psych

MDPI

Article

Evaluation of the English Version of the Smartphone Application-Based Addiction Scale (SABAS) among an Adolescent Sample

Andre Mason [1], Taylor Winter [2], Benjamin C. Riordan [3], Mark D. Griffiths [4] and Damian Scarf [1,*]

1 Department of Psychology, University of Otago, Dunedin 9054, New Zealand
2 Department of Psychology, Victoria University of Wellington, Wellington 6140, New Zealand
3 Centre for Alcohol Policy Research, La Trobe University, Melbourne 3550, Australia
4 International Gaming Research Unit, Psychology Department, Nottingham Trent University, Nottingham NG1 4FQ, UK
* Correspondence: damian@psy.otago.ac.nz

Abstract: The increased use of smartphones among adolescents has highlighted the need to distinguish between problematic and non-problematic smartphone use. To date, there are a lack of short, easy-to-use, and valid psychometric tools to assess smartphone addiction. The primary aim of the present study was to conduct the first psychometric assessment and evaluation of the Smartphone Application-Based Addiction Scale (SABAS) among English-speaking adolescents. Participants were 1175 students recruited from across four different high schools in New Zealand, of which 1031 completed all questions and were used in the final analyses. Several psychometric tests were conducted to ascertain reliability and validity. The SABAS had high internal consistency. Consistent with earlier validation studies, the SABAS displayed weak-moderate, positive relationships with symptoms of depression (PHQ-2), anxiety (GAD-2), and sleep quality. Overall, the SABAS is a sound, unidimensional scale with robust psychometric properties and is a short and easy-to-use measure that can be used confidently among English-speaking adolescents.

Keywords: smartphone addiction; social media addiction; nomophobia

Citation: Mason, A.; Winter, T.; Riordan, B.C.; Griffiths, M.D.; Scarf, D. Evaluation of the English Version of the Smartphone Application-Based Addiction Scale (SABAS) among an Adolescent Sample. *Psych* **2022**, *4*, 961–968. https://doi.org/10.3390/psych4040071

Academic Editor: Mosad Zineldin

Received: 26 October 2022
Accepted: 12 December 2022
Published: 19 December 2022

1. Introduction

Surveys conducted in the United States [1], the United Kingdom [2], and Japan [3] report that over 50% of 8-year-old children own a smartphone. Therefore, from a developmental perspective, many children are given their first smartphone before adolescence. Broadley speaking, children enter adolescence between 9 and 12 years of age, coinciding with the start of puberty [4]. The hormonal and physiological changes during this time are accompanied by marked changes in young people's social worlds [4]. For example, there is a shift away from their family as the focal point and toward friendship groups [5]. Given that smartphones are one of the primary avenues through which adolescents communicate, changes to young people's social worlds are likely mirrored by changes in smartphone use [6].

When investigating smartphone use in adolescence, it is essential to distinguish between problematic and non-problematic smartphone use. This distinction is difficult because high smartphone use levels are not necessarily problematic [7]. Indeed, smartphones have many uses (e.g., communication, entertainment, education, etc.), and problematic use levels are likely a function of both the time spent on the device and the specific functions that are used. For example, during adolescence, high use levels for communicative purposes may be less problematic than high use levels for viewing social media (e.g., *Instagram* [8]).

Several researchers have drawn on the behavioral addictions literature to provide a framework for distinguishing between problematic and non-problematic use [7,9]. According to a behavioral addiction framework, for an activity to be classified as an addiction, the

behavior must meet all six of the following criteria; salience, mood modification, tolerance, withdrawal, conflict, and relapse [10].

When considering the salience of smartphone use for adolescents, there is little question that many adolescents view having a smartphone as essential and, if the smartphone were confiscated or lost, the absence of their smartphone would dominate their thoughts (i.e., a concept termed 'reverse salience' [10]). The term "nomophobia" captures this reverse salience effect and refers to the phobia or fear of an individual being unable to use their smartphone [11]. Reverse salience is also related to the criteria of conflict. Parental concern about adolescent smartphone use is common, and approximately one-third of adolescents report daily conflicts with their parents over smartphone use [12–14]. From a developmental perspective, the potential for conflict is heightened during adolescence, as the drive for independence and autonomy is a defining feature of this period of life [15].

