalues being > 1.0, and total variance being > 10%.

To verify the EFA findings of a two factor structure, a CFA was performed using Lisrel 8.8. The following indices were investigated to examine the goodness-of-fit between the original model and the study sample data: The Normal Theory Weighted Least Squares Chi-Square, the root mean square error of approximation (RMSEA), Standard Root Mean Square Residual (SRMR), Minimum Discrepancy Function divided by the Degrees of Freedom (CMIN/DF), the comparative fit index (CFI), a normalized fit index (NFI), a Goodness of Fit Index (GFI), and the Tucker-Lewis Index (TLI). The following criteria were used for evaluation: normed chi-square < 5 and preferably < 2 (39), RMSEA and SRMR < 0.08 (39), CMIN/DF < 3 is excellent and < 5 good, CFI, GFI, NFI and TLI > 0.90 (40). These indices indicated whether the model's fit to the data was satisfactory.

Results

Participants' characteristics

The descriptive results for participants (n = 250) are presented in Table 1. The mean (SD) age was 24.34 (3.99) years and there were relatively fewer males (45.6%) than females (54.4%). Most participants noted their marital status as 'single' (62.4%).

Table 1. Participants' Demographic Characteristics and Smartphone Pattern of Use (n = 250)

Variables		Total sample	Male sample n = 114	Female samples n = 136
Age (mean ± SD)		24.3 (3.9)	23.7 (3.8)	24.7 (4.05)
Marital status	Single	156 (62.4%)	61(53.5%)	95 (69.8%)
	Married	94 (37.6%)	53 (46.5%)	41 (30.2%)
Smartphone use / purpose	Social Network	64 (25.6%)	24 (21%)	40 (29.4%)
	Chat	62 (24.8%)	34 (29.8%)	28 (20.5%)
	Email	28 (11.2%)	12 (10.5%)	16 (11.8%)
	Search	13 (5.2%)	9 (7.8%)	4 (2.9%)
	Read news and books	29 (11.6%)	11 (9.6%)	18 (13.2%)
	Combination of the above	26 (10.4%)	11 (9.6%)	15 (11.1%)
	Others	28 (11.2%)	13 (11.4%)	15 (11.1%)

Cross-cultural adaptation process

To adapt a new version of a scale for the intended population, the cultural-linguistic process must also be performed in an appropriate way. During the process of translation, no major problems or disagreements were reported. Minor modifications were suggested by participants for the understanding of item-5; hence, it was revised with the final consensus in the Persian language reached as "I am restless and worried when I don't have my cellphone in hand." All pilot study participants (n = 20) reported no difficulty in understanding the concepts and items. Some minor changes were made by the expert committee according to the user feedback such as adding the word "telegram" in item-8 because of the frequency of use of the telegram application among Persian speaking cultures.

Psychometric properties

Content validity

The results calculated for the CVI showed an acceptable level of content validity for the Persian SAS-SV based on the expert panel's opinion. The specific calculated I-CVI values for each item were accordingly: item 3 = 0.81, items 1, 5, 7 = 0.86, items 2, 10 = 0.94, and for the other items it was CVI = 1. Also, an excellent content validity was obtained for this scale (S-CVI = 0.93) (41). The floor and ceiling effects were 0.4% which was

below the 15% cut-off and indicated neither floor nor ceiling effects for respondents; thus, indicating a satisfactory content validity for the SAS-SV -Pr.

Reliability

Test-retest reliability results (n = 50) showed a good correlation between the baseline and the repeated measure at the one-week interval (ICC (2, 1) = 0.89; 95%, CI 0.77-0.94). Factor analysis extracted two factors. Hence, the ICC for these two factors was measured and both indicated a high reliability at ICC2.1 = 0.90 and 0.87, respectively. We also determined internal consistency for all 10 items, with the results noting a high correlation between items (Cronbach's alpha = 0.88) (Table 2). Also, the values of split-half coefficient (= 0.84), and CR (= 0.78) were obtained.

Table 2. Descriptive Statistics and Item Analysis of Persian Smart Phone Addiction Scale-Short Version (n = 250)

Items	Mean	Standard deviation	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
S1	3.68	1.35	0.67	0.86
S2	3.36	1.40	0.67	0.86
S4	3.61	1.34	0.57	0.87
S4	2.48	1.37	0.51	0.87
S5	3.42	1.44	0.70	0.86
S6	3.36	1.47	0.59	0.87
S7	2.42	1.44	0.55	0.87
S8	3.66	1.45	0.58	0.87
S9	3.90	1.37	0.57	0.87
S10	2.74	1.39	0.63	0.86

Concurrent validity

The correlation between the total scores of the Persian SAS-SV and IAT was 'moderate' (r = 0.57; P < 0.001), indicating acceptable concurrent validity (42, 43).

