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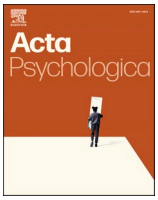

Adaptation of the Bergen Social Media Addiction Scale (BSMAS) in Spanish

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ABSTRACT

The impact of social networks on people's daily lives is worrisome, particularly in adolescents and young people, who seem to exceed the limits of normal use. Constant excessive use can lead to pathological behaviors linked to social media addiction (SMA). Our objectives were to 1) adapt the Bergen Social Media Addiction Scale (BSMAS) to Spanish and 2) evaluate its psychometric properties in a young population. The BSMAS was adapted to Spanish, involving experts on social media addiction and people from the target population during the adaptation process. For the psychometric evaluation, 650 Peruvian college students responded to the Spanish version (53.5 % women aged 18 to 40, $M = 21.5$ $SD = 2.7$). The one-dimensional measurement model proposed for the original BSMAS was confirmed for our version ($X^2_{(9)} = 23.9315$, CFI = 0.994, TLI = 0.990, SRMR = 0.032, RMSEA = 0.061). The reliability was good (α = 0.863; 95 % CI: 0.848–0.870; ω = 0.864; 95 % CI: 0.846–0.844), and the measurement invariance was confirmed for sex and age by fitting models. The concurrent validity with external social media addiction and mental health indicators was also confirmed. This study provides new and relevant information on the BSMAS validity and allows its application to Spanish-speaker college students from Peru and similar countries.

1. Background

The use of social media platforms such as Facebook, Instagram, Twitter and YouTube has become a massive activity in contemporary society. Approximately 50 % of the world's population uses this type of platforms (Beveridge, 2022), where people -virtually- connect with other people via portable devices (Décieux et al., 2019). In early 2023, two global social media consultants (Meltwater and We Are Social) reported that 4.76 billion people around the world use social media, showing an increase of 137 million new users within the last year ("Digital 2023", 2023). At the individual level, the time spent on social media has become extreme, with a daily average > 2.5 h that mostly compromises adolescents and young adults (Andreassen, 2015; Andreassen et al., 2017; Kuss & Griffiths, 2011). This excessive exposure to social media platforms can cause addiction ("Digital 2023", 2023; Beveridge, 2022; Décieux et al., 2019; Kuss & Griffiths, 2011), which implies a systematic disruption of normal activities (e.g., work, personal and family life) because of the time dedicated to social media (Andreassen, 2015), bringing other problematic behaviors (Bányai et al., 2017; Paakkari et al., 2021).

A better understanding arises from the biopsychosocial model of Griffiths (2005) that was based on the comparison of people addicted to substances and people who interact with technologies, as shared and reinforcing behaviors. These addiction criteria are uniformly adjusted based on the six core addictive behaviors identified as follows: a) salience, denoting the significance attributed to a specific activity, which interferes across various facets of individuals' lives; b) mood change influenced by attachment to a particular behavior; c) tolerance,

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reflecting the process of escalating engagement to achieve anticipated effects; d) withdrawal symptoms or the withdrawal syndrome, typically emerging due to a reduction or cessation of specific behaviors; e) conflict, whether interpersonal or intrapersonal, originating from addictive conduct; f) relapse or a tendency to revert to problematic behaviors following a period of abstinence (Griffiths, 2005, 2017; Kuss & Griffiths, 2017).

Social Media Addiction (SMA) has been linked to other psychological problems such as anxiety, depression and stress (Baek et al., 2014; Stănculescu & Griffiths, 2023; Watson et al., 2020). Intense use of social media has been linked to internet gambling (Chen, Strong, et al., 2020; Lin et al., 2017; Monacis et al., 2017; Yam et al., 2019), eating disorders (Frost & Rickwood, 2017), and sleep problems and insomnia (Lin et al., 2021; Wong et al., 2020). Relational difficulties such as deficits in interpersonal skills, social connectivity and emotional stability, especially in the adolescent group (Casale & Banchi, 2020), have been associated with SMA, as well as academic performance (Hou et al., 2019).

