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Research article

Validation of the Chinese version of the Smartphone Distraction Scale

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ABSTRACT

The Smartphone Distraction Scale (SDS) is a novel assessment scale for smartphone distraction; it comprises 16 items that cover attention impulsiveness, online vigilance, multitasking, and emotion regulation. This study aimed to investigate the validity and reliability of the SDS in college students in China. After translating and culturally adapting the original version of the SDS into Chinese, the scale was tested on a sample of 1302 college students.The validity and reliability were assessed utilizing SPSS 25.0, AMOS 25.0 and Mplus 8.3. Parallel analysis, Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were performed for the validity analysis. Criterion-related validity for the SDS was tested by correlation analysis with the mobile phone addiction scale (MPAI). The reliability analysis was tested by Cronbach's alpha coefficients and intraclass correlation coefficients (ICC). EFA and parallel analysis revealed a three-factor structure. The EFA identified factor loadings on three factors (14 items), explaining a total variance of 60.73 %. The CFA model fit was good (χ^2/df = 4.644, RMSEA = 0.047, GFI = 0.930, CFI = 0.955, SRMR = 0.047), and the multigroup confirmatory factor analysis indicated measurement invariance for gender. Both convergent and discriminant validity were established. The criterion-related validity was established based on a significant correlation (r = 0.758) with the MPAI. The Cronbach's alpha coefficient was 0.916, and the split-half reliability was 0.769, demonstrating a satisfactory internal consistency. The score of ICC was 0.907, demonstrating the stability of the SDS. Based on these data, the Chinese version of the SDS demonstrated satisfactory validity and reliability in a sample of college students.

1. Introduction

As a unique technological development, smartphones as mobile devices are now the primary tools for accessing the Internet [1]. Smartphones are becoming increasingly popular as the Internet continues to advance. The use of smartphones for personal, recreational, and work purposes has become widespread and constant in our daily lives [2–4]. According to the China Internet Network Information Centre (CNNIC) report, as of June 2023, the total number of Internet users in the country has reached 1.079 billion, indicating an Internet penetration rate of 76.4 %. Moreover, the number of mobile Internet users has reached 1.076 billion.

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Excessive smartphone use can have negative effects on individuals including distraction, mood regulation issues, increased stress and anxiety levels, interference with cognitive processes, overuse of online applications, withdrawal symptoms, and heightened online vigilance [1,5–7]. Excessive smartphone use, also known as problematic smartphone use, is a type of behavioural addiction [8]. Studies on the Chinese population have shown that excessive smartphone use is associated with poor sleep quality [9], cervical disc degeneration [10], anxiety [11], loneliness [12], and burnout [13]. Consequently, issues concerning smartphone usage should be extensively considered [14].

Smartphone distraction is a manifestation of loss of concentration associated with smartphone use [15,16]. Studies have found that distraction from smartphone use is an issue among university students [17]. This may negatively affect productivity and lead to various physical and mental health problems, such as increasing anxiety levels [18].

Meanwhile, smartphone distraction might be associated with psychological distress, boredom tendencies, and avoidance expectations [19,20]. Research has also indicated that excessive smartphone use can negatively affect mental health and further increase distraction [21]. A study conducted on Italian children during the COVID-19 pandemic also indicated that excessive smartphone use could lead to distractions, changes in emotions, feelings of loneliness, and isolation from others [22]. Therefore, it is necessary to study the effects of smartphone distraction.

Given the potential problems associated with smartphone distraction, it is essential to have dedicated and effective measurement tools to assess this phenomenon. Researchers have developed numerous measurement tools to identify potential issues related to mobile phone usage, such as the Problematic Use of Mobile Phones (PUMP) scale [23], Problematic Mobile Phone Use Questionnaire (PMPU-Q) [24], and the Mobile Phone Affinity Scale (MPAS) [25]. Nevertheless, there are few relevant scales for the comprehensive assessment of issues related to smartphone distraction. Throuvala et al. developed a Smartphone Distraction Scale (SDS) that included attention impulsiveness, online vigilance, multitasking, and emotion regulation [26]. By conducting exploratory and confirmatory factor analysis, assessing the validity of the construction, and examining gender invariance, they found that the SDS exhibited sound psychometric properties. The SDS is a psychological tool with a strong theoretical basis, is shorter in length than other tools and has good psychometric properties, making it an effective method to measure distraction. Until now, SDS has been available in many languages and has been validated in Turkey [27], Italy [28] and China [29]. The Turkish, Italian and Chinese versions of the SDS have been shown to be a valid and reliable measurement tool in these countries. X. Y. Zhao et al. [29] found that the Chinese version of the SDS showed a 3-factor structure and the Cronbach's alpha coefficient was 0.88. Although it was found to have excellent reliability and validity, we found that the study of the Chinese version mainly focused on reliability and factor structure. However, reliability and validity, such as test-retest reliability, discriminant validity and criterion-related validity, have not been studied in depth. Also, China is a vast country that can be divided into northern and southern regions, each with its own distinct personality. The sample of X. Y. Zhao et al.'s survey was from southern China. Despite this, a related study of the northern Chinese population has not yet been performed.

