



Psychometric Properties of Smartphone Addiction Inventory (SPAI) in Russian Context

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Abstract

Smartphones facilitate communication, education, information, and entertainment through a diverse array of mobile applications. Excessive smartphone use has become a significant societal issue. The research community has explored both the positive and negative consequences of mobile phone use. The phrase “problematic smartphone use” refers to an excessive pattern of smartphone use that may have negative consequences. Smartphone addiction may present with symptoms that are unique from Internet addiction. Severe sadness, anxiety, and tension are all associated with problematic smartphone use. Numerous negative consequences are discussed, including mental health problems, diminished physical fitness, and poor academic achievement. According to the findings of the literature analysis, there is no inventory that evaluates smartphone addiction in the context of Russia. The goal of this study is to examine the psychometric characteristics of the smartphone addiction inventory (SPAI) in a Russian context. Several Russian Federation universities performed the study during the autumn semester of the 2020-2021 academic year. To enhance the inventory, Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were utilized on 209 students. As a result, research on the validity and reliability of the Smartphone Addiction Inventory were done in the Russian setting. The research revealed a brief inventory of 14 items and three factors (functional impairment, anxiety, and compulsive behavior).

Keywords: smartphone addiction inventory, psychometric properties, exploratory factor analysis (EFA), confirmatory factor analysis (CFA), university students

INTRODUCTION

Increasingly common in everyday life, smartphones provide a wide range of mobile applications for communication, education, information and entertainment. While it is stated that 6.055 billion smartphones are used worldwide in 2020, this number is estimated to be 6.378 billion in 2021 and 7.516 billion in 2026 (O'Dea, 2021). With the rising popularity of smartphones, excessive smartphone use has emerged as a serious societal concern (Lin et al., 2014). However, it is not only possession of electronic equipment that is creating worry in the domains of psychology and cognition. Rather than that, it is the potential for dysfunction linked with smartphone usage that is prompting academics to emphasize the critical nature of studying the habit (Harris et al., 2020).

According to Gutierrez et al. (2016), the most major corpus of behavioral addictions today – the Internet, videogames, and mobile phones – are the subject of a growing number of research. In the past, Internet usage might manifest as a worldwide addiction or as involvement with addictive material and behaviors. Young (2009) looked at five main types of Internet addiction: (1) the computer itself, (2) the quest for information, (3) interaction compulsions, such as engagement with the web through online games, shopping, and so on, (4) cybersexuality, and (5) cybercontacts. At this point, technological addiction becomes apparent. Technology addiction is described as a compulsive and regular manner of using technology to avoid dealing with life's various difficulties (Agarwal & Kar, 2015). Thus, Lin et al. (2021) suggest that "Smartphone addiction" might be regarded a type of technology addiction.

As a result of this explosion in mobile phone use, research has lately exploded to examine both the beneficial and negative repercussions of mobile phone use (Billieux et al., 2015). The usage of a mobile phone entails optimizing communication between persons and systems. Additionally, mobile phone technology facilitated the development and validation of a diverse range of health-related and behavior change interventions and applications that aide in the management of such activities as weight management, smoking cessation, physical activity promotion, and chronic disease management (Akhmadieva et al., 2021; Anstey Watkins et al., 2018; Fjeldsoe et al., 2009; Marcolino et al., 2018).

There have been a variety of negative outcomes associated with mobile phone use, particularly excessive use, including (but not limited to) self-reported dependence and addiction-like symptoms, sleep disruption, financial difficulties, dangerous use (phoning while driving), prohibited use (phoning in prohibited areas), and mobile phone-based aggressive behaviors (e.g., cyberbullying) (Billieux et al., 2015; Chhabra et al., 2019; Oviedo-Trespacios et al., 2017; Thomée et al., 2011).

According to American Society of Addiction Medicine (ASAM)

"Addiction is a treatable, chronic medical disease involving complex interactions among brain circuits, genetics, the environment, and an individual's life experiences. People with addiction use substances or engage in behaviors that become compulsive and often continue despite harmful consequences. Prevention efforts and treatment approaches for addiction are generally as successful as those for other chronic diseases." (ASAM, 2019).