Moreover, adolescents view smartphones as facilitating and enhancing their autonomy, allowing them to communicate with peers, use social media, and search the internet without direct parental supervision [16]. Yang and Zhang [14] reported that parental responsiveness (e.g., "*I can depend on my parents to help me out if I have a problem*") might help to moderate conflict regarding smartphone use. However, they also reported that this approach is less effective as the intensity of smartphone use increases, suggesting that conflict may be inevitable for adolescents displaying problematic smartphone use. Empirical support for the remaining criteria (mood modification, tolerance, withdrawal, conflict, and relapse) is arguably relatively limited [7].

In addition to providing a framework, the behavioral addictions literature has also been used to develop self-report measures that aim to assess problematic smartphone use. There are a growing number of scales, including the widely cited Smartphone Addiction Scale [17] and its shorter ten-item version, the Smartphone Addiction Scale Short Version (SAS-SV) [18]. In addition, there is the Smartphone Addiction Inventory (SPAI) [19], Smartphone Addiction Proneness Scale (SAPS) [20], and the Smartphone Application-Based Addiction Scale (SABAS) [21,22].

Although they all purportedly tap smartphone addiction, the scales tend to vary in the specific combination of addiction criteria covered. Many include items that cover salience (e.g., SABAS: "*My smartphone is the most important thing in my life*"), tolerance (e.g., SAPS: "*I try cutting my smartphone usage time, but I fail*"), conflict (e.g., SAS: "*Conflicting with family members due to smartphone use*"), withdrawal (e.g., SAS-SV: "*I get restless and nervous when I am without a smartphone*"), mood modification (e.g., SAS: "*Feeling pleasant or excited while using a smartphone*"), and relapse (e.g., SABAS: "*I try to cut the time I use my smartphone, I manage to do so for a while, but then I end up using it as much or more than before*").

The SABAS stands out among these scales of problematic smartphone use as an ultra-brief and easy-to-use screening tool for the risk of smartphone addiction. From a pragmatic perspective, the brevity of the SABAS makes it desirable for use within research and clinical practice, mainly when working with adolescents and when space in survey-based studies is at a premium. The SABAS also has the benefit of having been translated and validated in English [21], Persian [23], Italian, [24], Serbian [25], Turkish [26], Bangla [27], Arabic [28], Indonesian [29] and Chinese [30].

Present Study

To the best of the present authors' knowledge, only two studies have validated the SABAS among adolescents [22,23], and neither of these validations was conducted in English. Additionally, scales that assess problematic smartphone use have typically been validated in college students, making it unclear whether they are valid instruments for use with adolescents. Such validation is crucial before the SABAS can be applied within English-speaking adolescent contexts. The present study presents the first psychometric assessment and validation of the scale for English-speaking adolescents.

2. Materials and Methods

2.1. Participants

The participants comprised 1175 high school students recruited from four New Zealand high schools. A total of 1031 students completed all questions related to smartphone use and symptoms of depression and anxiety and were used in the current analysis. A further 832 students (from three of the four schools) completed measures related to sleep quality. Students were relatively evenly split across each of the four high schools. Participants were between the ages of 11 and 19 years old (mean [M] = 14.79 years; standard deviation [SD] = 1.48) with more female than male participants (female n = 598, male n = 388, another gender n = 31). Of those who identified as another gender, most identified as non-binary or gender fluid (n = 16) or did not specify (n = 9). The majority of participants self-identified as New Zealand European (62%; n = 634), followed by Māori (n = 198), Pasifika (n = 28), and Asian (n = 57). A total of 113 participants (11%) stated specific ethnicities, of which 83 fell into other Western regions (e.g., British, Australian, American) and 30 into non-Western regions (e.g., African, Middle Eastern).

2.2. Measures

2.2.1. Smartphone Addiction

The Smartphone Application-Based Addiction Scale (SABAS) is a six-item instrument assessing the risk for smartphone addiction. The scale asks participants to indicate the extent to which they agree with each item (e.g., "*Conflicts have arisen between me and my family [or friends] because of my smartphone use*") from 1 (*strongly disagree*) to 5 (*strongly agree).* The psychometric properties are reported in the Results section.