The Bergen Social Media Addiction Scale (BSMAS) is one of the most widely used instruments to measure addiction to social media (Cheng et al., 2021; Žmavc et al., 2022). The BSMAS has been adapted to multiple languages in different continents such as Europe (Andreassen et al., 2016; Bányai et al., 2017; Dadiotis et al., 2020; Monacis et al., 2017; Stănculescu, 2022), Asia (Chen, Ahorsu, et al., 2020; Leung et al., 2020; Lin et al., 2017; Shin, 2022; Yam et al., 2019) and America (Watson et al., 2020). The BSMAS provides a reliable and valid one-dimensional measure of SMA that positively correlates with external criteria such as anxiety and depression scales (Samra et al., 2022). Although there are two versions in Spanish, neither shows a clear adaptation process (Brailovskaia & Margraf, 2022; Carratalá & Ibáñez, 2019) or the evaluation of different evidence of validity (Brailovskaia & Margraf, 2022).

Although the BSMAS is a robust psychometric tool, there are two aspects of its structural validity that merit special revision in any trans-cultural adaptation. First, three SMA indicators included in the BSMAS have shown very high correlations with each other (i.e., salience, tolerance and relapse, and conflict) (Balcerowska et al., 2022; Huang et al., 2021; Monacis et al., 2017; Yam et al., 2019), an issue called overlapping. This issue can, among other things, lead to wrong interpretations (e.g., based on an incorrect measurement model) and inflate reliability estimates (Balcerowska et al., 2022; Yam et al., 2019). Second, the measurement invariance (Putnick & Bornstein, 2016), which relates to how the BSMAS measurement model and some of its properties are stable across subgroups, has been barely studied. Some studies have confirmed the measurement invariance across groups by gender (Chen, Strong, et al., 2020; Stănculescu, 2022; Yue et al., 2022), although others just found partial invariance (Lin et al., 2017; Monacis et al., 2017). We are particularly interested in the invariance according to age groups, as adult users spend less time on social media and, therefore, may be less likely to develop SMA compared to younger users (Chen, Strong, et al., 2020; Lin et al., 2017; Yam et al., 2019).

The BSMAS studies evaluated for their concurrent validity with other instruments related to social media such as facebook addiction (BFAS); social network intensity or forms of engagement with social networks (SNI or SMEQ) and fear of missing out (FOMO) obtaining moderate relationships (Bakioğlu et al., 2022; Chen, Strong, et al., 2020; Islam et al., 2022; Stănculescu, 2022). These variables have shown importance because they share characteristics between the functionalities and possible maintenance conditions in SM (Bakioğlu et al., 2022; Balcerowska et al., 2022). Likewise, other psychological factors have shown small and moderate relationships, especially with psychopathological variables such as anxiety and depression using widely studied screening (i.e, PHQ and GAD) (Žmavc et al., 2022). These conditions can generate escape/avoidance behaviors in situations perceived as harmful, maintaining the connection pattern by problematic users (Cerniglia et al., 2019).

Our study objectives were to 1) perform a cultural adaptation of the BSMAS to Spanish, 2) determine the internal structure validity and reliability of the Spanish version, 3) analyse the BSMAS measurement invariances across groups by age and sex, 4) determine the concurrent validity of the BSMAS with other variables related to SMA (i.e., facebook addiction, Fear of missing out, social network intensity and social media engagement). In addition, the inclusion of other psychological factors (i.e., depression and anxiety scale).

2. Method

2.1. Participants

The psychometric evaluation was performed with Peruvian adults who lived in Lima, the capital and most populous city of Peru. We included people aged 18 to 40 years who agreed to participate in the online survey. Those who reported a work activity directly related to the use of social media (e.g., community manager) or a psychiatric comorbidity were excluded. We performed a controlled quota sampling (Yang & Banamah, 2014), choosing gender and age as specific categories. The sample size calculation suggests values less than $n = 400$, for more details see the supplementary material. For this study, a sample of 650 Peruvian youth and adults was used.

2.2. Cross-cultural adaptation

Following the back-translation strategy, we performed a linguistic adaptation process (Muñiz et al., 2013). The original English BSMAS (Andreassen et al., 2016) was translated into Spanish by two certificated translators for whom Spanish was their first language. Then, the translated BSMAS was back-translated into English by two other certificated translators, for whom English was their born language. Both translations were reviewed and updated until the translation team concluded that the working Spanish version was semantically equivalent to the original English version. This working version was also reviewed by the research team (i.e, specialists in addictive behaviors) to ensure that all the original BSMAS concepts (i.e., SMA indicators) were maintained in the working version (Gjersing et al., 2010).