For many individuals, the term "addiction" connotes the use of narcotics. As a result, it's somewhat unexpected that the majority of official definitions focus on drug intake. Despite these criteria, there is a growing consensus that a variety of behaviors, including several that do not entail the consumption of a drug, are potentially addictive. These include gambling, binge eating, sex, exercise, videogame activity, romance, Internet usage, and work (Griffiths, 2005). According to Pavia et al. (2016), the research has not reached a consensus definition of smartphone addiction due to the existence of a broad variety of pattern symptoms and indications that cannot be properly classified as indicators of addiction.

Research has shown that problematic smartphone use is related to impulsivity (Contractor et al., 2017; De-Sola et al., 2017; Harris et al., 2020; Horvath et al., 2020; Tugun et al., 2020), impaired attention (Harris et al., 2020; Rezaee & Pedret, 2018; Roberts et al., 2015), and compromised inhibitory control (Chen et al., 2016;

Harris et al., 2020; Vezzoli et al., 2021). In recent years, academics and public health practitioners have focused more emphasis on problematic smartphone use such as smartphone addiction and nomophobia (fear of being detached from mobile phone connectivity). According to Awofala (2020), nomophobia is one of the predictive variables of smartphone addiction. However, given the idea of problematic smartphone use's relatively recent development as a research subject, definitions of the term are continually developing. Problematic smartphone use is a general term that refers to an obsessive habit of smartphone use that might have negative implications that impede the user's everyday functioning. Compulsive usage is a term that refers to an uncontrollable overuse of a smartphone that is characterized by maladaptive reliance and a proclivity to use it without being removed from it (Busch & McCarthy, 2021).

It is important to measure the prevalence of many addictive behaviors arising from digital tools among young people and adolescents. Such behaviors need to be addressed from both a psychological and a health point of view. For example; the research examined and assessed how changes in family structure affect online gaming addiction and delinquency in children in their vulnerable adolescence period. It is found that a considerable cause-and-effect link between juvenile delinquency and online gaming addiction (Choi et al., 2018). At the same time, it has been determined that addiction types such as internet addiction are also associated with cyberbullying (Mikhaylovsky et al., 2019). There is a relationship between addiction and misbehavior. In other words, addiction affects both themselves and the people around them.

Recent statistics on smartphone use indicate that only a tiny percentage of users exhibit addictive-like symptoms (Billieux et al., 2015; Elhai et al., 2017). Problematic smartphone use is connected with depression severity, anxiety, and stress (Arrivillaga et al., 2020; Elhai et al., 2017; Huckins et al., 2020). According to Mitchell and Hussain (2018), predictors of problematic smartphone use are impulsiveness, age, excessive reassurance seeking, and depression. There are no differences in terms of gender and extraversion personality type.

Although cellphones provide several benefits, researchers have explored various negative repercussions, including mental health difficulties (Bauer et al., 2020; Elhai et al., 2017; Thomée et al., 2011), decreased physical fitness (Lepp et al., 2014; Stanislaus et al., 2020), and decreased academic performance (Cha & Seo, 2018; Felisoni & Godoi, 2018; Lepp et al., 2014).

The symptoms of smartphone addiction may be distinct from those of Internet addiction. Lin et al. (2014) proved through exploratory factor analysis that smartphone addiction shares significant characteristics with DSM-5 substance-related disorders, including the following four major factors: obsessive behavior, functional impairment, withdrawal, and tolerance. In another study (Pavia et al., 2016), factors were named as "Time Spent", "Compulsiveness", "Daily Life Interference", "Craving", "Sleep Disorder".

Psychometric properties of smartphone addiction inventories were measured in different country contexts (Ching et al., 2015; Lopez-Fernandez, 2017; Pavia et al., 2016). In the literature review, no inventory was found that measures smartphone addiction in the context of Russia. It is aimed to contribute to the literature and to conduct a validity and reliability study of the inventory that can determine the prevalence of smartphone addiction among university students.

METHODS

The objective of this study is to determine the psychometric properties of smartphone addiction inventory (SPAI) in the Russian context. The study was carried out in the fall semester of the 2020-2021 academic year in the following Russian universities: Kazan Federal University, The State University of Management, Sechenov University, RUDN-University, Moscow State Regional University, and MGIMO University.