2.2.2. Depressive Symptoms

The Patient Health Questionnaire-2 (PHQ-2) is a two-item instrument assessing depressive symptoms, revised from the original nine-item scale [31]. Participants were asked to indicate how frequently they experience depression-related symptoms (e.g., "*Little interest or pleasure in doing things*") on a four-point scale from 0 (*not at all*) to 3 (*nearly every day).* Higher scores indicated greater depressive symptoms (Cronbach's α = 0.62).

2.2.3. Anxiety Symptoms

The General Anxiety Scale-2 (GAD-2) is a two-item instrument assessing anxiety symptoms revised from the original seven-item scale [32]. Participants were asked to indicate how frequently they experience anxiety-related symptoms (e.g., "*feeling nervous, anxious or on edge*") on a four-point scale from 0 (*not at all*) to 3 (*nearly every day*). Higher scores indicated greater anxiety symptoms (Cronbach's α = 0.83).

2.2.4. Sleep Quality

Sleep quality was assessed using four items related to specific sleep problems [33]. Responses to items (e.g., "*You have trouble falling asleep at night*") were rated on a four-point scale from 1 (*never*) to 4 (*very often*). Higher mean scores indicated greater sleep problems (Cronbach's α = 0.76).

2.3. Data Analysis

Analyses were conducted using Jamovi (version: 2.2). Firstly, descriptive statistics were used to describe the sample. To assess the reliability of the SABAS, we tested the skewness, kurtosis, and distributions of each scale item in the SABAS, the internal consistency (Cronbach's α), and inter-item and item-total correlations. Further, confirmatory factor analysis (CFA) was conducted using maximum likelihood estimation to evaluate the factor structure of the SABAS and report the factor loadings and the goodness of fit using root mean square error of approximation (RMSEA where good fit is typically less than 0.1) and comparative fit index (CFI where good fit is typically more than 0.9). Finally, a polytomous Rasch model using the partial credit model was used to assess the unidimensionality and

item fits of the SABAS. Given the nonlinearity of the data, to assess convergent validity Spearman's correlations were used to assess the relationship between smartphone addiction and depressive symptoms, anxiety symptoms, and sleep quality.

3. Results

Descriptive statistics for each instrument are presented in Table 1. The mean SABAS score was 15.1 (out of 30; SD = 5.23), PHQ-2 was 2.07 (out of 6; SD = 1.69), GAD-2 was 2.23 (out of 6; SD = 1.95), and Sleep Quality was 2.33 (out of 16; SD = 0.74). Tables 2–4 show the summary statistics and item analysis for each scale item in the SABAS (mean item scores, standard deviation, skew, kurtosis, inter-item and item-rest correlations, and internal consistency if item was deleted). All items were normally distributed, as indicated by skew and kurtosis falling between the −2 to 2 range. Finally, the internal consistency, if an item was deleted, ranged from 0.76 to 0.80. This suggests that dropping any item in the scale would not improve overall consistency.

Table 1. Descriptive statistics for each measure.

	N	Mean	SD	Skewness	SE	Kurtosis	SE
SABAS	1031	15.1	5.23	0.01	0.08	−0.71	0.15
PHQ-2	1031	2.07	1.69	0.59	0.08	−0.49	0.15
GAD-2	1031	2.23	1.95	0.55	0.08	−0.86	0.15
Sleep Quality	832	9.33	2.98	0.34	0.08	−0.58	0.17

Table 2. Summary statistics for the Smartphone Application-Based Addiction Scale.

	N	Mean	SD	Skewness	SE	Kurtosis	SE
SABAS Item 1	1031	2.19	1.2	0.65	0.08	−0.61	0.15
SABAS Item 2	1031	2.25	1.24	0.6	0.08	−0.83	0.15
SABAS Item 3	1031	3.06	1.31	−0.19	0.08	−1.06	0.15
SABAS Item 4	1031	2.86	1.21	−0.08	0.08	−0.99	0.15
SABAS Item 5	1031	2.21	1.17	0.61	0.08	−0.62	0.15
SABAS Item 6	1031	2.54	1.18	0.24	0.08	−0.84	0.15

Table 3. Inter-item correlations for the Smartphone Application-Based Addiction Scale.