Construct validity

Results of the EFA showed a satisfactory KMO value (0.86) and Barlett's Test of Sphericity (P < 0.001) indicating a suitable correlation matrix for the SAS-SV (38). This demonstrated that the correlation matrix was unlikely to be an identity matrix and, consequently, that the MLE was appropriate. The scree plot (Figure 1) indicated a potential one-factor structure, as determined by the position of the inflection point at the second factor. However, for all three a-priori factors, the remaining two gave Eigenvalues greater than 1 and a variance above10%. The factor analysis results suggested a two factor structure based on the a-priori requirements of Eigenvalues > 1.0, and a satisfactory percentage of total variance accounted for 50.28% of variance (44). This EFA indicated an ambiguous or borderline one to two factor solution. The extracted item loading based on the two-factor solution determined by the MLE method, and the average item score are both presented in Table 3. The CFA method was performed to clarify the factor structure and the commonly reported fit indices, and showed that the two factor model had adequate fitness indicators. The two dimensional model revealed an acceptable fit to the data with a CFI of 0.94, TLI of 0.90, GFI of 0.90, NFI of 0.93, RMSEA of 0.113 (90%C.I., (0.095; 0.13)), SRMR of 0.073, (CMIN/DF) = 4.1 and a $\chi 2$ = 142.81, as well as a DF = 34 (P < 0.001). For this two-factor model, all item factor loadings were found to be statistically significant while the standardized estimates range was between 0.47 and 0.86 (Figure 2).

Table 3. Exploratory Factor Analysis: Factor Loadings and Total Variance Explained for the Final Rotated Two-Factor Structure

Item	Explanation	Factor 1	Factor 2
1	Missing planned work	0.80	
2	Hard time concentrating [assignments/working position]	0.96	
3	Feeling pain [wrists/back of the neck]	0.54	
4	Unable to stand not having a smartphone		0.35
5	Feeling impatient and fretful [when not holding the smartphone]		0.83
6	Having my smartphone in my mind [even when not using it]		0.84
7	Never giving up my smartphone [even when daily life is affected]		0.34
8	Constantly checking my smartphone [not to miss conversations]		0.60
9	Using my smartphone longer [than intended]		0.42
10	[People around me tell me] I use my smartphone too much		0.43
	% of Variance	25.99	24.28

Extraction: Maximum Likelihood (MLE). Rotation: Promax with Kaiser Normalizatio

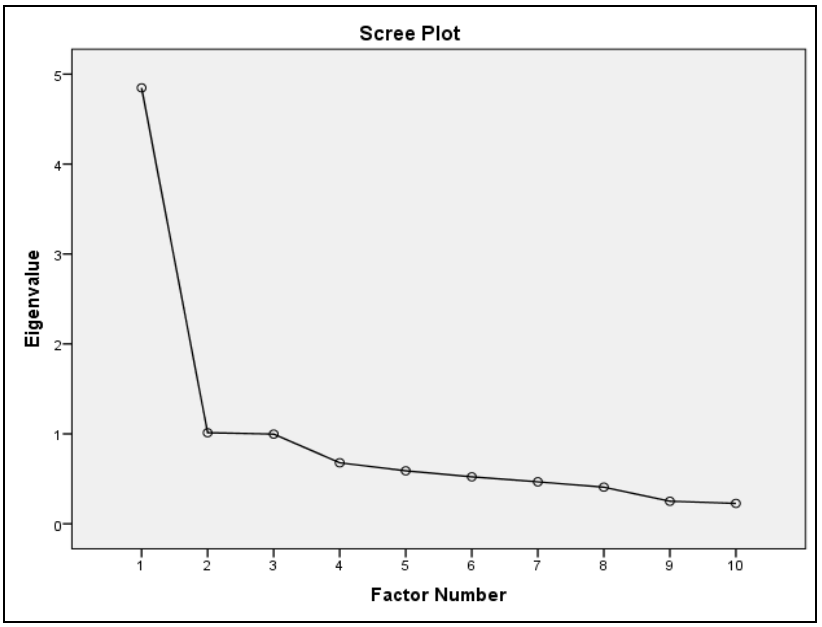

Figure 1. The Scree Plot for the 10 Items of the Persian Smart Phone Addiction Scale-Short Version