The number of smartphone users across all age groups in China is growing rapidly. Studies have shown that excessive smartphone use in China may lead to visual impairment, neck pain, work interruptions, and Internet game addiction [10,30–33]. Given these negative effects, it is appropriate to investigate SDS in China. Further reliability and validity analyses are necessary to determine whether the scale is appropriate for the Chinese cultural context. Therefore, this study aimed to translate the SDS into Chinese, assess its psychometric properties, and confirm its validity among a northern Chinese population. Meanwhile, the correlations between SDS and mobile phone addction were conducted in the criterion-related validity analysis. Moreover, the primary study of the SDS has shown the gender measurement invariance. Gender invariance was conducted to evaluate the similarity or divergence in the interpretation of the construct across different genders, as well as to identify any latent mean differences across the factors [34]. Therefore, it is necessary to further investigate the gender measurement invariance of the Chinese version of SDS. So, another purpose of this study was to explore if the SDS has gender measure invariance.

2. Methods

2.1. Participants

The data from the questionnaire were gathered using the Wenjuanxing platform (https://www.wjx.cn/), an online platform for collecting data in China. All participants voluntarily completed the online test, following the principle of informed consent. Finally, 1302 college students were recruited from the Liaoning Province in China through random online sampling. The participants included 401 males (30.8 %) and 901 females (69.2 %) which from various academic levels: junior college students (15.9 %), undergraduate students (75.3 %), and postgraduate students (8.8 %). The average age was 21.02 ± 2.62.

2.2. Measurement

The survey comprised questions regarding sociodemographic information, such as gender, age, and education, as well as the SDS [26] and Mobile Phone Addiction Index scale (MPAI) [35].

2.2.1. The SDS

The SDS [26] is a 16-item scale divided into four factors: attention impulsiveness, online vigilance, multitasking, and emotion regulation. The items were measured using a 5-point Likert scale ranging from 1 (seldom) to 5 (almost always). The scores were summed to produce a total score ranging from 16 to 80. A higher score indicated a higher risk of being distracted by smartphone use.

2.2.2. The MPAI

The MPAI is a 17-item scale that assesses addiction and inappropriate mobile phone use. It was developed by Louis Leung [35] and was divided into four factors: losing control and receiving complaints, anxiety and craving, withdrawal/escape, and productivity loss. The items were measured using a 5-point Likert scale ranging from 1 (seldom) to 5 (almost always). The total score was calculated by adding up these scores, with a higher total score indicating a higher risk for addiction. The Cronbach's alpha of the MPAI in this study was 0.759.

2.3. Procedure

2.3.1. Translation procedure

Following systematic translation guidelines, the SDS was first translated into Chinese by two psychologists and then back-translated by two English experts. All of them were proficient in English. Third, the original, translated and back-translated scales were discussed, examined and revised by experts regarding conceptual and semantic aspects to ensure that the translated scales were more in line with Chinese culture. Finally, we selected 30 students to complete the experimental version of the scale and revised it as appropriate to create the final version of the SDS. The participants in the original scale were students and a small number of employed people. Therefore, we chose the college students as the subject of the survey. Meanwhile, college students are the majority and active users of smartphones, so we selected college students to validate the Chinese scale.

2.4. Data analysis

The data were analysed using Mplus 8.3 (Muthén & Muthén, Los Angeles, CA, USA) [36], SPSS25.0 and AMOS25.0 (IBM Corporation, NY, USA) [37]. Descriptive statistics were used to analyse the general survey data.

Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were conducted to test the structural validity of the Chinese version of the SDS. The data were randomly divided into two groups. In total, 656 participants participated in the EFA, while another group of 646 participants participated in the CFA.

In the EFA, Bartlett's test for sphericity and the Kaiser−Meyer−Olkin (KMO) were used to determine the appropriateness of the factor analysis. When the result of Bartlett's test for sphericity was significant ($P < 0.05$) and the KMO value exceeded 0.60, the data were suitable for factor analysis [38]. Then, the factor structure was examined through EFA following the recommended procedures by Fabrigar [39], Costello [40], and Howard [41]. The factor extraction was employed by the principal axis factoring (PAF) method, which does not rely on assumptions regarding the normality of the data. Oblimin oblique rotation was chosen as it was not assumed that the motives or the patterns of use would be orthogonal [42]. The determination of the number of factors to retain was made based on parallel analysis [43]. The EFA was conducted using the principal axis factoring (PAF) method and oblimin rotation to determine the optimal number of factors recommended by parallel analysis [44].

CFA of the SDS was conducted using AMOS to assess the model fit [45]. The following fit metrics were utilized to assess the model's goodness of fit: the chi-square degree of freedom (χ^2/df) should be less than 5, the root mean square error of approximation (RMSEA) should be below 0.1, the goodness-of-fit index (GFI) and comparative fit index (CFI) should exceed 0.9, and the standardized root mean square residual (SRMR) ought to be lower than 0.05 [46]. Furthermore, for model comparisons, we employed the Akaike information criterion (AIC) and Bayesian information criterion (BIC), where smaller values indicate a superior fitting model [47]. A Multigroup Confirmatory Factor Analysis (MGCFA) was also conducted to assess the measurement invariance of the factor structure of the SDS across genders [48]. Gender invariance is suggested when the disparities in the RMSEA and CFI values (ΔRMSEA and ΔCFI) are less than 0.02 and 0.01, respectively [49].

In addition, the convergent validity and discriminant validity were also examined. To assess convergent validity, the study employed average variance extracted (AVE) greater than 0.50, and composite reliability (CR) above 0.70 [42,50]. The discriminant validity was assessed by comparing the square root of the AVE with the correlations between each pair of variables. If the square root of the AVE was higher, then implied that the discriminant validity was supported [51]. To examine criterion-related validity, we conducted a correlation analysis by using the total scores of the SDS and the total scores of the MPAI.

The internal consistency of the SDS was calculated using Cronbach's alpha, and the reliability of the SDS was tested using split-half and test-retest reliability. The value of Cronbach's alpha is considered perfect when $\geq$0.80 [52]. The reliability of the SDS was also estimated in terms of stability by calculating a two-way random intra-class correlation coefficient (ICC) [53]. ICC values below 0.50, between 0.50 and 0.74, between 0.75 and 0.90, and above 0.90 are considered poor, moderate, good, and excellent, respectively [54].

3. Ethics statement

The study was conducted in accordance with the Declaration of Helsinki. The study was approved by the Medical Ethics Committee of The First Affiliated Hospital of Jinzhou Medical University (NO. 202227). All participants volunteered to fill out the online questionnaire with informed consent.

4. Results

4.1. Validity analysis

4.1.1. Exploratory factor analysis

The KMO index was 0.923, above the minimum acceptable value of 0.6. The Bartlett's test of sphericity was significant ($\chi^2 = 6272.557$; $P < 0.001$). Therefore, it was deemed appropriate for factor analysis. The result of parallel analysis suggested retaining three factors (Fig. 1). When oblique rotation was employed, the EFA yielded solutions with a three-factor structure, each of which exhibited an eigenvalue larger than 1.0. This was consistent with the results of the parallel analysis. By using EFA, it was found that the factor loadings of items were greater than 0.40. After careful discussion and analysis, items 8 and 9 were removed due to cross-loading. After removing these items, the results of the EFA showed that the KMO index was 0.919, and Bartlett's test of sphericity was substantial ($\chi^2 = 5806.034$; $P < 0.001$). The final three-factor structure was extracted and explained a total of 60.73 % of the variance, with factor 1 (attention impulsiveness) explaining 44.74 %, factor 2 (emotion regulation) explaining 10.73 %, and factor 3 (multitasking) explaining 5.26 % of the variance. The final factor loadings were listed in Table 1.