	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6
SABAS Item 1	—					
SABAS Item 2	0.33 **	—				
SABAS Item 3	0.38 **	0.39 **	—			
SABAS Item 4	0.39 **	0.42 **	0.60 **	—		
SABAS Item 5	0.43 **	0.32 **	0.42 **	0.42 **	—	
SABAS Item 6	0.38 **	0.34 **	0.45 **	0.50 **	0.46 **	—

** $p < 0.001$.

Table 4. Item-rest correlations and Cronbach's α if an item is dropped.

	Item-Rest Correlation	Cronbach's α	McDonald's ω
SABAS Item 1	0.52	0.79	0.8
SABAS Item 2	0.48	0.8	0.8
SABAS Item 3	0.62	0.77	0.77
SABAS Item 4	0.66	0.76	0.76
SABAS Item 5	0.56	0.78	0.79
SABAS Item 6	0.59	0.78	0.78

Internal consistency for the SABAS was strong for this sample, with Cronbach's α = 0.81. The CFA of the scale showed a good fit, with CFI and RMSEA of 0.97 and 0.07

(95% CI: 0.06–0.09), respectively (Table 5). Additionally, all items significantly loaded onto the same latent factor, with standardized loadings between 0.67 and 9.5 ($p < 0.001$). All items fitted well with their latent construct as the infit and outfit MNSQ were within an acceptable range (0.5–1.5; Table 6).

Table 5. Confirmatory factor analysis of the Smartphone Application-Based Addiction Scale.

Factor	Indicator	Estimate	SE	Z	*p*
Factor 1	SABAS Item 1	0.67	0.04	17.86	<0.001
	SABAS Item 2	0.67	0.04	17.06	<0.001
	SABAS Item 3	0.95	0.04	24.71	<0.001
	SABAS Item 4	0.93	0.04	26.28	<0.001
	SABAS Item 5	0.72	0.04	19.79	<0.001
	SABAS Item 6	0.78	0.04	21.8	<0.001

Table 6. Item statistics from partial credit polytomous Rasch model.

	Measure	S.E. Measure	Infit	Outfit
SABAS Item 1	−1.04	0.03	1.11	1.12
SABAS Item 2	−1.12	0.03	1.22	1.21
SABAS Item 3	−2.06	0.03	1	0.98
SABAS Item 4	−1.83	0.03	0.82	0.82
SABAS Item 5	−1.07	0.03	1	0.97
SABAS Item 6	−1.46	0.03	0.92	0.93

To assess concurrent validity, the SABAS was correlated with measures of depression symptoms, anxiety symptoms, and sleep quality (see Table 7). The SABAS showed good concurrent validity. More specifically, weak-moderate relationships were found between symptoms of depression (rho = 0.26, $p < 0.001$) and anxiety symptoms (rho = 0.23, $p < 0.001$), and sleep quality (rho = 0.23, $p < 0.001$).

Table 7. Spearman's correlations testing concurrent validity between the Smartphone Application-Based Addiction Scale and other measures.

	PHQ-2	Anx-2	Sleep	SABAS
PHQ-2	—			
GAD-2	0.63 **	—		
Sleep Quality	0.54 **	0.52 **	—	
SABAS	0.26 **	0.23 **	0.23 **	—

** $p < 0.001$.

4. Discussion

The primary aim of the present study was to evaluate the English version of the SABAS among adolescents. Across a large sample of Aotearoa New Zealand high school students, the SABAS had high internal consistency (Cronbach's $\alpha = 0.81$). This is similar to [25–27] or greater than [29] previous validation studies using this model. In line with previous studies, the SABAS was found to have good model fit across classical test theory [23,28] and Rasch analysis [23]. Moreover, as with the Persian [23] and Hungarian [22] versions, the SABAS had a stable unidimensional structure using an adolescent sample. In addition, our data are consistent with previous work, demonstrating that problematic smartphone use is associated with greater depressive and anxiety symptoms [34,35] and poorer sleep quality [36,37]. Moreover, the findings are consistent with the observed relationships in previous tests of the SABAS [23,24,28]. Therefore, the English version of the SABAS appears to have adequate concurrent validity with these measures among an adolescent sample.

