



Cross-cultural adaptation and psychometric evaluation of the Turkish version of the Smombie Scale for Adolescents

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Abstract

Background: Smombie has become an important problem especially in terms of adolescent health. The aim of this study was to translate the Smombie Scale for Adolescents (SSA) into Turkish and to examine its psychometric properties.

Methods: This study has a methodological design. The study was conducted between March and April 2024. The sample of the study consisted of 430 adolescents. The data were collected by using Personal Information Form and SSA. Content Validity Index, Confirmatory Factor Analysis (CFA), test-retest reliability, Cronbach's α coefficient, item-total score correlation, 27% upper-lower group item analysis and Hotelling T^2 test were used in data analysis.

Results: The four-factor structure of the scale showed a good fit in CFA (chi-square minimum discrepancy [CMIN] = 187.463, degrees of freedom (DF) = 83, CMIN/DF = 2.259, root mean square error of approximation = 0.054, root mean square residual = 0.033, goodness of fit index = 0.947, adjusted goodness of fit index = 0.923, normed fit index = 0.930, tucker-lewis index = 0.949 and comparative fit index = 0.959). Cronbach's α coefficient of the scale was found to be 0.86. The item-total score correlation of the scale was found between 0.212 and 0.721. The test-retest intraclass correlation coefficient of the scale was found to be 0.876.

Conclusions: This study shows that the scale is a reliable tool for assessing adolescents' smombie tendencies. It is thought that the scale will contribute to the protection and development of adolescent health.

KEYWORDS

adolescent, psychometrics, reliability, smartphone, validity

1 | BACKGROUND

Smartphone use is increasing all over the world and is becoming a part of people's lives. Smartphone usage rates have approached 90% in recent year.¹ Smartphones are used for many purposes

such as taking notes, taking photos, following e-mails as well as communicating.² In addition to their facilitating effects in daily life, the widespread use of smartphones may also cause unexpected problems.³

Due to its convenient use and multiple functions, users may tend to become overly attached to their device and/or preoccupied with

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the phone.³ Individuals may want to use these devices in many situations, both because of people's addiction to smartphones and because of the interesting content that can be accessed through them. A study shows that people check their phones approximately every 18 min.⁴ Due to this attitude towards smartphones, users' interest in the environment may decrease and this situation may cause individuals on foot in traffic to become vulnerable to accidents.⁵ Pedestrians in this situation are described as 'smombies' in the literature. The term Smombie is a combination of the words 'Smartphone' and 'zombie'. Smombie refers to pedestrians who walk using their smartphones and become unaware of their surroundings and pose a risk for accidents.⁶ Smombie-related accidents account for an increasing proportion of all road accidents.⁷ A study conducted in Korea shows that the number of traffic accidents caused by smombies increased from 119 in 2014 to 225 in 2019. Another study reported that pedestrians looking at their mobile phones cause traffic accidents resulting in injury or death.⁸

It is known that the use of smartphones is widespread in the adolescent age group, almost all adolescents have smartphones and this has reached an addiction level.^{9,10} The use of smartphones in adolescents can lead to many health problems such as eating disorders and sleep disorders.¹¹ In addition, smombie-related accidents are more common in adolescents than in adults.⁸ Possible reasons for this may be that brain development is still ongoing in adolescence and therefore attention spans are short.¹² In addition, there are studies showing that adolescents' smartphone addiction is associated with many problems such as self-esteem, self-efficacy, social withdrawal.¹³ Due to the mental and physical problems and the personal development period they are in, adolescents may need more instant rewards and may try to earn these instant rewards through their interactions on their smartphones.¹⁴ All these reasons may cause adolescents to look at the phone more and to be unsafe when they are on foot.¹⁵

The concept of smombie, which may cause many potential health problems in adolescence, is gaining importance all over the world. Therefore, the importance of evaluating the concept of smombie and developing nursing care for the subject has been increasing in recent years.^{16,17} It was observed that nurses were able to support adolescents' ability to use smartphones in a healthy way.^{16,18} Park and Kim developed a scale that can be applied to adults to define the increasingly common smombie problem.¹⁹ Later, the scale was adapted to adolescents by Park and Oh.⁶ When we look at the literature in Türkiye, there are only studies on the physical and psychological problems caused by smartphone use.^{20,21} However, there is no study on traffic accidents caused by the use of smartphones or any measurement tool. This suggests that awareness on the subject is not at the desired level.