Sample

The sample group was selected to be university students who agreed to take part in the study. Researchers used convenience sampling technique in the sample determination process. The announcements were made by the researchers from the participating institutions. Participation in the study was entirely voluntary, and

no compensation was offered. The sample is made up of 209 students, and 74% of the group consists of females and 26% of males who came from different grade.

Inventory Items and Determination of Factors

Inventory items (**Appendix 1**) were taken from the study by Lin et al. (2014). The inventory comprised 26 items that were originally categorized into four dimensions: functional impairment (8 items), withdrawal (6 items), compulsive behavior (9 items), and tolerance (3 items). In order to determine initial psychometric properties, EFA was conducted with a study group of 283 university students. As a result, it was found that the Cronbach's alpha for the overall scale was 0.94, and that it was 0.87, 0.88, 0.81, and 0.72 for the four variables, which were categorized as "compulsive behavior," "functional impairment," "withdrawal," and "tolerance," respectively. Four factors with eigenvalues greater than one were identified, and combined they explained 57.28 percent of the total variance (Lin et al., 2014).

Prior to undertaking factor analysis, the researchers determined if the obtained data were factorable; this was accomplished to determine whether the data obtained was sufficient to generate a series of factors. Williams et al (2010) advice using Kaiser-Mayer-Olkin (KMO) Sampling Adequacy Measurement and Bartlett Sphericity Test in order to determine factorability. KMO index is between 0 to 1. A KMO index greater than 0.50 indicates factor analysis (Williams et al., 2010; Yong & Pearce, 2013). Additionally, Bartlett's Test of Sphericity assures that variables and factors do not overlap (Hair et al., 2014; Yates, 1987) and should yield a significant level of $p > 0.5$ to permit factorial analysis (Williams et al., 2010; Yong & Pearce, 2013).

Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were employed to improve the inventory's overall quality. EFA is accepted in multivariate statistical method (Edwards & Bagozzi, 2000; Watkins, 2018; Yates, 1987). Rotation approaches are used to obtain stronger structures in EFA. In this study, Varimax with Kaiser normalization was employed as a factor rotation approach in EFA (Hayton et al., 2004; Williams et al., 2010). The method of parallel analysis was used to identify the number of factors to be considered. In a parallel analysis, we evaluated real eigenvalues versus eigenvalues in a random order to see which was more accurate. In cases where real eigenvalues outnumber random ordered eigenvalues, factors are retained (Hayton et al., 2004; Williams et al., 2010). Additionally, the item is removed if it (a) loaded on multiple factors and the difference between the two loading factors is less than 0.1, or (b) achieved a factor load less than 0.4 (Deng et al., 2017).

CFA is used to enhance items during inventory construction and validation by evaluating the nature and linkages of structures. Because the structural model is developed using CFA, a conclusive hypothesis regarding the instances analyzed may be produced (Jackson et al., 2009). To evaluate model fit, there is a need to analyze indices such as the chi-square goodness, Root Mean Squared Error of Approximation (RMSEA), Standardized Root Mean Square Residual (SRMR), Comparative Fit Index (CFI), and Tucker-Lewis index (TLI) (Yu, 2002).

Reliability Calculations

Cronbach alpha coefficient analysis was used to assess the newly designed tool's reliability. Alpha coefficient should be greater than 0.70 (Kline, 2005) and not greater than 0.94 for perfect reliability (Fraenkel et al., 2012; Taber, 2018). Additionally, we calculated composite reliability.

Data Analyses

Jamovi (The Jamovi Project, 2021) software was utilized in the study for EFA, CFA, and inferential analysis during the scale's psychometric assessments. It is stated that Jamovi is an open-source, free software package for performing basic statistical calculations. 0.05 was used as the statistical significance level. The measurement has a normal distribution (Shapiro-Wilk $W=0.99$ $p(0.178)>0.5$, Skewness=0.168, Kurtosis=-0.406) and have not outliers ($-2.09 < z < 2.82$, no outlier sign in boxplot).