The current validation study opens the door for longitudinal research on problematic smartphone use across adolescence. There are multiple benefits to taking a longitudinal

approach in this area, including the ability to understand the etiological pathways and causal variables that may lead to problematic smartphone use. Billieux, Maurage, Lopez-Fernandez, Kuss, and Griffiths [7] suggest three possible pathways: excessive reassurance, impulsive–antisocial, and extraversion. For the excessive reassurance pathway, problematic smartphone use is driven by the constant need for reassurance regarding personal relationships. The extraversion pathway shares a communicative function with the excessive reassurance pathway but is differentiated by the fact that the motive is to stay connected to other individuals rather than seek reassurance from them. Moreover, the extraversion pathway is also not limited to existing relationships. Finally, the impulsive pathway is driven by the inability for individuals to regulate their smartphone use. Billieux et al. [7] noted that the impulsive pathway may have very different manifestations. For example, beyond the urgent need to use the smartphone constantly, the impulsive pathway might lead to high-risk use (e.g., using a smartphone while driving, sending nude pictures, etc.).

From a developmental perspective, each of the pathways outlined by Billieux et al. [7] would place adolescents at an increased risk of developing problematic smartphone use. Indeed, adolescence is marked by a shift from the family group as the focal point toward peer groups and, as a result, a greater sensitivity to social inclusion and exclusion [5,38]. For example, Pharo, Gross, Richardson, and Hayne [38] had adolescents and adults play Cyberball [39], exposing half of the participants in each age group to ostracism and assessing the impact of ostracism on the four basic needs (i.e., belonging, self-esteem, control, and meaningfulness). Although both age groups displayed a reduction in the four basic needs, this effect was more marked for adolescents, suggesting they are more sensitive to social exclusion. This greater sensitivity may make them more susceptible to the excessive reassurance pathway.

The impulsive pathway also presents a risk for adolescents, with a wealth of evidence demonstrating that adolescence is marked by a peak in sensation seeking but immaturity in executive control [40–43]. The dual-systems model holds that the socio-emotional areas of the brain (e.g., amygdala, striatum, etc.) are most sensitive during adolescence. In contrast, the areas of the brain responsible for executive control (e.g., prefrontal cortex) undergo a more linear development, not reaching full maturity until adulthood. This discrepancy between reward-seeking and cognitive control is thought to explain the peak in risk-taking observed during adolescence [44]. One difficulty to highlight when applying Billieux et al.'s [7] pathways to adolescent populations is that the impulsive pathway likely overlaps with the excessive reassurance and extraversion pathways. Indeed, social context plays an influential role in risk-taking during adolescence [5]. For example, Chein et al. [45] demonstrated that differences in risk-taking between adolescents and adults only occur in social contexts, where adolescents are more driven to seek the approval of their peers. Consequently, for adolescents, the impulsive pathway to problematic use may be characterized by different behaviors than those observed among adults.

The current validation also provides a brief, valid, and easy-to-use model for clinicians to assess risk for problematic adolescent smartphone use and adjust their therapy modalities accordingly. Therapists could use the SABAS to monitor adolescent smartphone use and intervene as risk increases, either by offering psychoeducation regarding the benefits and pitfalls of smartphone use or by delivering adjusted family therapy to reduce home-based conflict.

Limitations

Although the data comprised over 1000 students from four different high schools, all four schools were from New Zealand. Additionally, all data were self-report and may be subject to established methods biases. Given the study's cross-sectional nature, the directionality between the risk of smartphone addiction and depression, anxiety, and sleep quality could not be determined. Longitudinal analyses are required to determine whether smartphone addiction predicts poorer outcomes, vice versa, or both. However, for a scale validation study, the design was robust.