Nurses need to play a key role in reducing the problematic use of smartphones in adolescents and preventing smombie behaviour, which can become an important public health problem. Therefore, it was realised that a scale was needed to define the concept of smombie and to develop nursing approaches to the subject. This study was carried out to determine the Turkish validity and reliability of the Smombie Scale for Adolescents (SSA).

2 | METHODS

2.1 | Study design

In this study, a methodological design was used.

2.2 | Participants

The population of this study consisted of adolescents aged 14–19 years who were attending high school in a province in the western region of Türkiye. The inclusion criteria were continuing their education in high school, using smartphones, agreeing to participate in the study and parental consent. Suggestions for sample size of psychometric studies in the literature are as follows: 200 is medium, 300 is good, 500 is very good, 1000 is excellent.²² It was aimed to reach at least 300 adolescents in the study. The study was completed with 430 adolescents who met the inclusion criteria using convenience sampling method.

As a result of the analysis conducted to determine whether the sample size is sufficient for validity and reliability analyses, Kaiser–Meyer–Olkin (KMO) coefficient was 0.853 and Bartlett's test was $\chi^2 = 2643.046$; $p < 0.001$. From these results, it was concluded that the sample size was sufficient for further analyses.

2.3 | Data collection tools

Personal Information Form and SSA were used as data collection tools.

2.3.1 | Personal information form

In this form prepared by the researchers, there are a total of 11 questions, including 6 questions to determine the sociodemographic characteristics of the participants such as birth year, class level, mother, and father education level, and 5 questions about smartphone usage.

2.3.2 | SSA

The smombie scale for adults developed by Park and Kim was adapted for adolescents by Park and Oh.^{6,19} The scale consists of 15 items and four sub-dimensions. These are Perceived risk, Stationary smartphone use, Pending instant message, Smartphone dependency. All statements in the scale are 5-point Likert type as '1-Never, 2-Sometimes, 3-Often, 4-Usually, 5-Always'. Cronbach's α coefficient of the scale is 0.85. Sub-dimension Cronbach's α coefficients are as follows: Perceived risk is 0.77, Stationary smartphone use is 0.90, Pending instant message is 0.83 and Smartphone dependency is 0.83. Perceived risk sub-dimension six items (1–6. items), Stationary smartphone use sub-dimension three

items (7–9. items), Pending instant message sub-dimension three items (10–12. items), Smartphone dependency sub-dimension three items (13–15. items). There are no reverse items in the scale. The total score is calculated as the sum of all items. Higher scores indicate more smombie tendencies.

2.4 | Procedure

Various methods can be followed in studies conducted for the adaptation of scales to different cultures. The translation and cultural adaptation process of the scale was carried out in accordance with the guidelines published by the Professional Society for Health Economics and Outcomes Research.²³ First, permission for the use of the scale was obtained from the scale owner via e-mail. The next step in the scale adaptation process is to ensure language validity. The scale was translated from English to Turkish by two independent translators who were fluent in both languages. The translation was then analysed and evaluated by the researchers. Afterwards, the scale was sent to a Turkish language expert and evaluated in terms of grammar and comprehensibility. After the necessary corrections were made, the Turkish version of the scale was translated back into English by two different independent translators. After back translation, it was confirmed that the Turkish version of the scale was close to the English version. Afterwards, a total of 10 experts from the fields of public health nursing, child health and diseases nursing, educational sciences and computer education and instructional technology were consulted to evaluate the content validity of the scale. Content Validity Index (CVI) was calculated after expert opinion. Minimal corrections were made after the expert opinions. Afterwards, a pilot study was conducted to evaluate the readability and comprehensibility of the scale. The pilot study was conducted with 30 adolescents with similar characteristics to the sample. No negative feedback was received in the pilot study, no corrections were made and the final version of the scale was created. Adolescents participating in the pilot study were excluded from the research sample. Figure 1 shows the translation and cultural adaptation process of the scale.

2.5 | Data collection

The data were collected face-to-face by the researcher between March and April 2024 using the personal information form and the Turkish version of the scale. The adolescents and their parents were informed about the study and their written informed consent was obtained. It took approximately 10–15 min to complete the data collection tools.