Table 1. Initial factor loading

	Factor 1	Factor 2	Uniqueness
Item 1	0.632	0.487	0.337
Item 2	0.614	0.507	0.365
Item 3	0.604	0.432	0.441
Item 4	0.678		0.264
Item 5	0.594		0.555
Item 6	0.680		0.526
Item 7	0.615		0.572
Item 8	0.505		0.687
Item 9	0.572		0.671
Item 10	0.627		0.524
Item 11	0.668		0.548
Item 12	0.580		0.588
Item 13	0.595		0.601
Item 14	0.527		0.719
Item 15			0.771
Item 16	0.693		0.507
Item 17	0.562		0.652
Item 18	0.578		0.599
Item 19	0.750		0.429
Item 20	0.572		0.627
Item 21			0.829
Item 22	0.677		0.482
Item 23	0.708		0.411
Item 24	0.673		0.446
Item 25	0.690		0.511
Item 26	0.701		0.445

RESULTS

First of all, exploratory factor analysis and then the results obtained will be confirmed by confirmatory factor analysis. Then, reliabilities' results will be shared.

Exploratory Factor Analysis Result

According to the results of the Bartlett test ($\chi^2=2611$, $df=325$, $p<0.001$) and the KMO test (0.929), the study data can be used for factor analysis. Primarily, EFA was applied with no rotation. Loading factors are presented in **Table 1**.

The rotation method was applied to generate a stronger and more organized structure. The Varimax rotation has been applied. The loading factor was set at 0.4 as the cutoff value.

According to the results of parallel analyses (**Figure 1**), two factors have been identified. The initial eigenvalues of the first two components (9.68 and 1.11,) are greater than the eigenvalues obtained from simulation. Moreover, as can be seen in the Scree plot, the initial eigenvalues in the first two factors are higher than the values obtained by randomly simulating the first two factors. Items with loading values less than 0.4 were deleted and loaded on multiple factors, then the analysis was repeated. As a consequence, only 14 things remained following the removal of the items 5, 6, 7, 9, 12, 14, 15, 17, 19, 20, 21, and 22 from the list of possible items.