5. Conclusions

The present study demonstrated that the English version of the SABAS is a stable, unidimensional scale with robust psychometric properties and concurrent validity among English-speaking adolescents. The findings demonstrate that SABAS is an appropriate, short, and easy-to-use instrument to assess the risk of smartphone addiction among English-speaking adolescents.

Author Contributions: Conceptualization, M.D.G. and D.S.; methodology, A.M. and D.S.; formal analysis, A.M., T.W. and B.C.R.; investigation, A.M. and D.S.; resources, D.S.; data curation, A.M., T.W. and B.C.R.; writing—original draft preparation, A.M.; writing—review and editing, M.D.G. and D.S.; supervision, D.S.; project administration, D.S.; funding acquisition, D.S. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Royal Society Te Apārangi Rutherford Discovery Fellowship (RDF-UOO1901).

Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the University of Otago Human Ethics Committee (Reference Code:19/049; Date of Approval: 25 June 2019).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Kamenetz, A. It's a smartphone life: More than half of U.S. children now have one. *National Public Radio*, 31 October 2019.
2. Pinkstone, J. Most children have their own mobile phone by the age of SEVEN and half of them sleep with it beside their bed, report suggests. *DailyMail*, 30 January 2020.
3. Kyodo. 51% of Japanese children get first phone at elementary school age, poll finds. *The Japan Times*, 2 May 2022.
4. Crone, E.A.; Dahl, R.E. Understanding adolescence as a period of social–affective engagement and goal flexibility. *Nat. Rev. Neurosci.* **2012**, *13*, 636–650. [CrossRef] [PubMed]
5. Kwon, S.-J.; Telzer, E.H. Social contextual risk taking in adolescence. *Nat. Rev. Psychol.* **2022**, *1*, 393–406. [CrossRef]
6. Orben, A.; Przybylski, A.K.; Blakemore, S.-J.; Kievit, R.A. Windows of developmental sensitivity to social media. *Nat. Commun.* **2022**, *13*, 1649. [CrossRef] [PubMed]
7. Billieux, J.; Maurage, P.; Lopez-Fernandez, O.; Kuss, D.J.; Griffiths, M.D. Can disordered mobile phone use be considered a behavioral addiction? An update on current evidence and a comprehensive model for future research. *Curr. Addict. Rep.* **2015**, *2*, 156–162. [CrossRef]
8. Vandenbosch, L.; Fardouly, J.; Tiggemann, M. Social media and body image: Recent trends and future directions. *Curr. Opin. Psychol.* **2022**, *45*, 101289. [CrossRef] [PubMed]
9. De-Sola Gutiérrez, J.; Rodríguez de Fonseca, F.; Rubio, G. Cell-phone addiction: A review. *Front. Psychiatry* **2016**, *7*, 175. [CrossRef]
10. Griffiths, M. A 'components' model of addiction within a biopsychosocial framework. *J. Subst. Use* **2005**, *10*, 191–197. [CrossRef]
11. King, A.L.S.; Valenca, A.-M.; Silva, A.-C.O.; Baczynski, T.; Carvalho, M.R.; Nardi, A.E. Nomophobia: Dependency on virtual environments or social phobia? *Comput. Hum. Behav.* **2013**, *29*, 140–144. [CrossRef]
12. Wartella, E.; Rideout, V.; Lauricella, A.R.; Connell, S. *Parenting in the Age of Digital Technology*; Northwestern University: Evanston, IL, USA, 2013.
13. Lauricella, A.R.; Cingel, D.P.; Beaudoin-Ryan, L.; Robb, M.B.; Saphir, M.; Wartella, E.A. *The Common Sense Census: Plugged-In Parents of Tweens and Teens*; Common Sense Media: San Francisco, CA, USA, 2016.
14. Yang, X.; Zhang, L. Reducing parent-adolescent conflicts about mobile phone use: The role of parenting styles. *Mob. Media Commun.* **2021**, *9*, 563–583. [CrossRef]
15. Ryan, R.M.; Deci, E.L. *Self-Determination Theory: Basic Psychological Needs in Motivation, Development, and Wellness*; Guilford Press: New York, NY, USA, 2017.
16. Blair, B.L.; Fletcher, A.C. "The only 13-year-old on planet earth without a cell phone": Meanings of cell phones in early adolescents' everyday lives. *J. Adolesc. Res.* **2011**, *26*, 155–177. [CrossRef]
17. Kwon, M.; Lee, J.Y.; Won, W.Y.; Park, J.W.; Min, J.A.; Hahn, C.; Gu, X.; Choi, J.H.; Kim, D.J. Development and validation of a smartphone addiction scale (SAS). *PLoS ONE* **2013**, *8*, e56936. [CrossRef] [PubMed]
18. Kwon, M.; Kim, D.J.; Cho, H.; Yang, S. The smartphone addiction scale: Development and validation of a short version for adolescents. *PLoS ONE* **2013**, *8*, e83558. [CrossRef] [PubMed]