2.6 | Ethics

Permission for the use of the scale was obtained from the owner of the scale via e-mail. Ethics committee permission (23.02.2024/

Decision no: 18-02) and institutional permission were obtained for the study. Written informed consent was obtained from the adolescents and their parents. In this study, scientific and universal principles were followed. The study was conducted in accordance with the Declaration of Helsinki.

2.7 | Analysis

IBM SPSS (v. 25) and analysis of moment structures (AMOS) (v. 21) software packages were used to analyse the data. Number, percentage, mean and standard deviation were calculated for the descriptive characteristics of the sample group. The distribution of the data was analysed in terms of skewness and kurtosis and it was determined that the data showed a normal distribution between ± 2 . For validity, Content Validity and Confirmatory Factor Analysis (CFA) were performed. The original four-factor structure of the scale was confirmed by CFA. Maximum Likelihood estimation method and covariance matrix were used for CFA in AMOS. Before starting CFA, it was evaluated whether the data were normally distributed (multivariate), whether there was multicollinearity and whether the sample size was sufficient. All assumptions were met. For reliability, test-retest reliability, Cronbach's α coefficient, item analysis based on item-total score correlation and item analysis based on 27% upper-lower groups were performed. Hotelling T^2 test was applied to determine the response bias of the scale.

3 | RESULTS

The mean age of the adolescents participating in the study was 16.51 ± 0.994 (14–19 years). 80% of the adolescents were female students, 41.6% were in the third grade of high school, 35.6% had primary school education, 38.4% had high school education, and 48.6% had middle income. 97.9% of the participants had not heard the word smombie before. Most adolescents use smartphones for 4 h or more on weekdays (45.1%) and weekends (59.3%). 14% of the participants experienced an accident while using a smartphone on the street or pavement. It was stated that the accidents they experienced were, in descending order, hitting a person, colliding with objects (such as an electric pole), colliding with animals (e.g., a dog) and colliding with vehicles (e.g. car, motorbike, bicycle, etc.).

3.1 | Validity analyses

3.1.1 | Content validity

For the draft (Turkish version) form of the scale, the opinions of 10 experts were sought. For CVI, item-CVI (I-CVI) and scale-CVI (S-CVI) were calculated using Davis technique. I-CVI was determined between 0.90 and 1.00 and S-CVI was determined as 0.98.