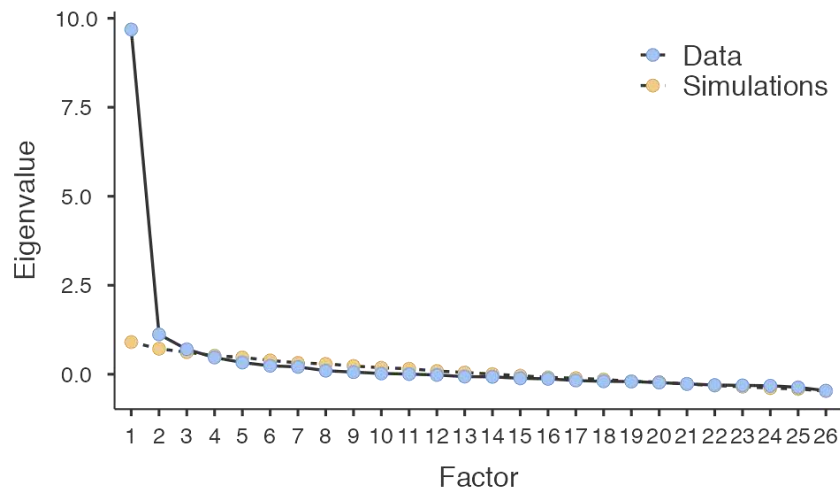


Figure 1. First solution for scree plot

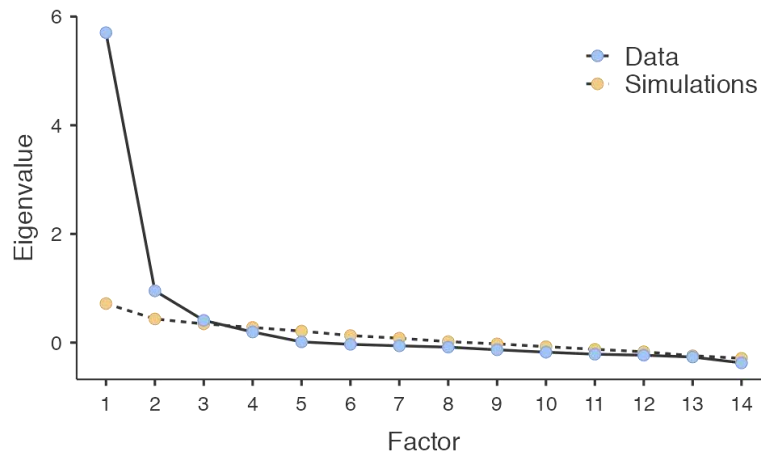


Figure 2. Final Solution of Scree Plot

Table 2. Final version factor loading

Items	Factor 1	Factor 2	Factor 3
I make it a habit to use smartphone and the sleep quality and total sleep time decreased.	0.759		
I feel tired on daytime due to late-night use of smartphone.	0.743		
I need to spend an increasing amount of time on smartphone to achieve same satisfaction as before.	0.601		
I cannot have meal without smartphone use.	0.595		
(My recreational activities are reduced due to smartphone use.	0.516		
I have slept less than 4 h due to using smartphone more than once.	0.511		
I feel aches and soreness in the back or eye discomforts due to excessive smartphone use.	0.497		
I was told more than once that I spent too much time on smartphone.		0.817	
I feel uneasy once I stop smartphone for a certain period of time		0.755	
I find that I have been hooking on smartphone longer and longer.		0.676	
I feel restless and irritable when the smartphone is unavailable.		0.577	
I feel missing something after stopping smartphone for a certain period of time.			0.646
I feel distressed or down once I cease using smartphone for a certain period of time.			0.628
I fail to control the impulse to use smartphone.			0.498

KMO (0.907) and Bartlett's test ($\chi^2=1362$, $df=91$, $p<0.001$) were calculated in the second analysis. They also are on a significant level. So, the data is useable for factor analysis.

Three variables were identified as a consequence of the parallel analysis. As seen in **Figure 2**, the initial eigenvalues for the first three components are bigger than the randomly produced simulation values. All items were gathered based on three factors. The factors and load values are as specified in **Table 2**.

Table 3. The variances and total variances of the factors

Factor	SS loadings	% of variance	Cumulative %
Functional impairment	3.15	22.5	22.5
Anxiety	2.67	19.0	41.5
Compulsive behavior	1.73	12.3	53.9

Table 4. Fit indices for the initial model and final model

	χ^2/df	CFI	TLI	SRMR	RMSEA	RMSEA 90% CI	
						Low	High
Cut-off criteria	≤ 2 : good	> 0.90	> 0.90	< 0.08	< 0.05		
Initial model	154/74=2.08	0.939	0.925	0.0507	0.0719	0.0558	0.0879
Final model	107/71=1.51	0.972	0.965	0.0473	0.0495	0.0289	0.0679

Note: Chi-square goodness (χ^2), Degree of freedom(df), Comparative fit index (CFI), Tucker-Lewis index (TLI), Standardized root mean square residual (SRMR), Root mean squared error of approximation (RMSEA).

All factor loadings vary between +0.497 and +0.759. In the factor I, there are 7 items. When the seven items listed above are taken into consideration, it will become clear that the items are connected to the impairment of the individual's quality of life. So, the first factor may be called as "Functional impairment". Second factor has 4 items. They are mostly related to an emotional issue. So, it may be called "Anxiety". They are mostly concerned with self-control. It might be referred to as "Compulsive behavior".

When factor structures such as those in **Table 3** are examined, the scale of three factors and 14 items accounts for 53.9 percent of the total variance. These components provide a variety of topologies based on the correlation calculation between them. Correlation coefficients of $r = 0.00$ are not statistically significant. As a result, "functional impairment," "anxiety," and "compulsive behavior" all refer to distinct structural components.

Confirmatory Factor Analysis

A CFA test model analysis indicated that the latent variable is true and may be further processed to validate the structural model.

The first model fit indices are not acceptable since the CFI and TLI are acceptable but the RMSEA is more than the cutoff values on the other hand (**Table 4**). In the first model, there is not any covariance connection. The final model was produced by using the software's proposed covariance connections (shown in **Figure 3**). When the final model fit indices are examined, it is observed that the CFI and TLI values are greater than 0.9, the SRMR value is less than 0.08, and the RMSEA value is less than 0.05 (Hair et al., 2014; Yu, 2002). The CFA results indicate that the inventory is at an acceptable level. **Table 5** depicts factor loading values.

