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ORIGINAL ARTICLE

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Smartphone Addiction Scale (SAS): Italian translation and preliminary validation

Tiziano Prodi [1,2], Matteo Cerioli [1], Beatrice Benatti [1,3], Maurizio Proto [1], Dario Conti [4], Caterina Viganò [1], Bernardo Dell'Osso [1,3,5,6], Roberto Truzoli [1]

[1] Department of Mental Health, Department of Biomedical and Clinical Sciences, University of Milan, [2] Department of Pharmacological and Biomolecular Sciences, University of Milan, [3] Aldo Ravelli" Center for Nanotechnology and Neurostimulation, University of Milan, [4] Department of Mental Health and Addiction, ASP Palermo, Palermo, [5] Department of Psychiatry and Behavioral Sciences, Stanford University, Stanford, California, USA, [6] Centro per lo studio dei meccanismi molecolari alla base delle patologie neuro-psico-geriatriche", University of Milan, Milan, Italy.

Correspondence to: Dr. Beatrice Benatti, Via G.B. Grassi 74, 20157, Milan, Italy, Tel: 02 3904 1.
E-MAIL: beatrice.benatti@unimi.it

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Abstract

OBJECTIVE: Persistent or recurrent use of technological tools along with online-related activities could lead to digital addiction. The prevalence of Smartphone Addiction (SPA) has become a serious issue in many countries, currently rising in the US and Western European countries. SPA use usually involves adolescents and young adults, reaching prevalence rates of 25–30 % in these age groups. The Smartphone Addiction Scale (SAS) represents a diagnostic tool specifically designed to assess smartphone addiction. The present study aimed to perform a preliminary validation of the Italian version of the SAS (SAS-I).

DESIGN: SAS-I was administered to 167 subjects without any psychiatric diagnosis. Internal consistency of the SAS-I was assessed employing Cronbach's alpha with Duhacheck confidence interval. To investigate the construct validity, an exploratory factor analysis (EFA) was performed, and five factors were extracted.

RESULTS: The internal consistency of the SAS-I was 0.92, while the coefficients for the five factors were 0.91 for factor 1, 0.86 for factor 2, 0.74 for factor 3, 0.74 for factor 4, and 0.72 for factor 5. The five factors corresponded to five subscales, respectively: "overuse and craving", "withdrawal", "positive relief", "daily-life disturbance", and "virtual-oriented relationships". Deletion of any of the items did not increase the internal consistency of the total scale.

CONCLUSION: Results show a good internal consistency for the SAS-I and each factor extracted. Future research should provide complementary data to further validate the present scale, which could be a valuable tool for the diagnosis and severity assessment of smartphone addiction.

Introduction

Since the advent of the Internet, the use of computers and other digital devices has sharply increased and has become an extensive part of our daily routine. However, persistent or recurrent use of technological tools, namely digital devices, like computers or smartphones, along with online-related activities (e.g., online games, social media, etc.), could lead to digital addiction (Christakis, 2019; Truzoli *et al.* 2024). Addiction involves dysfunction in the brain's reward system, particularly in mesolimbic dopaminergic pathways (Rutherford *et al.* 2010; Jorgenson *et al.* 2016). During addiction, neural circuits related to reward processing are altered, with dopaminergic projections from the ventral tegmental area to the nucleus accumbens playing a central role (Joffe *et al.* 2014). Dopamine release in the nucleus accumbens increases in response to both substance use and certain behaviors, such as gaming, gambling, and sexual activity (Rutherford *et al.* 2010). Behavioral addictions, including Internet Addiction (IA) and Smartphone Addiction (SPA), showed similar dysregulation of the dopaminergic projections, contributing to an overall reward system deficiency. Recent evidence also suggests the cerebellum's involvement in drug craving and addiction. However, its role remains debated—whether as a core component of addiction-related neural networks or as a modulating structure (Mundorf *et al.* 2023).

Gambling Disorder is the only behavioral addiction currently included in the Diagnostic and Statistical Manual for Mental Disorders (DSM-5 TR). However, IA has been considered as potential mental disorders as well and is currently listed in the third section of DSM-5-TR as conditions that require additional research (American Psychiatric Association [APA], 2022).