Then, the working version was responded to by a group of local university students (focus group, $n = 30$). The items' comprehension and acceptability were assessed, and respondents were asked to rephrase each problematic item (Gjersing et al., 2010; Boateng et al., 2018). The research team analysed all responses from this group and then integrated them into the working version to generate the final BSMAS in Spanish. This version was used in the following step.

2.3. Measures

2.3.1. BSMAS

The Bergen Social Media Addiction Scale (BSMAS) was developed by Andreassen (Andreassen et al., 2016) as a one-dimensional scale for measuring SMA with six items/indicators: 1) salience, 2) tolerance, 3) mood modification, 4) relapse/loss of control, 5) withdrawal, and 6) conflict/functional impairment. Each item can be responded to by selecting one of five options (1 = very rarely, 2 = rarely, 3 = sometimes, 4 = often, 5 = very often), for which the summative total is the BSMAS raw score. The BSMAS provides a reliable measure (McDonald's Ω and Cronbach's $\alpha > 0.8$) while its internal structure has been confirmed as one-dimensional in different cultural contexts (Shin, 2022; Stănculescu, 2022).

2.3.2. Other measurements

The Bergen Facebook Addiction Scale (BFAS) was developed by Andreassen (Andreassen et al., 2012) and adapted to Spanish by Vallejos-Flores, Copez-Lonzoy and Capa-Luque (Vallejos-Flores et al., 2018). This one-dimensional scale measures addiction to Facebook and

it is composed of six items with five response options (1 = "very rarely" to 5 = "very often"). The raw score is equal to the sum of all items' responses. The BFAS one-dimensional model reported good fit ($x^2_{Satorra\text{-}Bentler}(9) = 23.9315$, CFI = 0.994, TLI = 0.990, SRMR = 0.032, RMSEA = 0.061) and a good internal consistency ($\alpha_{ordinal} = 0.847$). Given their similarities in assessing social media addiction, the BFAS measure is expected to correlate positively with the BSMAS measure (Balcerowska et al., 2022).

The Fear of Missing Out (FoMO) scale, developed by Przybylski, Murayama, DeHann and Gladwell (Przybylski et al., 2013) assesses the fear of missing news on a social network. It is a one-dimensional scale of ten items that can be responded to according to five Likert-Type options (1 = "not at all true" to 5 = "extremely true"). The FoMO's one-dimensional model has a good fit (RMSEA = 0.036; CFI = 0.988; TLI = 0.985) as well as good reliability (ω = 0.895) (Correa-Rojas et al., 2020). We expect higher levels of missing out fear to be associated with higher levels of social media addiction (i.e., measured by the BSMAS) (Abel et al., 2016; Alt, 2015).

The Social Network Intensity (SNI) is a brief scale designed to assess the intensity of social networks use (Salehan & Negahban, 2013). The SNI has five items with a 7-point Likert-type response option each (1 = "never" to 7 = "always"). The SNI authors propose a one-dimensional model, with the main latent factor explaining 73 % of the items' variance. The model presented good fit (CFI = 0.990; TLI = 0.970; SRMR = 0.030). The reliability of the scale was good (α = 0.86) in the original study. We expect a positive correlation between the BSMAS and SNI, since the latter has shown a similar correlation with other technology-related addictive behaviors (e.g., with smartphone addiction that was $r > 0.40$) (Salehan & Negahban, 2013).

The Social Media Engagement Questionnaire (SEMQ) is a one-dimensional scale that evaluates daily participation in social media contexts and this fit was adequate (CFI = 0.98; TLI = 0.96; SRMR = 0.025). It has five items with 8-point Likert-type response options (0 = none to 7 = every day) that can be summed to obtain a reliable measure of social media engagement ($\alpha > 0.80$) (Przybylski et al., 2013). We expect SEMQ to be positively correlated with BSMAS.

The Generalized Anxiety Disorder-7 (GAD-7) is a self-administered brief screening scale developed by Spitzer et al. (1999). It consists of 7 items that assess symptoms of generalized anxiety disorder through 4-point response options (0 = not at all; 1 = several days; 2 = more than half of the days; 3 = almost every day). In Peru, the GAD-7 one-dimensional model showed adequate fit (CFI = 0.977; TLI = 0.966; SRMR = 0.043; RMSEA = 0.076) and reliability (α and ω >0.70) (Villarreal-Zegarra et al., 2023). We expect anxiety symptoms to be positively associated with social media addiction (Andreassen et al., 2016).