19. Lin, Y.H.; Chang, L.R.; Lee, Y.H.; Tseng, H.W.; Kuo, T.B.; Chen, S.H. Development and validation of the Smartphone Addiction Inventory (SPAI). *PLoS ONE* **2014**, *9*, e98312. [CrossRef] [PubMed]
20. Kim, D.; Lee, Y.; Lee, J.; Nam, J.K.; Chung, Y. Development of Korean Smartphone Addiction Proneness Scale for Youth. *PLoS ONE* **2014**, *9*, e97920. [CrossRef]
21. Csibi, S.; Griffiths, M.D.; Cook, B.; Demetrovics, Z.; Szabo, A. The psychometric properties of the Smartphone Application-Based Addiction Scale (SABAS). *Int. J. Ment. Health Addict.* **2018**, *16*, 393–403. [CrossRef]
22. Csibi, S.; Demetrovics, Z.; Szabo, A. Development and psychometric validation of the Brief Smartphone Addiction Scale (BSAS) with schoolchidren. *Psychiatr. Hung. Magy. Pszichiatr. Tars. Tud. F.* **2016**, *31*, 71–77.
23. Lin, C.Y.; Imani, V.; Broström, A.; Nilsen, P.; Fung, X.C.C.; Griffiths, M.D.; Pakpour, A.H. Smartphone application-based addiction among Iranian adolescents: A psychometric study. *Int. J. Ment. Health Addict.* **2019**, *17*, 765–780. [CrossRef]
24. Soraci, P.; Ferrari, A.; Antonino, U.; Griffiths, M.D. Psychometric properties of the Italian version of the Smartphone Application-Based Addiction Scale (SABAS). *Int. J. Ment. Health Addict.* **2021**, *19*, 1261–1273. [CrossRef]
25. Sojević, M.; Pećanac, D.; Latas, M. Connection of depression, anxiety and impulsivity with the way of using modern mobile phones among students. *Med. Podml.* **2018**, *69*, 27–34. [CrossRef]
26. Altundağ, Y.; Yandi, A.; Ali, Ü. Adaptation of Application-Based Smartphone Addiction Scale to Turkish cultures. *Sakarya Univ. J. Educ.* **2019**, *9*, 261–281. [CrossRef]
27. Islam, M.S.; Sujan, M.S.H.; Tasnim, R.; Mohona, R.A.; Ferdous, M.Z.; Kamruzzaman, S.; Toma, T.Y.; Sakib, M.N.; Pinky, K.N.; Islam, M.R. Problematic smartphone and social media use among Bangladeshi college and university students amid COVID-19: The role of psychological well-being and pandemic related factors. *Front. Psychiatry* **2021**, *12*, 647386. [CrossRef] [PubMed]
28. Vally, Z.; Alowais, A. Assessing risk for smartphone addiction: Validation of an Arabic version of the Smartphone Application-Based Addiction Scale. *Int. J. Ment. Health Addict.* **2022**, *20*, 691–703. [CrossRef]
29. Nurmala, I.; Nadhiroh, S.R.; Pramukti, I.; Tyas, L.W.; Zari, A.P.; Griffiths, M.D.; Lin, C.-Y. Reliability and validity study of the Indonesian Smartphone Application-Based Addiction Scale (SABAS) among college students. *Heliyon* **2022**, *8*, e10403. [CrossRef] [PubMed]
30. Yam, C.W.; Pakpour, A.H.; Griffiths, M.D.; Yau, W.Y.; Lo, C.L.M.; Ng, J.M.T.; Lin, C.Y.; Leung, H. Psychometric testing of three Chinese online-related addictive behavior instruments among Hong Kong university students. *Psychiatr. Q.* **2019**, *90*, 117–128. [CrossRef]