IA was defined as the inability to control the internet use with a subsequent negative impact on daily functioning, or as a dysfunctional pattern of behavior with excessive preoccupations, urges, or behaviors regarding computer use and internet access that may lead to impairment or distress (Young, 1998; Shaw & Black, 2008). Several types of IA were reported (i.e., social media addiction (SMA) in which the excessive

Tab. 1. English and Italian versions of the Smartphone Addiction Scale

English	Italian
1. Missing planned work due to smartphone use	1. Non ho eseguito un lavoro programmato a causa dell'uso dello smartphone
2. Having a hard time concentrating in class, while doing assignments, or while working due to smartphone use	2. Ho difficoltà nel concentrarmi in classe, mentre faccio i compiti o mentre lavoro a causa dell'uso dello smartphone
3. Experiencing lightheadedness or blurred vision due to excessive smartphone use	3. Provo sensazione di vertigini o visione offuscata a causa dell'uso eccessivo dello smartphone
4. Feeling pain in the wrists or at the back of the neck while using a smartphone	4. Provo una sensazione di dolore ai polsi o alla nuca durante l'utilizzo di uno smartphone
5. Feeling tired and lacking adequate sleep due to excessive smartphone use	5. Mi sento stanco e non dormo bene a causa dell'uso eccessivo dello smartphone
6. Feeling calm or cozy while using a smartphone	6. Mi sento calmo o a mio agio mentre utilizzo uno smartphone
7. Feeling pleasant or excited while using a smartphone	7. Mi sento bene o eccitato mentre utilizzo uno smartphone
8. Feeling confident while using a smartphone	8. Mi sento sicuro di me mentre uso uno smartphone
9. Being able to get rid of stress with a smartphone	9. Riesco a liberarmi dallo stress utilizzando uno smartphone
10. There is nothing more fun to do than using my smartphone.	10. Non c'è niente di più divertente che usare il mio smartphone
11. My life would be empty without my smartphone	11. La mia vita sarebbe vuota senza il mio smartphone
12. Feeling most liberal while using a smartphone	12. Mi sento molto generoso mentre utilizzo uno smartphone
13. Using a smartphone is the most fun thing to do	13. Usare uno smartphone è la cosa più divertente da fare
14. Won't be able to stand not having a smartphone	14. Non posso sopportare di non avere uno smartphone
15. Feeling impatient and fretful when I am not holding my smartphone	15. Mi sento impaziente e irritabile quando non ho in mano il mio smartphone
16. Having my smartphone in my mind even when I am not using it	16. Ho in mente il mio smartphone anche quando non lo uso
17. I will never give up using my smartphone even when my daily life is already greatly affected by it.	17. Non rinuncerò mai a usare il mio smartphone anche se la mia vita quotidiana ne è già fortemente influenzata
18. Getting irritated when bothered while using my smartphone	18. Mi irrito quando vengo infastidito mentre uso il mio smartphone
19. Bringing my smartphone to the toilet even when I am in a hurry to get there	19. Porto il mio smartphone in bagno anche quando ho urgenza di arrivarci

use of social media and associated technology interferes with everyday functioning; the person reporting SMA also experiences withdrawal, cravings, and tolerance for social media (Petrie *et al.* 2001; Truzoli *et al.* 2023; Reed *et al.* 2018).

Considering devices used for internet connection, smartphones are among the most used; indeed, by the end of 2022, 68% of the world's population were smartphone users (Crowhurst & Hosseinzadeh, 2024). Among different devices, young Italian adults prefer to use the smartphone, both day (97%) and night (72%), followed by the personal computer and the tablet. In recent years, the prevalence of smartphone users between 14 and 29 years old in Italy was 89.8% (Della Vedova *et al.* 2022).