The Patient Health Questionnaire - 9 (PHQ-9) is a self-reported screening tool for major depression symptoms. It scores from 0 to 27 points, claiming responses in a Likert-type format (0 = not at all; 1 = several days; 2 = more than half of the days; 3 = almost every day) (Kroenke et al., 2001; Spitzer et al., 1999). In Peru, the PHQ-9 has shown high reliability (α = ω = 0.87) and adequate fit for the one-dimensional model (CFI = 0.936; RMSEA = 0.089 and SRMR = 0.039) (Villarreal-Zegarra et al., 2019). We expect that people with higher PHQ-9 scores also get higher BSMAS scores (Andreassen et al., 2016; Lin et al., 2017).

Two demographic variables were also measured, sex and age, to evaluate the BSMAS measurement invariance.

2.4. Procedure

2.4.1. Item analysis

We described the BSMAS items' distributions by reporting their mean, standard deviation, skewness and kurtosis and by verifying the floor and ceiling effect. The corrected test-item correlation was evaluated as an index of item discrimination. The possible ways to exclude an item were if $r \leq 0.20$ (insufficient information to represent the construct) or $r > 0.85$ (possible overlap).

2.4.2. Internal structure validity

We fitted a one-dimensional model by performing a confirmatory factor analysis with the weighted least squares mean and variance estimator (WLSMV), which allows for handling non-normality and ordinal data (Li, 2016). For assessing the model fit, we calculated: the robust x^2 for which p-values >0.05 are a reflection of good fit (Hu & Bentler, 1999), the comparative fit index (CFI) as an incremental measure for which values >0.95 indicate good fit (Hu & Bentler, 1999), the root mean square error of approximation (RMSEA) as a parsimony measure for which values ≤0.06 are optimal (Brown, 2006; Hu & Bentler, 1999), and the standardized root mean residuals ratio (SRMR) for which values ≤0.08 are optimal (Brown, 2006). The average variability extracted (AVE) was assessed, as an expression of the items' variance proportion explained by the latent factor, using the cut-off point >0.50 as the minimal expected (Fornell & Larcker, 1981). The detection of possible between-item overlapping was determined by modification indexes (MI) that allow models of possible error structures in the model, values below lower <30 (Whittaker, 2012).

2.4.3. Reliability

We calculated the α coefficient (Cronbach, 1951; Graham, 2006) using Feldt's method (Charter & Feldt, 2001; Romano et al., 2011), and the ω coefficient using McDonald's method (Flora, 2020; McDonald, 1999). The omega was selected for its flexibility in evaluating factorial models and the alpha to facilitate comparisons against previous studies (Cronbach, 1951; Graham, 2006; Zumbo et al., 2007).

2.4.4. Measurement invariance

We performed a multiple group confirmatory factor analysis (MG-CFA) analysis for the measurement invariance evaluation across defined groups (i.e. gender and age). Different progressive restrictions were added and different change criteria were used in a wide repertoire of fit indices (CFI; TLI; SRMR and RMSEA) for the comparison of models with restrictions against models with less restrictions (Ding et al., 2023). First, we assumed configural invariance (similar structure between groups), threshold invariance (i.e., invariant structure and thresholds between groups), metric invariance (i.e., similar factorial structure, thresholds and factor loadings between groups) and finally the scalar invariance (i.e., thresholds, factor loadings, factor structure, and intercepts). The difference x^2 was not taken into account due to its sensitivity to sample size. For analyses, we prefer to examine the ΔCFI; ΔTLI; ΔSRMR and ΔRMSEA. For the initial levels of invariance, more liberal criteria can be taken in the cut-off points (e.g., CFI of ≤0.02 or RMSEA of ≤0.03) (Ding et al., 2023; Rutkowski & Svetina, 2017). However, in the case of the evaluation of scalar invariance, a more rigid criterion ΔCFI <0.01 or ΔRMSEA <0.015 was maintained (Cheung & Rensvold, 2002; Putnick & Bornstein, 2016).