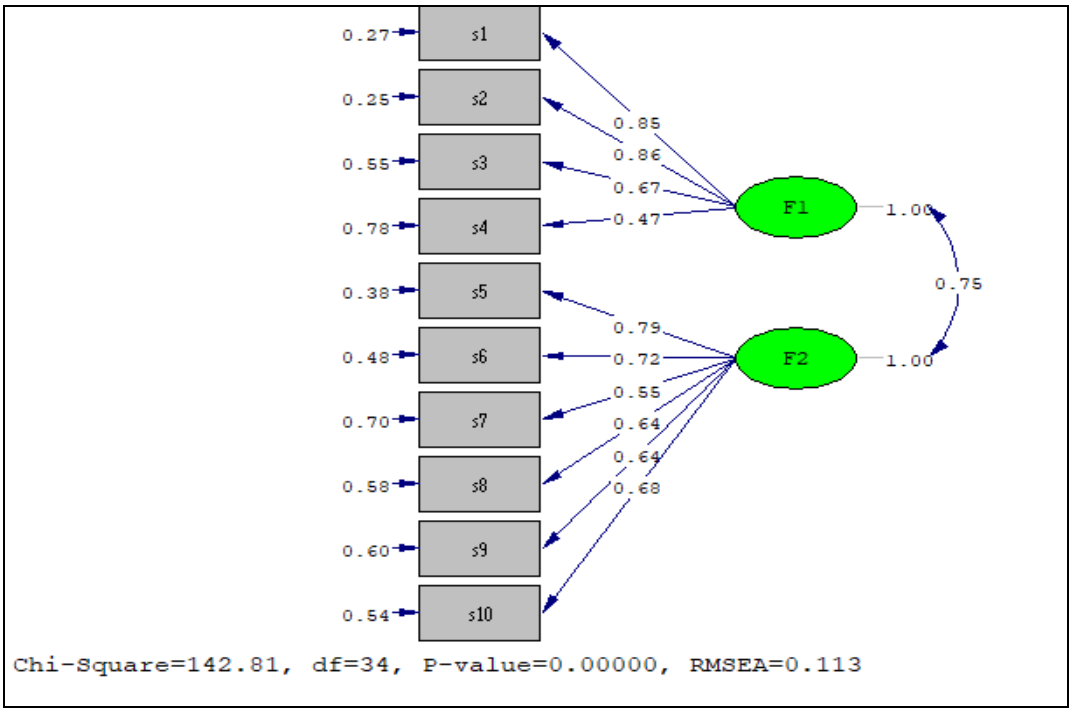

Figure 2. Standardized Two-Factor Structural Model of the Persian Smart Phone Addiction Scale-Short Version

Discussion

This study's essential intention was to adapt and determine the psychometric properties of the SAS-SV-Pr in the cultural domain of Iranian, Persian speaking people. Within the available research related to the psychometric evaluation of PROMs adapted for cultural and linguistic content, it has been critical to show that content validity has been maintained at the conceptual level. The original SAS was developed by a group of clinicians and researchers in South Korea, initially in a long form (10), and then its items were reduced to create a short version (45). To maintain content validity, the translation and cultural adaptation processes must be performed simultaneously.

Minor modifications and revisions were made to the scale, such as adding the word "telegram" in item-8 due to the common usage of telegram among the Iranian population. Also some minor changes were made to increase the understandability of item-5. The same changes are reported to have been made in the Persian SAS long version (17). To our knowledge, this is the first study which has reported the results of revisions during the cultural adaptation of the SAS-SV. In the Brazilian short version study, they affirmed that there were no uncertainties about understanding and interpreting the scale by the participants (46). In the Malay version (SAS-M-SF), the participants had reported that the PROMs items were clear, and easy to understand. They commented that its instructions should be simplified to improve clarity (47). Providing the short form measure can reduce the burden on participants and consequently reduce the missing data and increase practicality and simplicity of use (47).

Smartphone addictions have become a concern for public health, because smartphone addiction has become highly prevalent. In order to screen subjects that are at-risk of smartphone addiction, the need for an instrument that is reliable, valid and simple to use has become critical. Hence, different language versions of the short version of the SAS such as Turkish (20), Brazilian (23), Italian (21), Egyptian (48), Spanish/French (18), Chinese (22), Brazilian Portuguese (46) and Arabic (2) were validated for use in different countries.