SPA onset may be related to personal, social, and cultural risk factors. SPA is defined as the inability to control the usage of the smartphone despite negative effects on users [i.e., harmful consequences in financial, academic or professional, physical, psychological, mental health, social and quality of life areas (Van Deursen *et al.* 2015; Cha & Seo, 2018; Busch & McCarthy, 2021; Li *et al.* 2020; Conte *et al.* 2025; León Mendez *et al.* 2024; Lai *et al.* 2022; Ratan *et al.* 2021)]. Like substance-related addictions, SPA can lead to tolerance, salience, withdrawal, and craving (Kuss *et al.* 2017). Epidemiological evidence suggests that SPA is exponentially increasing worldwide (Crowhurst & Hosseinzadeh, 2024). This condition is becoming a serious issue in many countries, which his prevalence is currently rising in the US and Western European countries (Zhang *et al.* 2022; Meng *et al.* 2022; Olson *et al.* 2023). In Italy, data collected before and during the COVID-19 pandemic demonstrated an escalation in addiction prevalence ranging from 26.1% to 46.7% (Serra *et al.* 2021); in post COVID-19 pandemic era, 30.1% of the participants exhibited a risk of SPA (Cali *et al.* 2024). A study focusing on Italian university students (mean age 23 ± 3.2 years) reported that nearly one in three participants (31%) experienced SPA (Perilli *et al.* 2021).

Notably, due to the absence of a defined diagnostic framework of smartphone overuse, the term Problematic Smartphone Use (PSU), instead of SPA, is often

English	Italian
20. Feeling great meeting more people via smartphone use	20. Mi fa sentire bene conoscere più persone tramite l'uso dello smartphone
21. Feeling that my relationships with my smartphone buddies are more intimate than my relationships with my real-life friends	21. Sento che i rapporti con i miei amici dello smartphone sono più intimi dei rapporti con i miei amici della vita reale
22. Not being able to use my smartphone would be as painful as losing a friend	22. Non poter usare il mio smartphone sarebbe doloroso come perdere un amico
23. Feeling that my smartphone buddies understand me better than my real-life friends	23. Sento che i miei amici dello smartphone mi capiscono meglio dei miei amici della vita reale
24. Constantly checking my smartphone so as not to miss conversations between other people on Twitter or Facebook	24. Controllo costantemente il mio smartphone per non perdere conversazioni tra altre persone su Twitter o Facebook
25. Checking SNS (Social Networking Service) sites like Twitter or Facebook right after waking up	25. Controllo i Social come Twitter o Facebook subito dopo il risveglio
26. Preferring talking with my smartphone buddies to hanging out with my real-life friends or with the other members of my family	26. Preferisco parlare con i miei amici dello smartphone piuttosto che uscire con i miei amici della vita reale o con gli altri membri della mia famiglia
27. Preferring searching from my smartphone to asking other people	27. Preferisco cercare dal mio smartphone piuttosto che chiedere ad altre persone
28. My fully charged battery does not last for one whole day.	28. La mia batteria completamente carica non dura un giorno intero
29. Using my smartphone longer than I had intended	29. Utilizzo il mio smartphone più a lungo di quanto avessi previsto
30. Feeling the urge to use my smartphone again right after I stopped using it	30. Sento il bisogno di usare di nuovo il mio smartphone subito dopo aver smesso di usarlo
31. Having tried time and again to shorten my smartphone use time, but failing all the time	31. Ho provato più e più volte a ridurre il tempo di utilizzo del mio smartphone, ma senza riuscirci
32. Always thinking that I should shorten my smartphone use time	32. Penso sempre che dovrei ridurre il tempo di utilizzo del mio smartphone
33. The people around me tell me that I use my smartphone too much.	33. Le persone intorno a me dicono che uso troppo il mio smartphone

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Tab. 2. Sociodemographic features and characteristics of smartphone usage