31. Kroenke, K.; Spitzer, R.L.; Williams, J.B.W. The Patient Health Questionnaire-2: Validity of a two-item depression screener. *Med. Care* **2003**, *14*, 1284–1292. [CrossRef]
32. Kroenke, K.; Spitzer, R.L.; Williams, J.B.W.; Monahan, P.O.; Lowe, B. Anxiety disorders in primary care: Prevalence, impairment, comorbidity, and detection. *Ann. Intern. Med.* **2007**, *146*, 317–325. [CrossRef]
33. Vazsonyi, A.T.; Harris, C.; Terveer, A.M.; Pagava, K.; Phagava, H.; Michaud, P.A. Parallel mediation effects by sleep on the parental warmth-problem behavior links: Evidence from national probability samples of Georgian and Swiss adolescents. *J. Youth Adolesc.* **2015**, *44*, 331–345. [CrossRef]
34. Elhai, J.D.; Dvorak, R.D.; Levine, J.C.; Hall, B.J. Problematic smartphone use: A conceptual overview and systematic review of relations with anxiety and depression psychopathology. *J. Affect. Disord.* **2017**, *207*, 251–259. [CrossRef]
35. Geng, Y.; Gu, J.; Wang, J.; Zhang, R. Smartphone addiction and depression, anxiety: The role of bedtime procrastination and self-control. *J. Affect. Disord.* **2021**, *293*, 415–421. [CrossRef]
36. Demirci, K.; Akgonul, M.; Akpinar, A. Relationship of smartphone use severity with sleep quality, depression, and anxiety in university students. *J. Behav. Addict.* **2015**, *4*, 85–92. [CrossRef]
37. Graham, S.; Mason, A.; Riordan, B.; Winter, T.; Scarf, D. Taking a break from social media improves wellbeing through sleep quality. *Cyberpsychol. Behav. Soc. Netw.* **2021**, *24*, 421–425. [CrossRef] [PubMed]
38. Pharo, H.; Gross, J.; Richardson, R.; Hayne, H. Age-related changes in the effect of ostracism. *Soc. Influ.* **2011**, *6*, 22–38. [CrossRef]
39. Williams, K.D. Ostracism. *Annu. Rev. Psychol.* **2007**, *58*, 425–452. [CrossRef] [PubMed]
40. Steinberg, L. A dual systems model of adolescent risk-taking. *Dev. Psychobiol.* **2010**, *52*, 216–224. [CrossRef]
41. Steinberg, L. The influence of neuroscience on US Supreme Court decisions about adolescents' criminal culpability. *Nat. Rev. Neurosci.* **2013**, *14*, 513–518. [CrossRef] [PubMed]
42. Steinberg, L. A social neuroscience perspective on adolescent risk-taking. *Dev. Rev.* **2008**, *28*, 78–106. [CrossRef]
43. Steinberg, L.; Albert, D.; Cauffman, E.; Banich, M.; Graham, S.; Woolard, J. Age differences in sensation seeking and impulsivity as indexed by behavior and self-report: Evidence for a dual systems model. *Dev. Psychol.* **2008**, *44*, 1764–1778. [CrossRef]
44. Shulman, E.P.; Smith, A.R.; Silva, K.; Icenogle, G.; Duell, N.; Chein, J.; Steinberg, L. The dual systems model: Review, reappraisal, and reaffirmation. *Dev. Cogn. Neurosci.* **2016**, *17*, 103–117. [CrossRef]
45. Chein, J.; Albert, D.; O'Brien, L.; Uckert, K.; Steinberg, L. Peers increase adolescent risk taking by enhancing activity in the brain's reward circuitry. *Dev. Sci.* **2011**, *14*, F1–F10. [CrossRef]