In this study the EFA showed two factors with Eigenvalues > 1.0, also two factors with variances greater than 10% accounted for ~50.28% of variance, although the corresponding scree plot inflection point was at the second point. The EFA findings are ambiguous, but the CFA clarified the preference for the two factor solution. The first factor entitled "daily-life disturbance" has three components including items 1-3, and these concern missing the planned work by the individual, poor concentration while working and doing assignments, and lastly, feeling pain in wrists or the neck during excessive smartphone use. The second factor, entitled "overuse", included items 4-10. The participants signify that they make an uncontrolled use of their smartphone; for example, they are unable to manage without the smartphone, they feel impatient and fretful, always have the smartphone 'in-mind' even when it is not used, never want to give up the smartphone use, constantly check the smartphone, use the smartphone longer than intended, and receive feedback of overuse by people around them. When considering SAS-SV findings, different results were reported in the Spanish/French (18), Turkish (20) and Arabic (2) versions where they found a unidimensional structure which can explain a smaller amount of the variance. In the Italian, Brazilian and Chinese versions, a one factor structure was also reported through conducting CFA (21, 22, 49). The different extracted factor structures in various versions of the SAS-SV can be related to the cultural differences of participants. To our knowledge there has been no reported cultural adaptations in the mentioned studies. We performed cultural adaptation in this study and determined that the two-factor structure of the Persian SAS was most likely related to cultural variation. This may be explained by the fact that some items are culturally dependent. It should also be noted that the third factor approximated the second on the EFA and that this close proximity further suggests the potential for an ambiguous factor structure that is on the borderline between both a single and a dual factor structure. Consequently, a CFA was conducted, though the population would normally be above 500, which was beyond the aims of the current study due to the sample size. However, the sample CFA findings in this study did support the two factor solution. Potentially, further analysis of a pooled sample from different studies may be a solution for conducting further CFA analysis with a larger sample.

Additional psychometric properties of the SAS-SV-Pr that are critical to its performance were also shown within this study to be well supported. Past research results have demonstrated similar trends consistent with the SAS-SV reliability results found in this study. The Cronbach's alpha coefficient (α = 0.88) showed excellent internal consistency and the ICC (0.89) showed excellent test-retest reliability, which was similar to all other versions. We have summarized the results for reliability, internal consistency and the Corrected Item-Total Correlation in Table 4. The SAS-SV-Pr internal consistency (α = 0.88) was similar or very close to that reported in Spain (0.88), Belgium (0.90), Turkey (0.88), China (0.84), Egypt (0.90), Brazil (0.81) and the Arabic version (0.87) (2, 18, 20, 22, 48, 49). This confirms the scale's homogeneity, namely that all questions within the PROM are important in representing the construct in question. Reliability was reported only in Brazilian and Chinese versions; however, out results showed a higher reliability. Similarly, the corrected item-total correlation range of 0.51 to 0.70 in this study was close to the Spanish (18), Arabic (2) and original (9) versions and was relatively comparable with the remaining studies.

Table 4. Test-Retest Reliability, Internal Consistency and Corrected Item Comparision between Different Versions of Smart Phone Addiction Scale-Short Version

Versions	Cronbach's Alpha	ICC	Cronbach's Alpha if Item Deleted	Corrected Item-Total Correlation
Brazilain (46)	0.95	0.82	0.94-.095	0.59-0.91
Brazilian adolosent (49)	0.81	0.84	0.75-0.78	0.32-0.59

Spain (18)	0.88	NA	NA	0.46-0.71
Belguim (18)	0.90	NA	NA	0.62-0.74
Original (9)	0.91	NA	0.89-0.90	0.50-0.80
Turkish (20)	0.88	NA	NA	0.43-0.76
Egypy (48)	0.90	NA	0.74-0.89	0.70-0.83
China (22)	0.84	0.76	0.81-0.84	0.41-0.66
Arabic (2)	0.87	NA	0.86-0.88	0.42-0.76
Italian (21)	0.79	NA	0.76-0.80	0.21-0.60
Persian	0.88	0.89	0.86-0.87	0.51-0.70

For the total scores of the SAS-SV-Pr and IAT, a moderate correlation was found (r = 0.57), which was the same as the one found for the Brazilian version for adolescents (r = 0.50) (49). There is a logical correlation between internet access and the addictive potential of smartphones. When internet is in access, behavioral dependence can increase through the two elements of access and availability (49). The obtained results showed a correlation between smartphone addictive behavior and the internet, which are in the same context. Therefore, it seems that these instruments assess the behaviors representing behavioral dependencies.

Limitation

We limited the study to reliability, convergent validity and factor analysis of the SAS-SV. Discriminative validity assessment was not performed as there was no instrument available for this purpose. Also this study was conducted on a particular group of students; consequently, to achieve generalizability for the results, future studies must focus on a broader, more general population.

Conclusion

The Persian version of SAS-SV showed satisfactory psychometric properties for face, content, criterion and construct validities, as well as for suitable reliability and internal consistency. The two-factor structure may be ambiguous or borderline as compared to a single-factor structure; however, the two-factor structure was favored as was clarified by the CFA. This suggests that the SAS-SV Persian version is an appropriate instrument for the assessment and measurement of smartphone addiction in Iranian people and Persian speaking communities in general. Further research should be conducted to confirm these findings, particularly the factor structure, with further CFA in a larger single sample or from pooled studies.

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Conflict of Interest

None.

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