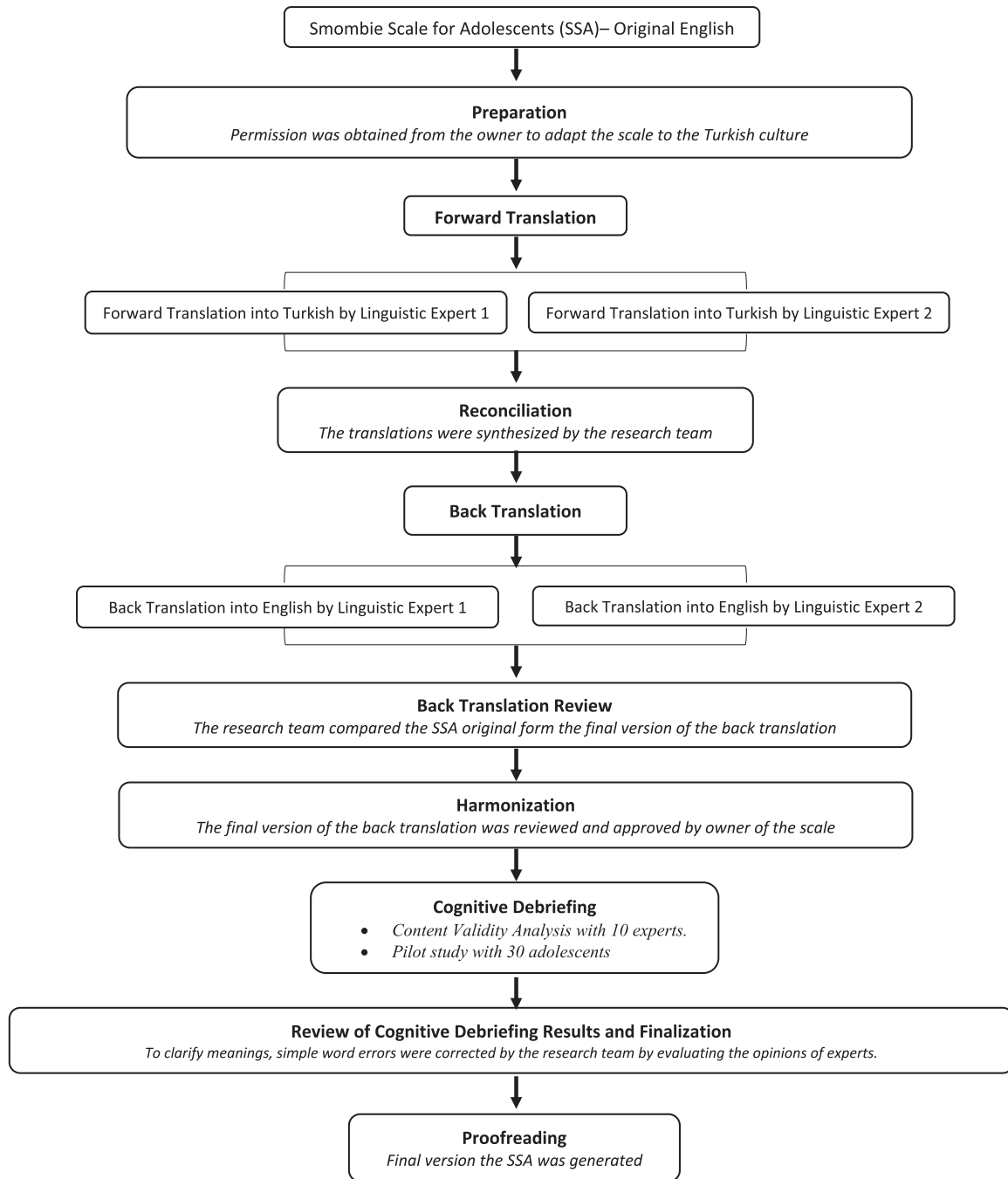


FIGURE 1 Cross-cultural adaptation process.