4.1.2. Confirmatory factor analysis

A CFA was performed to confirm the model derived by EFA. With CFA, the fitness indices of the models wer presented in Table 2. The comparison of the three-factor model (16 items) and the revised three-factor model (14 items) revealed that the model fitness index of the revised model (**Model 2**) was superior to that of the 16 items model (**Model 1**). However, the results of the **Model 2** did not achieve a satisfactory fit. In **Model 3**, the three-factor 14-item structure demonstrated satisfactory fit indices after establishing correlations between item 1 and item 2, item 3 and 4, as well as item 13 and 14, which were related residual variable 10 based on the modification index (MI). The standardized regression coefficient of the Chinese version of the SDS scale (Model 3) ranged from 0.61 to 0.86, which was shown in Fig. 2. The MGCFA also indicated the measurement invariance of the SDS across genders (ΔRMSEA<0.02; ΔCFI<0.01). The detailed analyses were presented in Table 3.

4.1.3. Convergent validity and discriminant validity

Table 4 showed the results for the AVE and CR values. The values of AVE are greater than 0.5 in all three factors, while the values of CR are greater than 0.7. It suggested that the convergent validity was acceptable. The inter-factor correlations of factors measuring different constructs should be kept low [50]. Therefore, in relation to discriminant validity, Table 5 showed the squared root of the AVE for all the factors of the SDS, ranging from 0.721 to 0.863. Notably, all values on the diagonal exceeded the correlations between factors, which provided evidence supporting the discriminant validity.

4.1.4. Criterion-related validity

The MPAI was used as a calibration scale to determine the criterion-related validity by analyzing its correlation with the Chinese version of the SDS. The results of the correlation analysis showed a significant correlation between the SDS and the MPAI ($r = 0.758$, $P < 0.01$). This indicated that the revised Chinese version of the SDS can evaluate the problem of mobile phone addiction from the side. The detailed analyses were listed in Table 6. As shown in Table 6, the mean score of SDS was 36.53 ± 10.57, with 18.14 ± 6.06 (attention impulsiveness), 6.97 ± 2.63 (multitasking), and 11.42 ± 3.86 (emotion regulation), respectively.

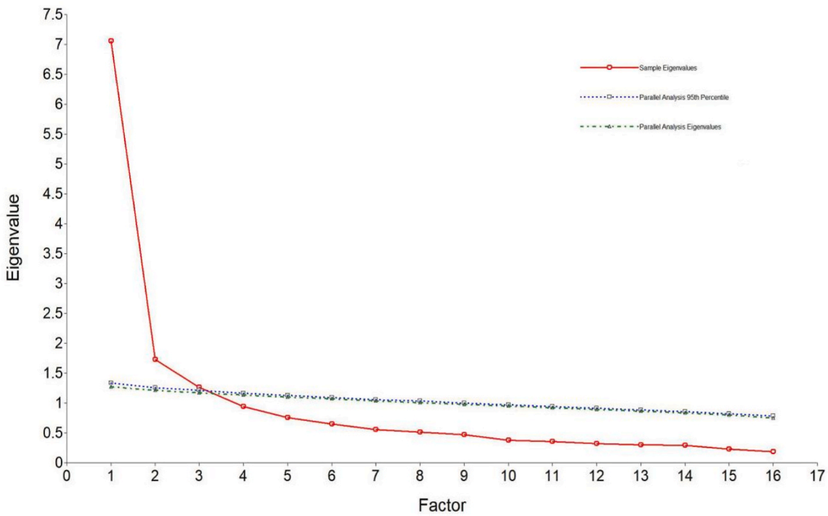

Fig. 1. Parallel analysis of the factor loadings.

Table 1
Factor loadings of the Chinese version of the SDS items (n = 656).