N = 167	
Age (mean (SD))	32.93 (12.09)
Range	19 - 71
Relational status (%)	
Single	51 (30.54)
Engaged	74 (44.31)
Married/co-habiting	39 (23.35)
Separated/divorced	2 (1.20)
Widowed	1 (0.60)
Gender (%)	
Female	108 (64.67)
Male	59 (35.33)
Has chlidren (%)	
No	138 (82.63)
Yes	29 (17.37)
Lives alone (%)	
No	136 (81.44)
Yes	31 (18.56)
Level of education (%)	
Middle school	2 (1.20)
High school	53 (31.74)
Degree	86 (51.50)
Postgraduate/Ph.D	26 (15.57)
Occupation (%)	
Student	52 (31.14)
Employee	85 (50.90)
Self-employed	24 (14.37)
Unemployed	5 (2.99)
Retired	1 (0.60)
Use smartphone for calls (%)	
No	12 (7.19)
Yes	155 (92.81)
Use smartphone for sms (%)	
No	103 (61.68)
Yes	64 (38.32)
Use smartphone for online chat (%)	
No	2 (1.20)
Yes	165 (98.80)
Use smartphone for news (%)	
No	14 (8.38)
Yes	153 (91.62)
Use smartphone for social network (%)	
No	18 (10.78)
Yes	149 (89.22)
Use smartphone for online shopping (%)	
No	57 (34.13)
Yes	110 (65.87)

used (Billieux *et al.* 2015). However, PSU also often referred to as SPA, and both terms are often used interchangeably (Sun, *et al.* 2019; Fischer-Grote *et al.* 2019). PSU usually involves adolescents and young adults, with a prevalence that can reach 25–30 % in these age groups (Lozano-Blasco *et al.* 2022). According to a comprehensive systematic review and meta-analysis (Sohn *et al.* 2019), the prevalence of PSU among children and young people ranges from 10 to 30%, with the median = 23.3%, and interquartile range 14–31%.

In the current literature some assessment tools for SPA have been described. The Smartphone Addiction Inventory (SPAI), a 26 items scale, was developed to assess SPA among Taiwanese university students (Lin *et al.* 2014). The SPAI has been validated in Italian university students; mean age of 21.75 years (range = 19–27, SD = 2.72) (Pavia *et al.* 2016).

Kwon *et al.* (2013a) validated the Smartphone Addiction Scale (SAS), a 33 items self-administered scale, in an adult population with ages ranging from 18 to 53 years (M=26.06; SD=5.96).

A 10 items short version of SAS (SAS-SV) was developed (Kwon *et al.* 2013b), and an Italian version of this scale was validated in 2017, in adolescents and young adult students from High Public School and University (mean age of 18 years) (De Pasquale *et al.* 2017).

Considering that the Italian screening tools above mentioned actually cover only a specific age range, a screening tool adapted to a wider age range is needed to better identify SPA in the population.

With those premises, this study aimed to translate the SAS from the original Korean version and initiate preliminary validation analyses, including internal consistency analyses and exploratory factor analysis (EFA).

Material and methods

Procedure

The original instrument adopted for the translational process is the English version of the SAS (Kwon *et al.* 2013a). A back-translation procedure was employed (Brislin, 1986; Jones *et al.* 2001). Clinical experts in psychiatry and psychology were involved in the translation from English to Italian. More in detail, two of the authors of the present paper, native Italian speakers and fluent in English, separately translated the 33 items into Italian. A third author translated back to English

the two versions of the scale and compared them to the original. All the authors approved the final version of the scale. The Italian version of the SAS (SAS-I) was administered to 167 participants taken from the general population, never been diagnosed with any psychiatric disorder. The estimated sample size was 165 participants, five participants per item (Gorsuch, 1983).

Data were collected anonymously from an online survey administered to the general population. The survey platform was provided by Google Form and it was shared using social media platform and through dissemination supported by collaborators. Informed consent for data collection for research purposes was obtained before starting to fill out the survey.

Inclusion criteria were: being 18 years old or older and owning a smartphone. The exclusion criteria were the inability to fill in informed consent.

Data regarding socio-demographic features and smartphone type of use were collected along with the 33 SAS items. Both the English and Italian versions of SAS are reported in Table 1.

Statistical analysis

Statistical analyses were conducted using RStudio version 4.3.3. Continuous variables were described using the mean and the standard deviation (SD). The frequency of categorical variables was expressed as both the number and percentage of cases.