2.4.5. Concurrent validity

We calculate strong winzorized correlations to obtain better results in the presence of outliers (especially with psychometric studies), this reduces serious consequences associated with possible type I errors (Wilcox, 2016) between social media addiction (i.e., BSMAS score) and 1) Facebook addiction (i.e., BFAS score), 2) fear of missing out (i.e., FoMO score), 3) social network intensity (i.e., SNI score), 4) social media engagement (i.e., SMEQ score), 5) anxiety symptoms (i.e., GAD-7 score) and 6) depressive symptoms (i.e., PHQ-9 score). A large (> 0.70), moderate (> 0.50) or small (> 0.30) concurrent is concluded depending on these values (Mukaka, 2012).

All the statistical analyses were performed with the Rstudio 4.1.1 program using the packages, lavaan (Rosseel et al., 2023), psych (Revelle, 2023), WRS2 (Mair et al., 2022), MBESS (Kelley, 2022), SEMtools (Jorgensen et al., 2022) and semPlot (Epskamp et al., 2022).

2.5. Ethics

The Ethics Committee of the Instituto Peruano de Orientación Psicológica – IPOPS (IPOPS-024-2020) approved the study protocol. The BSMAS was administered only under conditions of voluntariness, anonymity and non-remuneration in people who were previously informed about the aims and purposes of the study. Only participants who fully accepted their participation on a voluntary and non-remunerated basis were counted.

3. Results

3.1. Cross-cultural adaptation

After the full translation process (Fig. 1), the expert panel improved some language details in the Spanish version. For example, the pre-assessment question for the SMA items was customized and salience component in Spanish was changed "*mucho tiempo*" to "*largo tiempo*". Each expert scored each item regarding its content validity, showing an average Aiken's V equal to 0.96. The focus group identified some problems related to temporality and social desirability. For example, the average response time of those evaluated was timed with a maximum of 15 min. To mitigate the possible effect of social desirability regarding SM ("*facebook, instagram or twitter*") the terms directed to these social media site was removed. Considering these improvements, the Spanish version was updated until its optimal shape.

3.2. Characteristics of participants

We analysed Spanish BSMAS responses from 650 college students, mostly women (53.5 %) and aged, on average, 21.1 years old (*SD* = 2.7). They were mostly in their third year of studies (48.5 %), considering that typical Peruvian college studies take 5 years. Anxiety (31.2 %) and depressive symptoms (40 %) were highly prevalent in this population, while indicators of high social media use were present in >18 % of this group (Table 1).

3.3. Item analysis

Table 2 shows the mean (*M*), standard deviations (*SD*) and corrected-total correlation (r_{itc}) for each BSMAS item. The lowest mean was on item 4, while the highest mean was on item 2.6. The skewness and kurtosis values were within acceptable limits. The discrimination index on the BFAS scale was also acceptable (r_{itc} = 0.581–0.706).

3.4. Internal structure validity

In the study sample, the one-dimensional model showed a good fit ($x^2_{(9)}$ = 23.9315, CFI = 0.994, TLI = 0.990, SRMR = 0.032, RMSEA = 0.061). All BSMAS items presented high factor weights (λ >0.60) with a shared common variance (h^2) >0.50 (Table 3). The average variance extracted (AVE) was 0.58, which is above the accepted minimal (0.50). All modification indices (MI) were lower than 0.30, which is also ideal. More information about possible overlapping can be seen in the supplementary material.

Table 1
Socio-demographic characteristics.

		n = 650
		n (%)
Age*		21.1 ± 2.7
College level	1st year	58 (8.9)
	2nd year	157 (24.2)
	3th year	315 (48.5)
	4th year	111 (17.1)
	5th year	9 (1.4)
Anxiety symptoms	Yes	203 (31.2)
	No	447 (68.8)
Depression symptoms	Yes	260 (40)
	No	390 (60)
Fear of missing out	Yes	120 (18.5)
	No	530 (81.5)
Social media engagement	Yes	155 (23.8)
	No	495 (76.2)
Social networking intensity	Yes	146 (22.5)
	No	504 (77.5)
Social media addiction	Yes	117 (18)
	No	533 (82)

Note: * mean ± standard deviation (n = 650).

Table 2
Descriptive statistics of the BSMAS items.

