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Psychometric properties of the Bergen Facebook Addiction Scale for Portuguese adults

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Abstract

Background: The research about online behavior addiction suggests the importance of improving assessment methods and deepening the knowledge about this phenomenon.
Goals: To characterize main psychometric properties of the Bergen Facebook Addiction Scale (BFAS) for Portuguese adults.
Methods: This cross-sectional study design involved Portuguese participants who were selected by snowball-convenience sampling. Data were collected through online survey of sociodemographic and BFAS, with invitations distributed by Facebook. Data analysis was performed through descriptive and reliability tests, as well factorial and invariance analysis.
Results: The sample was composed of 444 Portuguese people between 18 and 73 years old. Reliability estimate for the one-factor solution was .795, suggesting good internal consistency reliability properties. Confirmatory factor analysis revealed congruence with original unifactorial model of BFAS. Multigroup analysis supported measurement invariance across sex and education level.
Discussion: These results suggest reliability and validity. Invariance evidence was also confirmed for the BFAS in a Portuguese sample of Facebook users. These results contribute to the validation process of the Portuguese version of the BFAS, encouraging further studies with different clinical and non-clinical groups.

Keywords: Online behavior addiction, Virtual social networks, Screen exposure, Psychometric properties, Internal consistency

Introduction

The online human behavior has merited the focus of scientific research, particularly regarding its impact on mental health. Social media platforms are widely used among the general population, with Facebook remaining the leading platform worldwide in terms of active users, with a growing trend from 100 million users in 2008 to 3,03 billion per month currently (Statista, 2023). Therefore, it is natural to assume the importance of deepening the knowledge about behaviors related to this and others social networks, namely, to prevent and intervene in case of online addiction problems (Griffiths, 2012), previewed to be even more complex and important to public health in the next few years. For example, Hofmann and Baumeister (2012) showed that the desire to be on social networks in a daily basis was superior to the desire

to sleep, for the participants in their study. In the same way, a recent systematic review (Duradoni et al., 2020) revealed a negative association between FA and well-being. These findings suggest investigating more deeply, and possibly dampen negative impacts of information and communications technology on more vulnerable groups, more susceptible to psychological suffering.

Guedes et al. (2016) showed that Facebook addiction derives from brain reward mechanisms and gratification, more prevalent in people suffering from disorders associated with depression, low self-esteem, or narcissistic personality. They also concluded that despite being a current phenomenon, internet addiction and excessive social network use (e.g., Facebook) end up being underestimated socially (Guedes et al., 2016). For these reasons, it is necessary to develop more research to understand Facebook addiction and its relationship with other aspects of mental health, namely through the development of valid measures and procedures (Pontes et al., 2016; Silva et al., 2015).

Developing valid and reliable instruments is pivotal for the activity of psychologists, both in the field of research and in psychological evaluation and intervention (Fernandes & Vasconcelos-Raposo, 2010; Maroco, 2021; Pais-Ribeiro, 2010; Rodrigues-Fernandes, 2015). The Bergen Facebook Addiction Scale (BFAS), designed by Andreassen et al. (2012), is one of the most used instruments for measuring FA (Brown, 1993; Griffiths, 1996; 2005). It is based on theoretical models including several key elements for the diagnosis of addictive behaviors: salience, mood modification, tolerance, withdrawal, conflict, and relapse. This scale has been adapted to many languages (Atroszko et al., 2022; Dadiotis et al., 2021; Mahmood et al., 2020; Primi et al., 2021; Silva et al., 2015), including Portuguese of Portugal (Pontes et al., 2016; Veiga et al., 2019).

Psychometric studies suggested good properties of the instrument to diagnose the FA (Andreassen et al., 2012; Pontes et al., 2016; Primi et al., 2021; Silva et al., 2015; Veiga et al., 2019). However, recent studies (Ali et al., 2022; Atroszko et al., 2022) warned of the need to present evidence regarding the factorial invariance of the BFAS. Currently, research indicates that the BFAS assumes a unifactorial structure (Primi et al., 2021), but some caution should be taken into consideration when using the instrument for specific groups (Atrosko et al., 2022). For example, Primi et al. (2021), found evidence of factorial invariance at the level of sex and age in a study of Italian adults and adolescents. Atrosko et al. (2022), in a cross-cultural study concluded that the scale lack invariance across different samples and suggested that studies using BFAS are cross-culturally non-comparable and non-generalizable. There are no studies of factor invariance of the BFAS in Portugal and few exist at a global level (Ali et al., 2022; Astroko et al., 2022; Primi et al., 2021).