Item	Attention impulsiveness	Emotion regulation	Multitasking
1.I get distracted by my phone notifications.	**0.753**	0.438	0.355
2.I get distracted by my phone apps.	**0.782**	0.505	0.332
3.I get distracted by just having my phone next to me.	**0.792**	0.414	0.449
4.I get distracted by my phone even when my full attention is required on other tasks.	**0.776**	0.313	0.516
5.I get anxious if I don't check messages immediately on my phone.	**0.709**	0.367	0.436
6.I think a lot about checking my phone when I can't access it.	**0.717**	0.420	0.527
7.I get distracted with what I could post while doing other tasks.	**0.739**	0.335	0.586
10.I can easily follow conversations while using my phone.	0.423	0.363	**0.625**
11.I often walk and use my phone at the same time.	0.489	0.373	**0.608**
12.I often talk to others while checking what's on my phone.	0.466	0.353	**0.836**
13.Using my phone distracts me from doing unpleasant things.	0.431	**0.841**	0.376
14.Using my phone distracts me from negative or unpleasant thoughts.	0.414	**0.890**	0.337
15.Using my phone distracts me from tasks that are tedious or difficult.	0.506	**0.847**	0.387
16.Using my phone distracts me when I'm under pressure.	0.469	**0.791**	0.361

Exraction method: Principal Axis Factoring. Rotation method: Oblimin with Kaiser normalization.

Table 2
Model fitness index for the Chinese version of the SDS (n = 646).

Model	χ^2/df	RMSEA	GFI	CFI	AIC	BIC	SRMR
Model 1	9.332	0.114	0.831	0.877	1012.522	1169.000	0.064
Model 2	8.412	0.107	0.871	0.905	684.499	823.094	0.062
Model 3	4.644	0.047	0.930	0.955	397.747	549.754	0.047

Abbreviations: χ^2/df, Chi-square degree of freedom. RMSEA, root mean square error of approximation; GFI, goodness-of-fit index; CFI, comparative fit index; AIC, akaike information criterion; BIC, bayesian information criterion; SRMR, standardized root mean square residual.

4.2. Reliability analysis

The Chinese version of the SDS had excellent internal consistency. The Cronbach's alpha of the SDS was 0.916, and the split-half reliability coefficient was 0.769. Cronbach's alpha coefficients for the three factors were 0.902, 0.744, 0.914, all greater than 0.7, indicating that the internal consistency of the scale was good. The ICC (total score: 0.907, 95 % CI: 0.814–0.954) was employed as a measure of test-retest reliability, demonstrating the stability of the SDS. A detailed analysis of the ICC was presented in Table 7.

5. Discussion

This study translated the SDS into Chinese and validated the translated instrument. The Chinese version of the SDS had good construct validity, convergent validity, discriminant validity and criterion-related validity, as well as excellent internal consistency and test-retest reliability. It demonstrated that the Chinese version of the SDS had good psychometric properties.

The SDS was validated as a three-factor, 14-item instrument for the Chinese population. The results of EFA indicated that attention impulsiveness and online vigilance were on the same dimension. The possible reason might be that item comprehension under online vigilance in the Chinese context was also related to attention impulsiveness. Furthermore, attention impulsiveness was associated with checking social media among Chinese college students. Finally, attention impulsiveness was chosen as the first factor which included seven items and the factor of online vigilance was removed. The three-factor structure was consistent with the conclusion obtained by another Chinese researcher in the study of the Chinese version of the SDS [29]. Through EFA analysis, we found that items 8 and 9 had lower loading factor values and were loaded simultaneously onto another factor. First, the items were considered to be removed due to cross-factor loading. Second, these items might affect the goodness-of-fit index of the model in CFA. Third, the differences from the original scale might be related to factors such as cross-cultural and cross-regional factors. Therefore, items 8 and 9 were deleted. Our final findings supported the three-factor structure after deleting items 8 and 9. This was differ from the findings of another Chinese researcher. Considering the possible reasons, it may be that the regional culture and understanding of the content may have differed slightly between the south and the north. The final modified version of the SDS had 14 items and the items were strongly correlated with one another within constructs (KMO>0.70) [55]. The structure of the Chinese version of the SDS was validated to be reasonable.

By comparing the mean scores of each dimension in Table 7, we found that the mean score of emotion regulation was higher. So we considered that a subset of the participants thought that smartphone use could regulate emotions. This was consistent with the findings of Cynthia A's study on the use of mobile phones to control negative emotions [56]. Studies also showed that participating in online games and social networks through smartphones to regulate emotions is also one of the purposes of using smartphones [57]. Second, the mean value of the attention impulsiveness dimension was higher, indicating that smartphone use might distract users. This was consistent with the negative aspects of addiction, distraction of smartphone use and social media use in medical education [58,59]. These two points reflect the motivation of some individuals to use smartphones to a certain extent. In our study, the SDS was correlated with the MPAI. This was consistent with Abdul Majid's [60] and Gregorio Serra's findings [26]. The results of our study revealed a