Internal consistency of the SAS-I was assessed employing Cronbach's alpha with Duhacheck confidence interval. Items homogeneity was evaluated through correlation coefficients between items and total scores if an item was deleted. Bartlett's test of sphericity and Kaiser-Meyer-Olkin measure of sampling adequacy were applied to determine whether the dataset was suitable for factor analysis. To investigate the construct's validity, an exploratory factor analysis (EFA) was performed. Considering the relationship between the subscales, an oblique Oblimin rotation was employed. To determine the optimal number of factors to retain a parallel analysis was performed (Hayton *et al.* 2004). Factor loadings ≥ 0.32 were used to determine the assignment of items to each factor. Items that loaded on more than one factor with a difference lower than 0.1 were considered relevant for both factors and were thus included in both to ensure the multidimensionality of the construct was properly represented. After the EFA was conducted, the internal consistency for each factor was performed using Cronbach's alpha.

Results

The total sample consisted of 167 participants. The mean age was 32.93 years (± 12.09 SD; range 19-71), with female sex representing 64.67% of the sample. One hundred percent of the participants owned a smartphone. Data regarding socio-demographic features and characteristics of smartphone usage are summarized in Table 2. Participants who do not use smartphones for social network services (SNS) showed a statistically significant lower SAS total score (68.06 ± 15.84, n = 18; 89.72 ± 23.45, n = 149; whole sample: 87.39 ± 23.70, n = 167) ($p < .001$).

Factor Structure and Internal Consistency of the SAS-I

Bartlett's test of sphericity was significant ($p < .001$), and the Kaiser-Meyer-Olkin measure of sampling adequacy for the SAS-I was 0.86, indicating that the scale was meritorious (Kaiser, 1974). According to our results, the dataset was suitable for factor analysis. Based on the parallel analysis sults, five factors were extracted via the EFA approach and oblique Oblimin rotation with Kaiser normalization. The five factors accounted for 48.08% of the total variance.

The internal consistency of the SAS-I was determined using Cronbach's alpha, whose coefficient for the total scale was 0.92 (IC: 0.9 – 0.94). The coefficients for the five factors were 0.91 (IC: 0.89 – 0.93) for factor 1, 0.86 (IC: 0.83 – 0.89) for factor 2, 0.74 (IC: 0.68 – 0.81) for factor 3, 0.74 (IC: 0.68 – 0.81) for factor 4, and 0.72 (IC: 0.65 – 0.79) for factor 5. The five factors corresponded to five subscales, respectively: "overuse and craving", "withdrawal", "positive relief", "daily-life disturbance", and "virtual-oriented relationships" (Table 3).

Deletion of any of the items did not increase the internal consistency of the total scale. The correct-editem total correlations and Cronbach's alpha if an item was deleted are shown in Table 4.

Discussion

The present study offers a preliminary evaluation of the first Italian version of the Smartphone Addiction Scale. The purpose of the present work was to provide a translation of the scale in the Italian language and an initial validation of the questionnaire. Current findings indicate that the scale shows good psychometric properties, comprising 33 items, which cluster, according to our analysis, in 5 sub-domains. The scale is characterized by good internal consistency, which would not have benefitted from removing any item from the questionnaire.

The original version of SAS, which was created and validated in Korea (Kwon *et al.*; 2013a), proposed a scale with 33 items that clustered into 6 domains: "daily-life disturbance", "positive anticipation", "withdrawal", "cyberspace-oriented relationship", "overuse", and "tolerance".

In our study, according to the EFA, five factors were extracted, as follows: "overuse and craving", "withdrawal", "positive relief", "daily-life disturbance", and "virtual-oriented relationships". Compared to the

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Tab. 3. Factor analysis of the Smartphone Addiction Scale – Italian version

Question N.	Factors				
	Overuse and craving	Withdrawal	Positive relief	Daily-life distubances	Virtual-oriented relationship
1				0.433	
2	0.476			0.401	
3				0.697	
4				0.689	
5	0.362			0.432	
6			0.732		
7			0.630		
8			0.689		
9			0.410		
10		0.626			
11		0.566			
12		0.574			
13		0.769			
14		0.358			
15	0.455	0.382			
16	0.480				
17	0.401	0.494			
18	0.404				
19	0.528				
20					0.356
21					0.745
22		0.686			
23					0.629
24	0.477				
25	0.544				
26					0.420
27	0.391				
28	0.454				
29	0.836				
30	0.764				
31	0.850				
32	0.647				
33	0.691				
Eigen values	9.969	3.019	2.077	1.829	1.434
Variance (%)	18.128	11.082	6.98	6.354	5.532

Korean version of the scale, we retrieved one dimension less, namely "tolerance" (Kwon *et al.*; 2013a).