3.1.2 | CFA

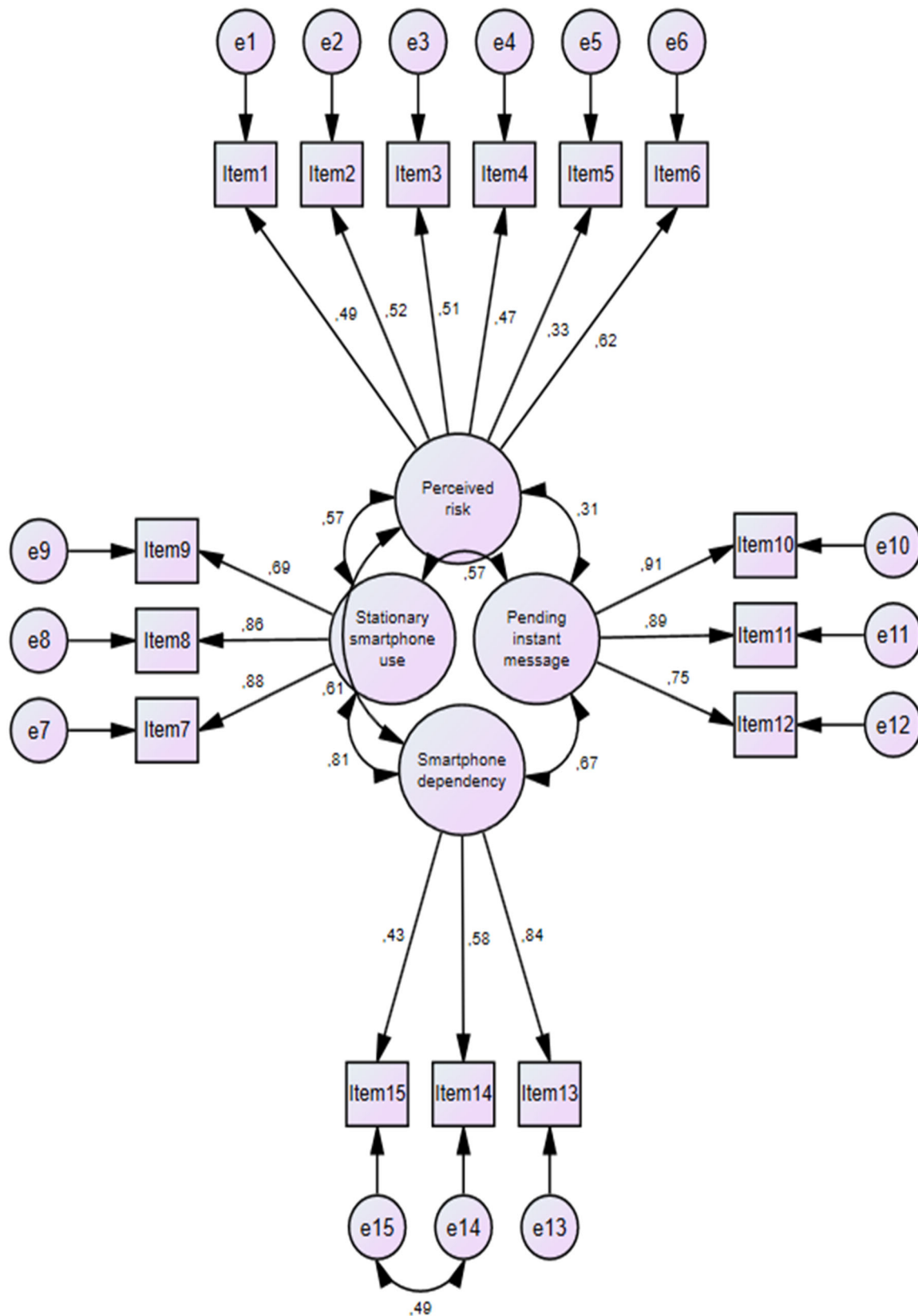
As a result of the CFA performed on the data to confirm the four-factor construct validity of the Turkish version of the SSA, it was found that the factor loadings of 15 items were between 0.33 and 0.91. In CFA, model fit values were found as chi-square minimum discrepancy (CMIN) = 187.463, degrees of freedom (DF) = 83, CMIN/DF = 2.259, root mean square error of approximation (RMSEA) = 0.054, root mean square residual (RMR) = 0.033, goodness of fit index (GFI) = 0.947, adjusted goodness of fit index (AGFI) = 0.923, normed fit index (NFI) = 0.930, Tucker-Lewis index (TLI) = 0.949 and comparative fit index (CFI) = 0.959.

The factor loadings of the scale items related to CFA are indicated by the path diagram (Figure 2).

3.2 | Reliability analyses

3.2.1 | Test-retest reliability

In our study, SSA was administered to 30 adolescents representing the population at 3-week intervals. These 30 adolescents were not included in the general sample. When the relationship between the



CMIN=187,463; DF=83; CMIN/DF=2,259; RMSEA=.054; RMR=.033; GFI=.947; AGFI=.923; NFI=.930; TLI=.949; CFI=.959

FIGURE 2 Path diagram of Smombie Scale for Adolescents.

**TABLE 1** Test-retest correlation results for SSA ($n = 30$).

First application	Second application										
	Total score		Perceived risk		Stationary smartphone use		Pending instant message		Smartphone dependency		
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	
Total Score	0.876	<0.001									
Perceived risk			0.720	<0.001							
Stationary smartphone use					0.857	<0.001					
Pending instant message							1.000	<0.001			
Smartphone dependency									0.789	<0.001	

Note: Bold values indicate statistically significant differences $p < 0.05$.

Abbreviations: *r*, Pearson Correlation; SSA, Smombie Scale for Adolescents.

TABLE 2 Reliability analysis of scale and subscale scores ($n = 430$).