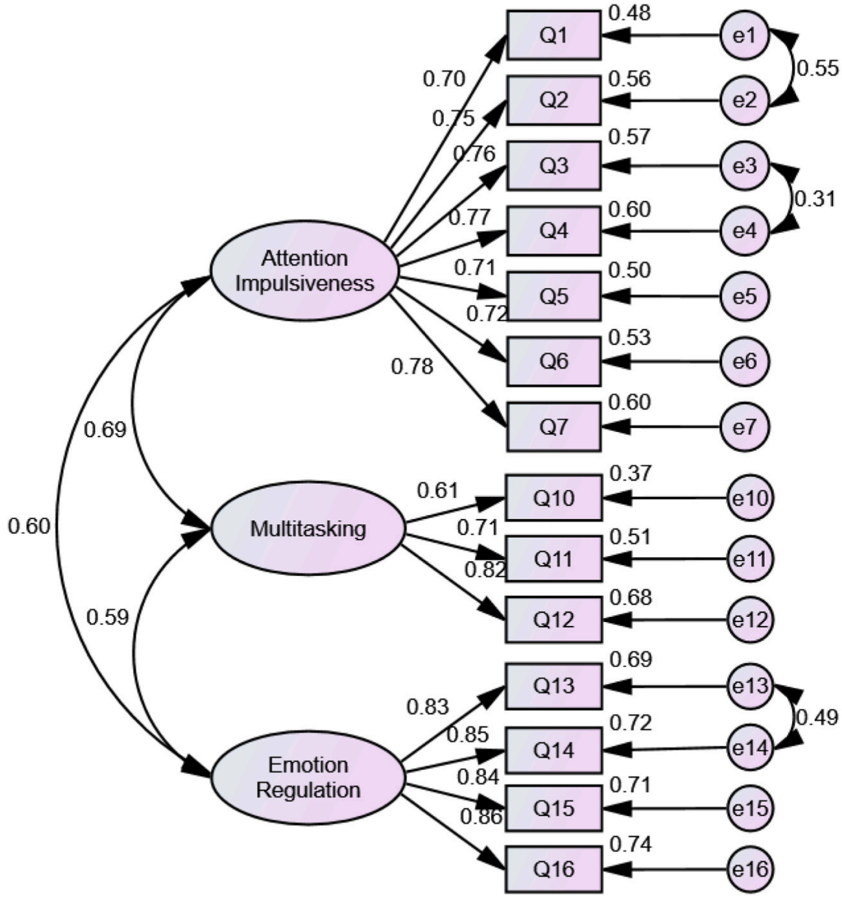

Fig. 2. Standardized three-factor structural model of the SDS.

Table 3
MGCFA fit indexes for genders.

Model	χ^2/df	RMSEA	CFI	SRMR	ΔRMSEA	ΔCFI	ΔSRMR
MGCFA							
Male	2.251	0.077	0.956	0.0447	–	–	–
Female	3.795	0.080	0.948	0.0544	–	–	–
Unconstrained model	3.023	0.056	0.951	0.0447	–	–	–
Structural covariances	2.770	0.052	0.952	0.0523	−0.004	0.001	0.008
measurement residuals	2.789	0.053	0.946	0.0509	0.001	−0.005	−0.001

Abbreviations: χ^2/df, Chi-square degree of freedom. RMSEA, root mean square error of approximation; CFI, comparative fit index; SRMR, standardized root mean square residual.

significant positive correlation between the score of the SDS and the MPAI. Thus, how to balance the smartphone use cannot be ignored.

The SDS facilitated a thorough evaluation of distraction, multitasking, and emotion regulation. Evaluating susceptible individuals and proposing possible interventions may effectively avoid the adverse effects caused by smartphone distraction. Therefore, the SDS may be utilized as a screening tool to explore the risk of the smartphone distraction in university student populations.

This study also has limitations. First, the participants were college students, and the results could not be applied to people in different life stages. So, future studies should investigate the effects of distraction across different age demographics. Second, the survey was conducted during the COVID-19 pandemic, a period when Chinese college students stayed at home and studied remotely. Thus, the COVID-19 pandemic might have affected the survey results. Third, the participants were mainly from Liaoning. China has vast territorial resources and a slightly different culture. Therefore, we should be aware of the geographic and cultural variability across China. Furthermore, as the SDS is a newly developed scale, additional validation across Chinese and other cultural contexts would allow for a more robust assessment of its psychometric properties. Nevertheless, the need for a validated screening tool for smartphone distraction in the Chinese context highlights the novelty of this study.