Items	*M*	*SD*	*g1*	*g2*	r_{tic}	*Floor*	*Ceiling*
1. Salience	2.36	1.105	0.550	−0.373	0.581	25	4.6
2. Tolerance	2.07	1.011	0.671	−0.292	0.696	35.3	1.4
3. Mood modification	2.18	1.028	0.566	−0.339	0.605	30.9	2.1
4. Relapse/loss of control	2.01	1.006	0.771	−0.099	0.695	38.4	1.6
5. Withdrawal	2.07	1.011	0.713	−0.191	0.669	34.9	1.6
6. Conflict/ functional impairment	2.10	1.032	0.626	−0.414	0.706	35.2	1.6

Note: g1 = skewness; g2 = kurtosis; rtic = corrected test item correlation. (n = 650).

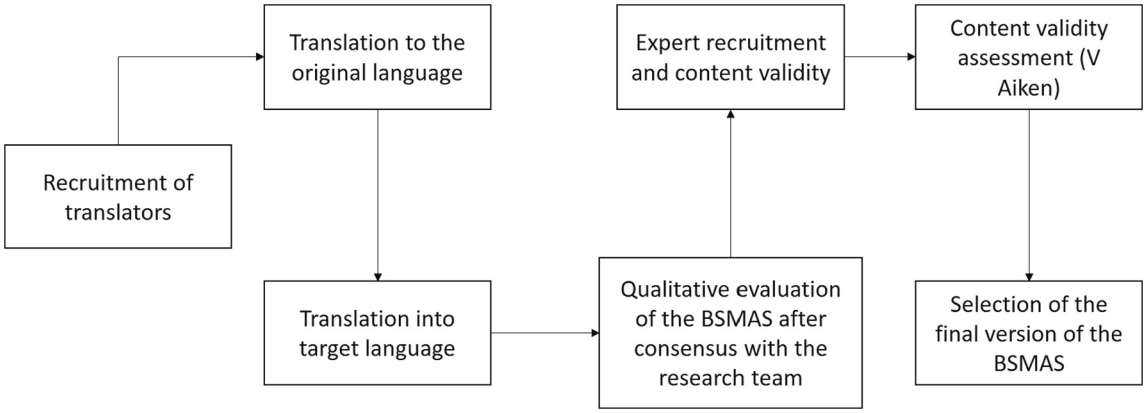

Fig. 1. Flowchart of the BSMAS linguistic adaptation.

Table 3
Standardized factor loadings and composite reliability of BSMAS in Peruvian sample.

BSMAS item	λ	se	h^2	*p*
1. Salience	0.676	0.023	0.458	<0.001
2. Tolerance	0.816	0.018	0.667	<0.001
3. Mood modification	0.697	0.022	0.486	<0.001
4. Relapse/loss of control	0.782	0.017	0.616	<0.001
5. Withdrawal	0.802	0.019	0.636	<0.001
6. Conflict/functional impairment	0.811	0.017	0.681	<0.001
AVE	0.586			
CR	0.894			

Note: λ = standardized loading; h^2 = communalities; AVE = average variance extracted; SE = standard error; FC = composite reliability. (n = 650).

3.5. Reliability

The BSMAS internal consistency was good, reporting α = 0.863 (95 % CI: 0.848–0.870) and ω = 0.864 (95 % CI: 0.846–0.844).

3.6. Measurement invariance

For the models by age and sex, ΔCFI; ΔTLI and ΔSRMR were <. 02, while ΔRMSEA were < 0.03 (Table 4). This means that BSMAS measurement is invariant across groups by sex and age.

3.7. Concurrent validity

The BSMAS measures showed a positive and large ($\rho w > 0.70$) or moderate ($\rho w > 0.50$) correlation with Facebook addiction (BFAS) and fear of missing out (FOMO), respectively (Table 5). For social network intensity, social network engagement, anxiety and depression, the correlation against BSMAS was also positive but with a small effect ($\rho w > 0.70$). In general, these findings show a good concurrent validity.

4. Discussion

The BSMAS was adapted to Spanish, involving social media addiction experts and people from the target population during the adaptation process. The Spanish version showed psychometric properties similar to the original BSMAS'; for example, we confirmed the one-dimensional measurement model in the adapted version. We also verified that the Spanish BSMAS provides a reliable and invariant measure across groups by sex and age, and that its general score is positively correlated with other external indicators of social media addiction.