Sub-dimensions	Item number	Item-sub-dimension total score correlation	Corrected item total score correlation	Cronbach α	Mean \pm SD (Min–Max)
Perceived risk (Factor 1)	Item 1	0.396	0.269	0.65	7.91 \pm 1.81 (6–15)
	Item 2	0.441	0.285		
	Item 3	0.399	0.360		
	Item 4	0.368	0.286		
	Item 5	0.271	0.212		
	Item 6	0.438	0.452		
Stationary smartphone use (Factor 2)	Item 7	0.792	0.666	0.85	7.84 \pm 2.75 (3–15)
	Item 8	0.747	0.684		
	Item 9	0.621	0.579		
Pending instant message (Factor 3)	Item 10	0.821	0.656	0.88	7.29 \pm 3.09 (3–15)
	Item 11	0.799	0.648		
	Item 12	0.707	0.565		
Smartphone dependency (Factor 4)	Item 13	0.472	0.721	0.74	7.45 \pm 2.86 (3–15)
	Item 14	0.672	0.564		
	Item 15	0.565	0.465		
Total score				0.86	30.49 \pm 8.14 (15–57)

Abbreviation: SD, standard deviation.

first and second application results of the total and sub-dimensions of the SSA was analysed, it was found that there was a high positive relationship (Table 1). According to the result of the paired samples *t* test, since $p = 0.076$, there is no difference between the first and second application. According to the results of the analysis, the averages of the first (35.13 ± 10.07) and second (33.30 ± 11.32) treatments are very close and similar to each other.

3.2.2 | Cronbach's α reliability coefficient and item analysis

The total Cronbach's α reliability coefficient of the SSA was 0.86. Sub-dimension Cronbach's α reliability coefficients are presented in Table 2. The item analysis based on the item-total score correlation to determine the internal consistency reliability of the scale in the

study is shown in Table 2. It was found that the item-total score correlations of the SSA were between 0.212 and 0.721 and the item-sub-dimension score correlations were between 0.271 and 0.821.

In the item analysis based on 27% upper-lower groups, which is the distinctiveness analysis, it was determined by independent sample *t* test whether there was a difference between upper and lower groups in terms of both item and scale total scores. It was found that the items of the scale had a discriminative feature in the researched subject ($p < 0.05$).

As a result of the Hotelling T^2 test performed to evaluate whether the responses of the individuals to the scale items were equal or not, it was determined as Hotelling $T^2 = 2097.771$ $p < 0.001$.

4 | DISCUSSION

Smombie refers to pedestrians who walk using their smartphones and become unaware of their surroundings and pose a risk for accidents.¹⁹ Smombie-related accidents in adolescents are increasing.^{7,12} Smombie can impair the safety of adolescents while on foot and cause potential health problems.^{15,16} In this direction, evaluation of smombie tendencies of adolescents is important in terms of increasing preventive health services and developing nursing approaches.

In this study, the SSA, adapted to adolescents by Park and Oh, was adapted to Turkish culture and its psychometric properties were analysed.⁶ This study is the first study on the adaptation of SSA to different cultures.

4.1 | Validity of the SSA

4.1.1 | Content validity

The translation and adaptation of the SSA to Turkish culture was carried out in accordance with internationally recognised standards developed by ISPOR.²³ Content validity was used to determine the extent to which the entire scale and each item in it represents the construct to be measured.^{24,25} Davis technique, which is one of the content validity techniques, grades expert opinions as (a) 'Appropriate', (b) 'Item should be slightly revised', (c) 'Item should be seriously revised' and (d) 'Item is not appropriate'.²⁶ In this technique, the CVI for the item is obtained by dividing the number of the experts who have selected option (a) and (b) by the total number of experts and the value of 0.80 is accepted as a criterion.^{24,26,27} The I-CVI and S-CVI values of the Turkish translated SSA calculated using expert evaluations were found to be high.²⁶ In addition, no significant problem was reported by the participants in the pilot study regarding the comprehensibility of the scale items. These results supported that the translation process was successful and the SSA had sufficient content validity in the Turkish sample.

4.1.2 | Structure validity

The four-factor structure of the SSA in its original form was also confirmed for the Turkish version. In CFA, factor loadings of all items were above 0.30.⁵ In CFA, different fit indices related to the scale are examined and the fit index values should be at the desired level.^{28,29} CMIN/DF, RMSEA, GFI, TLI and CFI fit index values of the original form of the scale were calculated within acceptable limits.⁶ In the present study, similar to the original scale, CMIN/DF, RMSEA, RMR, GFI, AGFI, NFI, TLI and CFI values were calculated within acceptable limits.^{22,28} The CFA results obtained in this study supported the construct validity of the scale and confirmed that the scale is a valid measurement tool.