Table 4
Convergent validity for the Chinese version of the SDS.

Factor	Item	Estimate (Loading)	CR	AVE
F1 Attention impulsiveness	Q4	0.771	0.895	0.548
	Q3	0.753		
	Q2	0.748		
	Q1	0.695		
	Q5	0.711		
	Q6	0.725		
	Q7	0.777		
F2 Multitasking	Q12	0.823	0.762	0.520
	Q11	0.713		
	Q10	0.611		
F3 Emotion regulation	Q13	0.902	0.921	0.745
	Q14	0.917		
	Q15	0.801		
	Q16	0.826		

Abbreviations: CR, composite reliability; AVE, average variance extracted.

Table 5
Correlations between factors, average variance extracted, discriminant validity.

Factor	AVE	F1	F2	F3
F1 Attention impulsiveness	0.548	**0.740**	0.477	0.306
F2 Multitasking	0.520	0.691	**0.721**	0.299
F3 Emotion regulation	0.745	0.553	0.547	**0.863**

NOTE: The square root of the AVE are presented on the diagonal. Correlations and squared correlations are below and above the diagonal, respectively. Abbreviations: AVE, average variance extracted.

Table 6
Criterion-related validity of the Chinese version of the SDS to MPAI.

	M ± SD	Correlations				
	Score	F1	F2	F3	The SDS	The MPAI
F1 Attention impulsiveness	18.14 ± 6.06	1	–	–	–	–
F2 Multitasking	6.97 ± 2.63	0.577**	1	–	–	–
F3 Emotion regulation	11.42 ± 3.86	0.527**	0.496**	1	–	–
The SDS	36.53 ± 10.57	0.910**	0.761**	0.791**	1	–
The MPAI	40.95 ± 12.92	0.685**	0.596**	0.595**	0.758**	1

**$P < 0.01$. Abbreviations: The SDS, the smartphone distraction scale. MPAI, Mobile Phone Addiction Index.

Table 7
Comparisons between the test and retest of the Chinese version of the SDS using intraclass correlation coefficients (ICC)[a] with 95 % confidence intervals (n = 30).

Item	ICC	95%CI	*P* value
Q1	0.928	0.855–0.965	<0.001
Q2	0.813	0.642–0.906	<0.001
Q3	0.815	0.648–0.907	<0.001
Q4	0.822	0.659–0.911	<0.001
Q5	0.709	0.472–0.850	<0.001
Q6	0.822	0.659–0.911	<0.001
Q7	0.613	0.333–0.794	<0.001
Q10	0.770	0.573–0.883	<0.001
Q11	0.767	0.565–0.882	<0.001
Q12	0.822	0.659–0.911	<0.001
Q13	0.875	0.753–0.939	<0.001
Q14	0.885	0.773–0.944	<0.001
Q15	0.824	0.663–0.912	<0.001
Q16	0.710	0.475–0.851	<0.001
Total score	0.907	0.814–0.954	<0.001

[a] Two-way random ICC for absolute agreement.

6. Conclusion

Our study validated the applicability of the Chinese version of the SDS. The Chinese version of the SDS had good stability and might be used as a screening tool to assess smartphone distraction, which may be implicated in problematic smartphone use. The Chinese version of the SDS has good psychometric properties in the context of Northeast China. Thus, it may be a good measure of smartphone distraction in the Northeast Chinese population and may provide a certain basis for providing possible intervention measures.

Data availability statement

Data will be made available on request.

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CRediT authorship contribution statement

Zhanpeng Guo: Writing – review & editing, Writing – original draft, Software, Methodology, Investigation, Data curation, Conceptualization. **Kun Liu:** Resources, Methodology, Investigation. **Chunguang Liang:** Resources, Methodology, Investigation. **Dan Li:** Writing – original draft, Investigation, Data curation. **Jinxiang Lou:** Resources, Methodology, Investigation. **Yu Deng:** Writing – original draft, Investigation, Data curation. **Mina Huang:** Writing – review & editing, Writing – original draft, Software, Methodology, Investigation, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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