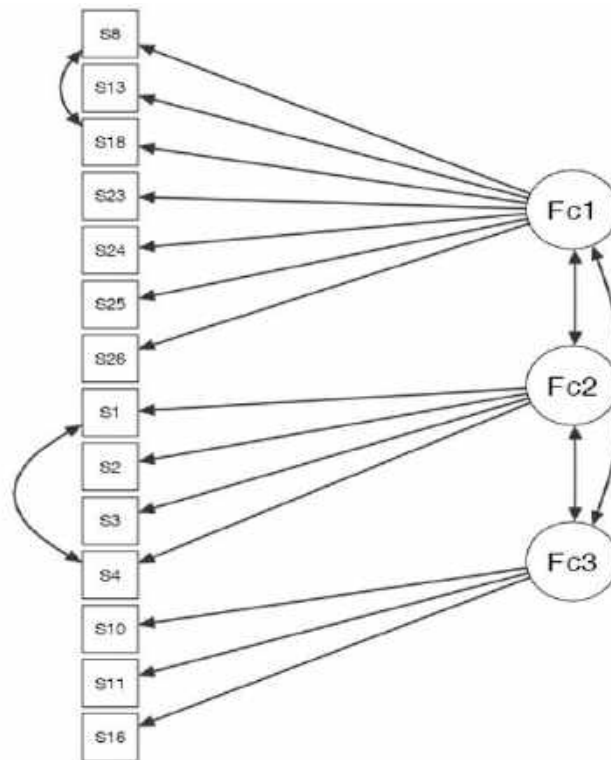


Figure 3. Path diagram of CFA

Table 5. Factor loading values, Z, and p values

Factor	Indicator	Estimate	SE	Z	p	Std. Estimate
Functional impairment	Item8	0.612	0.0718	8.51	< .001	0.574
	Item13	0.648	0.0712	9.10	< .001	0.603
	Item18	0.598	0.0631	9.49	< .001	0.626
	Item23	0.783	0.0588	13.32	< .001	0.801
	Item24	0.676	0.0611	11.07	< .001	0.702
	Item25	0.706	0.0668	10.57	< .001	0.683
	Item26	0.793	0.0661	12.00	< .001	0.746
Anxiety	Item1	0.837	0.0557	15.04	< .001	0.890
	Item2	0.697	0.0533	13.07	< .001	0.778
	Item3	0.653	0.0571	11.43	< .001	0.706
	Item4	0.760	0.0578	13.15	< .001	0.823
Compulsive behaviour	Item10	0.615	0.0615	9.99	< .001	0.667
	Item11	0.738	0.0633	11.67	< .001	0.749
	Item16	0.734	0.0613	11.99	< .001	0.767

When the relationship of each item with the relevant factors is examined, it is at the $p < 0.001$ level for all items. According to the CFA result, there is no item that should be removed from the inventory.

Reliability Analysis

Sufficient reliability is defined as being greater than 0.7 for both reliability measurements. According to Taber (2018), a Cronbach alpha of greater than 0.60 is an acceptable threshold. Composite reliability must exceed 0.7 (Hair et al., 2014; Schumacker & Lomax, 2004). Cronbach's alpha and McDonald's value are both better than 0.7, as seen in **Table 6**. Additionally, it was revealed that Cronbach's alpha value for the overall scale is 0.904, whereas McDonald's alpha value is 0.905.

Table 6. Reliability results for total inventory and sub-dimension

Factors name	Number of items	Cronbach α	McDonald's ω
Functional impairment	7	0.850	0.854
Anxiety	4	0.854	0.856
Compulsive behavior	3	0.771	0.772
Total inventory	14	0.904	0.905

DISCUSSION AND CONCLUSIONS

The purpose of this study is to investigate the psychometric features of the smartphone addiction inventory (SPAI) in the setting of Russia. The study was conducted at Kazan Federal University, The State University of Management, Sechenov University, RUDN-University, Moscow State Regional University, and MGIMO University during the autumn semester of the 2020-2021 academic year.

Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were used on 209 students to improve the inventory. The EFA method is stated one of the multivariate statistical techniques (Edwards & Bagozzi, 2000; Watkins, 2018). In EFA Varimax with Kaiser normalization was used as the factor method. Also, in order to determine the number of the factors, the parallel analysis approach was used. In a parallel analysis, real eigenvalues are compared with the random ordered eigenvalues. Factor is kept when actual eigenvalues exceed the random ordered eigenvalues (Williams et al., 2010). The item is also deleted if it (a) loaded on multiple factors with a difference of less than 0.1 between the two loading factors, or (b) obtained a factor load of less than 0.4. (Deng et al., 2017). As a consequence, only 14 things remained following the removal of the items 5, 6, 7, 9, 12, 14, 15, 17, 19, 20, 21, and 22 from the list of possible items.