4.2 | Reliability of the SSA

4.2.1 | Test-retest reliability

For most multi-item scales (whether self-report scales or observational scales), it is recommended to assess both internal consistency and test-retest reliability.³⁰ The test-retest coefficient should be high and there should be no difference between the two measurement scores.³¹ In the present study, a high positive correlation was calculated between the first and the second application performed 3 weeks apart. In addition, according to the results of the paired samples *t* test, the first and second application averages are very close and similar to each other.^{29,31} In this direction, it can be concluded that the measurements made with SSA at different times are similar and support the reliability of the scale.

4.2.2 | Cronbach's α reliability coefficient and item analysis

Whether the scale items are consistent with each other and whether they measure the same feature can be evaluated with Cronbach's α coefficient. The higher the Cronbach's α coefficient, the more reliable the scale is.^{27,32} Cronbach's α coefficient of SSA was calculated as 0.86. Except for the Cronbach's α coefficient of the Perceived risk sub-dimension (0.65), the Cronbach's α coefficients of the other sub-dimensions were calculated above 0.70. In addition, item-total score and item-sub-dimension total score correlation values of all items were above 0.20. A high item-total score correlation indicates that the relevant item is appropriate for the theoretical construct being measured, and a correlation coefficient of 0.20 and above is desirable.^{29,33} Similar to this study, it was reported that the Cronbach's α value of the original scale was 0.85 and the sub-dimension Cronbach's α values were higher than 0.70. In addition, the corrected item-total score correlation values of the original scale were reported to be above 0.30.⁶ These results supported the high internal consistency of the SSA. Accordingly, it can be concluded that similar to the original scale, the items in the SSA have a homogenous structure within themselves.



In the item discrimination analysis based on 27% upper-lower groups, it is calculated whether the scale can reveal the situations related to the researched subject by differentiating them.²⁹ A significant difference is expected between the upper-lower groups formed according to the total test scores.^{24,27,34} In the present study, it can be concluded that the SSA items have discriminative features in the subject under investigation.

The Hotelling T^2 test, which determines the response bias of the scale, evaluates whether the participants' responses to the scale items are equal.²⁹ It can be concluded that there is no response bias in the SSA in the present study. The results obtained from all reliability analyses supported the reliability of the SSA.

4.3 | Implications for school health policy, practice and equity

Investigating the smombie tendency of adolescents is an important step to understand risk factors and to develop appropriate intervention strategies in terms of school health. Investigating the smombie tendency of adolescents through this scale adapted into Turkish may provide an opportunity for school administrators and school health professionals to develop appropriate interventions. With the interventions to be developed, students' problematic smartphone use can be prevented, physical, emotional, and social health can be protected, and smombie tendencies can be reduced. Schools are the most appropriate settings for interventions such as educational programmes to promote students' balanced use of digital technology or policies limiting phone use.

4.4 | Limitations

The study sample was obtained by using convenience sampling method. This may have led to bias in sample selection. The majority of the sample of the study consisted of female students. This may be a limitation in terms of gender. Another limitation is that the data were based on self-report of adolescents.

5 | CONCLUSION

In conclusion, the scale adapted into Turkish to determine the smombie tendencies of adolescents was found to be a valid and reliable instrument and suitable for use. It is thought that the scale will guide and raise awareness for all professionals including health professionals such as nurses, child development specialists, psychologists and school administrators who take an active role in the development of adolescent health. The information to be obtained with the application of the scale will contribute to the protection and development of adolescent health.

AUTHOR CONTRIBUTIONS

Ebru Sönmez Sari: Project administration; conceptualisation; data curation; formal analysis; investigation; methodology; resources; supervision; visualisation; writing—original draft preparation; writing—review and editing. **Zeynep Temel Mert:** Investigation; resources; supervision; visualisation; writing—original draft preparation; writing—review and editing. **Vahide Semerci Çakmak:** Formal analysis; investigation; supervision; visualisation; writing—original draft preparation; writing—review and editing. **Pelin Sevgil Atli:** Data curation; investigation; resources; writing—original draft preparation. The manuscript has been read and approved by all the authors.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data can be obtained from the correspondent author by e-mail.

ETHICS STATEMENT

It was gathered an ethical approval from the Bayburt University Ethics Board (Approval number: 18-02/Date: 23.02.2024) for conducting the research. The informed consents were obtained from the individuals who agreed to participate in this research.

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