As shown in Table 3, several items traditionally associated with distinct dimensions in the original SAS (e.g., "overuse" and "tolerance") loaded onto the same factor in our sample, suggesting a stronger interdependence between excessive use behaviors and urgency/craving experiences in the Italian adult population. This semantic reconfiguration of the items supports renaming the factor as "overuse and craving". Similarly, items related to positive emotional regulation mediated by smartphone use (e.g., items 6–9) clustered into

a single factor, labeled "positive relief", distinguishing it from the "positive anticipation" domain identified in the Korean validation study. This difference may reflect a distinct role attributed to smartphones in stress management processes among Italian adults.

It is also noteworthy that items related to "tolerance", originally conceptualized as a separate dimension, did not form an independent factor. Instead, they showed distributed loadings primarily across the "overuse and craving" and "withdrawal" factors. This finding suggests that, in our sample, tolerance-related indicators do not constitute a distinct domain but are embedded within broader behavioral patterns characterized by excessive use and impaired control. This observation is consistent with the results reported in Table 3, where these items display moderate but non-exclusive loadings on specific factors

Despite both samples were mostly represented by women – approximately 65% of the whole sample – participants in our sample were older (32.93) if compared to the Korean study where the mean age was 26.0. However, it cannot be excluded that linguistic and cultural differences in the population considered may account for the allocation in the different domains. However, the five factors identified with the present analysis account for 48.08% of the variance of the total score.

Comparisons of different studies on dimensionality of SPA remain crucial to define this phenomenon as a potential new disorder in psychiatry, alongside other disorders correlated to the use of digital devices, as the problematic use of the internet.

The internal consistency analysis reported an excellent Cronbach's alpha coefficient for the overall total scale and coefficients for the five factors show good internal consistency.

Despite the present study offers only partial validation, it is important to point out the significantly lower SAS-I total score in subjects who did not use a smartphone for SNS: according to a review (2017), SPA may be a part of the more complex construct of SNS addiction (Kuss & Griffiths, 2017). Future research should focus on this topic to better understand smartphone addiction.

The present study must be viewed considering some limitations. First, participants were selected through convenience sampling, impacting the representativeness of the population. However, adequate numerosity supports that the assessed population can be considered homogenous. Moreover, the analyses presented in this research are only introductory. Future research should provide complementary data on this peculiar tool by proceeding to a confirmatory factor analysis. Furthermore, SAS-I should be compared to different scales to evaluate discriminant and concurrent validity. SAS-I reliability should eventually be tested by performing a test-rest analysis in a subsample.

Tab. 4. Corrected-item total correlation and Cronbach's alpha if an item was deleted for the Smartphone Addiction Scale – Italian Version

Question N.	Corrected-item total correlation	Cronbach's alpha if item deleted
1	0.392	0.919
2	0.647	0.915
3	0.374	0.920
4	0.284	0.921
5	0.427	0.919
6	0.197	0.922
7	0.493	0.918
8	0.367	0.920
9	0.417	0.919
10	0.621	0.917
11	0.551	0.918
12	0.488	0.919
13	0.551	0.918
14	0.613	0.916
15	0.733	0.915
16	0.618	0.916
17	0.700	0.916
18	0.458	0.918
19	0.454	0.919
20	0.467	0.919
21	0.527	0.918
22	0.531	0.918
23	0.431	0.919
24	0.613	0.916
25	0.608	0.916
26	0.412	0.919
27	0.552	0.917
28	0.488	0.918
29	0.681	0.915
30	0.736	0.914
31	0.678	0.915
32	0.563	0.917
33	0.560	0.917

Despite these limitations, the present study presents preliminary data about some psychometric properties (internal consistency, exploratory factor analysis) of the first Italian translation of the Smartphone Addiction Scale. Further studies are needed to validate the present scale, which could be a valuable tool for the diagnosis and severity assessment of SPA. Particularly, SAS-I could represent a valuable tool for developing new research and increasing the knowledge about SPA in adults.

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