As a result of second calculation, KMO (0.907) and Bartlett's test ($\chi^2=1362$, $df=91$, $p<0.001$) were on the significant level (Yong & Pearce, 2013). All items were classified into three variables using a scree plot and parallel analysis.

Factor loadings range from +0.497 to +0.759. There are seven items in the first factor. When the seven items stated above are considered, it becomes evident that the items are linked to a degradation in an individual's quality of life. As a result, the first element might be referred to as "functional impairment." There are four items in the second factor. They are almost always linked to an emotional problem. As a result, it may be referred to as "Anxiety" The majority of their concerns revolve with self-control. "Compulsive behaviour" is a term that has been used to describe it. In another study, the inventory items were grouped in a different way and the factors were named as Time Spent", "Compulsiveness", "Daily Life Interference", "Craving", "Sleep Disorder" (Pavia et al., 2016).

A CFA test model analysis was used to assess when the structure in the inventory is correct and may be further processed to validate the structural model. When looking at the final model fit indices, the CFI and TLI values are both greater than 0.95, the SRMR value is less than 0.08, and the RMSEA value is less than 0.05. (Hair et al., 2014). The scale is in line with the findings of the CFA. CFA calculation was made in the scale development study (Lin et al., 2014). In the study by Pavia et al. (2016), the 5-factor construct was confirmed by CFA. It was also discovered that the total scale of Cronbach alpha value is 0.904, and of McDonald is 0.905. Lin et al. (2014) calculated Cronbach alpha as 0.94

As a result, validity and reliability studies of Smartphone Addiction Inventory in the Russian context were conducted. According to the results of the analysis, a short inventory of 14 items and 3 factors was obtained. It is recommended for future researchers to conduct the validity and reliability study of the inventory with different groups. In addition, comparisons can be made by repeating the study in different cultural contexts. In addition, the inventory can be used to determine the prevalence of smartphone addiction among university students, especially with the widespread use of smartphones due to the pandemic. The study collects data on a voluntary basis. As a result, faculties and departments were not considered. The sample may not be representative of all students. This is a research limitation.

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APPENDIX 1

Items of Smartphone Addiction Inventory (English)

1. I was told more than once that I spent too much time on smartphone.
2. I feel uneasy once I stop smartphone for a certain period of time.
3. I find that I have been hooking on smartphone longer and longer.
4. I feel restless and irritable when the smartphone is unavailable.
5. I feel very vigorous upon smartphone use regardless of the fatigues experienced.
6. I use smartphone for a longer period of time and spend more money than I had intended.
7. Although using smartphone has brought negative effects on my interpersonal relationships, the amount of time spent on Internet remains unreduced.
8. I have slept less than 4 h due to using smartphone more than once.
9. I have increased substantial amount of time using smartphone per week in recent 3 months.
10. I feel distressed or down once I cease using smartphone for a certain period of time.
11. I fail to control the impulse to use smartphone.
12. I find myself indulged on the smartphone at the cost of hanging out with friends.
13. I feel aches and soreness in the back or eye discomforts due to excessive smartphone use.
14. The idea of using smartphone comes as the first thought on mind when wake up each morning.
15. To use smartphone has exercised certain negative effects on my schoolwork or job performance.
16. I feel missing something after stopping smartphone for a certain period of time.
17. My interaction with family members is decreased on account of smartphone use.
18. My recreational activities are reduced due to smartphone use.
19. I feel the urge to use my smartphone again right after I stopped using it.
20. My life would be joyless hadn't there been smartphone.
21. Surfing the smartphone has exercised negative effects on my physical health. For example, viewing smartphone when crossing the street; fumbling with one's smartphone while driving or waiting, and resulted in danger.
22. I try to spend less time on smartphone, but the efforts were in vain.
23. I make it a habit to use smartphone and the sleep quality and total sleep time decreased.
24. I need to spend an increasing amount of time on smartphone to achieve same satisfaction as before.
25. I cannot have meal without smartphone use.
26. I feel tired on daytime due to late-night use of smartphone.