The internal structure of the BSMAS (i.e., one-dimensional model) that we verified has been largely confirmed in populations from different countries in Europe (Andreassen et al., 2016; Bányai et al., 2017; Dadiotis et al., 2020; Monacis et al., 2017; Stănculescu, 2022), Asia (Chen, Strong, et al., 2020; Leung et al., 2020; Lin et al., 2017; Shin, 2022; Yam et al., 2019) and America (Watson et al., 2020). Unlike a few studies from Italy, Hong Kong and Poland that showed some overlapping between salience, tolerance, relapse, and conflict items (Balcerowska et al., 2022; Huang et al., 2021; Monacis et al., 2017; Yam et al., 2019), our findings did not show any overlap between these or other items. This is a good sign in terms of cultural equivalence to the original English version (Andreassen et al., 2016) because conceptual differences between items/indicators remain clear for Spanish readers.

The BSMAS also showed optimal reliability values, which is consistent with previous findings in non-clinical populations (Andreassen et al., 2016; Bányai et al., 2017; Chen, Ahorsu, et al., 2020; Dadiotis et al., 2020; Monacis et al., 2017; Stănculescu, 2022). Despite these populations being culturally different in types of users (e.g., users of one or more social media platforms), average connection time and Internet accessibility, reliability is always reported as optimal (i.e., between 0.82 and 0.91). Even where different reliability coefficients are reported (e.g., alpha or omega), the internal consistency shows similarity among studies. Only one study on schoolchildren from Turkey reported relatively low values of reliability (Demirci, 2019). Preadolescents may have greater supervision when using social media, experiencing SMA in a differentiated way (Bloemen & De Coninck, 2020) or having different risks of suffering it due to their parents' rules. The heterogeneity among preadolescents in terms of SMA symptoms, self-perception of social media use and actual SMA risk might affect the BSMAS internal consistency. For example, when the variance associated with each item is higher than the variance associated with the total score (i.e., in Cronbach's alpha calculation). However, this is certainly not the case in our and most studies on BSMAS worldwide. This implies that the accuracy of the reliability of the Spanish version is as accurate as in other widely used versions.

Our findings coincide with the measurement invariance of the BSMAS across age and sex groups reported elsewhere (Chen, Ahorsu, et al., 2020; Chen, Strong, et al., 2020). Measurement invariance is essential before performing any formal comparisons between these groups with the BSMAS score (Chen, Strong, et al., 2020; Leung et al., 2020; Lin et al., 2017; Stănculescu, 2022). We started this study assuming some potential deviations from measurement invariance in our target population. For example, with Peruvian men more focused on sports and other competitive activities and Peruvian women more focused on recreational/social activities (Vallejos-Flores et al., 2018), they could experience social media addictive use in a different way (Yue et al., 2022). These sex differences impact on addictions to psychoactive substances (PAS); thus, it is not unexpected to find similar differences in other addictive behaviors such as those reflected in BSMAS measures (Stein et al., 2021). Regarding differences by age reported previously, children and adolescents spend the least average time on social media (Chen, Strong, et al., 2020; Lin et al., 2017; Yam et al., 2019), reducing the risk of developing social media addiction compared to college students (Chen, Ahorsu, et al., 2020; Lin et al., 2017; Yam et al., 2019). This can be explained by the control that parents have over the way their kids use social media devices before they gain more independence. However,

Table 4
Measurement invariance for the variables sex and age.

Model	x^2 (df)	CFI	TLI	RMSEA	SRMR	ΔCFI	ΔTLI	ΔRMSEA	ΔSRMR
Sex									
Configural	20.033 (18)	0.994	0.991	0.063	0.025	–	–	–	–
Threshold	29.532 (30)	0.994	0.994	0.052	0.025	0.001	0.003	0.011	<0.001
Metric	40.324 (35)	0.993	0.994	0.050	0.028	0.001	<0.001	0.002	0.002
Scalar	46.398 (40)	0.993	0.995	0.046	0.028	<0.001	0.001	0.004	<0.001
Age									
Configural	22.200 (18)	0.994	0.990	0.069	0.025	–	–	–	–
Threshold	31.465 (30)	0.994	0.994	0.053	0.025	<0.001	0.004	0.016	<0.001
Metric	50.415 (35)	0.992	0.993	0.057	0.028	0.002	0.001	0.003	0.002
Scalar	52.544 (40)	0.993	0.995	0.049	0.028	0.001	0.002	0.008	<0.001

Note. df = degrees of freedom; CFI = comparative fit index; TLI = Tucker Lewis index; RMSEA = root mean square error of approximation; SRMR = standardized root mean residual; ΔCFI = delta of CFI; ΔTLI = delta TLI; ΔRMSEA = delta RMSEA; ΔSRMR = delta SRMR. (n = 650).

Table 5
Mean scores, standard deviations, robust correlation coefficients.

	1	2	3	4	5	6	7
1. BSMAS	–						
2. Facebook Addiction	**0.72*****	–					
3. Fear of missing out	**0.64*****	0.63***	–				
4. Social network intensivity	**0.34*****	0.24***	0.24***	–			
5. Social media engagement	**0.34*****	0.27***	0.37***	0.57***	–		
6. Anxiety	**0.33*****	0.29***	0.41***	0.04	0.17***	–	
7. Depression	**0.37*****	0.34***	0.37***	−0.03	0.12***	0.71***	–
M	12.78	12.51	20.92	19.34	17.65	6.23	7.53
SD	4.77	4.94	8.19	7.62	9.36	4.59	5.84

Note: ***$p < 0.001$. (n = 650).

none of our concerns about BSMAS measurement invariance related to sex and age were confirmed in the target population. This study evidences the bases for making valid comparisons at the level of sex and age, which makes it important to deepen these comparisons in this cultural group.

The BSMAS score shows good concurrent validity with other addictive behavior measures, as could be expected considering previous research on addiction topics. Individuals with SMA can present other addictive behaviors related to technologies (e.g., FOMO is a trigger for an indeterminate connection loop), generating irritability, anxiety, and maladaptive feelings and enhancing abuse/addiction by increasing participation in social media (Abel et al., 2016; Alt, 2015; Bloemen & De Coninck, 2020). To our knowledge there are few studies related to social network intensity (SNI) and SMA (Cataldo et al., 2022; Stănculescu & Griffiths, 2022). Despite this, the SNI is a strong predictor of negative purchasing behaviors that could generate maintenance in SMA (Pellegrino et al., 2022). Studies show that SMA is moderately related to some psychopathological variables such as anxiety or depression (Hussain et al., 2020; Malak et al., 2022), which is consistent with our findings. Our study presents major implications for depressive symptoms associated with problematic use of social media. This is because SM in adolescents and young people are used as an escape/avoidance behavior from situations perceived as harmful by certain users (Cerniglia et al., 2019). In sum, the Spanish BSMAS offers a valid measure of SMA that is consistently related to external indicators of SMA and mental health.

We identified some strengths and limitations of our study. This is the first time where verifiable adaptation process has been undertaken for the Spanish version of the BSMAS, a procedure that has not been previously carried out. We included a number of external measures for exploring concurrent validity that were not simultaneously considered in other studies, making our evidence stronger. However, we only had the opportunity to evaluate college students, which limits the generalization of our findings to similar populations. The measurement invariance was only evaluated for sex and age, which could not cover other important and more diverse groups such as cultural variables (in other Spanish-speaking contexts), differentiated age groups (adolescents or older adults) or other differentiated addictive behaviors. Despite these limitations, this study provides new and relevant information on the BSMAS validity and allows its application in some critical Spanish-speaker contexts.

5. Conclusion

We successfully adapted the BSMAS to Spanish, confirming the one-dimensional measurement model of the original version, good reliability, measurement invariant across groups by sex and age, and concurrent validity with external indicators of social media addiction and mental health.

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CRediT authorship contribution statement

Anthony Copez-Lonzoy: Conceptualization, Formal Analysis, Methodology, Supervision, Validation, Writing – Original version, Approval of the final version.

Miguel Vallejos-Flores: Conceptualization, Validation, Writing – Original version, Approval of the final version.

Walter Capa-Luque: Validation, Writing – Original version, Approval of the final version.

Edwin Salas-Blas: Validation, Writing – Original version, Approval of the final version.

Ana María Montero Doig: Approval of the final version.

Paulo C. Dias: Review & Editing, Approval of the final version.

Juan Carlos Bazo-Alvarez: Conceptualization; Methodology, Supervision, Validation, Writing – Review & Editing, Approval of the final version.

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.

Data availability

The authors do not have permission to share data.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.actpsy.2023.104072.

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