This article presents evidence about the psychometric properties of BFAS, with a specific contribution to the study of the factorial invariance of this scale, in a sample of the Portuguese population. The study had as a main goal to verify the factor invariance regarding level of education and sex, after confirming the factor structure of the BFAS, besides checking its reliability and factorial validity.

Methods

Research design and participants

The research followed a cross-sectional design. The sample was composed of Portuguese users of Facebook, selected using a non-probabilistic, snowball sampling. Inclusion criteria was having the Portuguese nationality, being 18+ years old, and being users of Facebook.

Measures

Sociodemographic data. A self-administered questionnaire was developed to collect the sociodemographic data of the sample, namely: sex, age, area of residence, education level and nationality.

Bergen Facebook Addiction Scale [BFAS]. The BFAS is a six-item self-administered questionnaire developed

by Andreassen et al. (2012). Each item is scored on a 5-point scale, from "1 = *Very rarely*" to "5 = *Very often*". Higher scores indicate greater Facebook addiction (Andreassen et al., 2012; Pontes et al., 2016). The original version of the BFAS revealed good psychometric properties, namely good internal consistency (α = .83), test-retest reliability (r = .82), convergent validity with related scales, and a one-factor structure with good fit indicators (RMSEA = .046, CFI = .99). The validity was tested in different countries, age groups, and cohorts, suggesting lack of measurement invariance across different samples and cultures (Atroszko et al., 2022).

Table 1. Bergen Facebook Addiction Scale: Portuguese adult version

Durante o último ano… *(Options of answer: "1 = Muito raramente"; "2 = Raramente"; "3 = Às vezes"; "4 = Frequentemente"; "5 = Muito frequentemente")*
1 Passou muito tempo a pensar sobre o Facebook ou a planear usá-lo?
2 Sentiu necessidade de usar o Facebook mais e mais?
3 Usou o Facebook para esquecer os seus problemas pessoais?
4 Tentou reduzir o uso do Facebook, mas sem sucesso?
5 Ficou inquieto(a) ou perturbado(a), ao ser proibido(a) de usar o Facebook?
6 Usou tanto o Facebook que isso teve um impacto negativo no seu trabalho/ estudo?

Procedure

The BFAS Portuguese adult version was administered as an online survey. All the people were users of Facebook, and the survey tool (self-administered structured questionnaire) was accessible from that same social network (Facebook).

Statistical analysis

The statistical treatment of the data was performed using the SPSS (version 23) and AMOS softwares (version 23, SPSS, IBM Company, Chicago, IL). Considering the size of the collected sample, data were evaluated for psychometric sensitivity using shape (skewness and kurtosis) and central tendency descriptive statistics. Psychometric sensitivity was accepted for skewness and kurtosis absolute values smaller than three and seven, respectively (Maroco, 2021).

The internal consistency of the scale was calculated using the *Cronbach's alpha.* The original factor structure (Andreassen et al., 2012) was evaluated through confirmatory factorial analysis). Regarding the modification indices, these were considered in case of correlation values above ten (Maroco, 2021). For the tested models the method of *maximum likelihood estimation* was used. For assessing the suitability of the model to the data, the following evaluation measures of adjustment were used: *ratio chi square statistics / degrees of freedom (X^2 / df), comparative fit index (CFI), goodness of fit index (GFI), root mean square error of approximation (RMSEA) and Akaike information criterion (AIC).* The *ratio X^2 / df* has been used as a model adjustment index, being suggested values below three (Maroco, 2021). The CFI assesses the suitability of the model regarding the independent model, varying the values between 0 and 1, with values greater than .90 indicative of appropriate adjustment (Byrne, 2001; Maroco, 2021). The GFI measures the relative amount of variance and covariance, together, explained by the model, varying between 0 and 1, with values higher than .90 suggesting appropriate adjustments (Byrne, 2001; Maroco, 2021). The RMSEA analyzes the discrepancy in the adjustment of the estimated and observed matrices; it ranges between 0 and 1, and the expected values should be under .8 (Byrne, 2001; Maroco, 2021).

When comparing two or more models, AIC is often used, with lower values indicating greater model suitability (Byrne, 2001; Maroco, 2021). To identify the factorial invariance of BFAS, we defined initially an appropriate adjustment model to comparative groups. After obtaining the factors, these were simultaneously subjected to multi-groups analysis (with Emulisrel6 correction), to make a progressive set of constraints (factor loadings, variances and covariances), to analyze the equivalence of the tool to different subgroups. The difference values of the chi-square *($\Delta\chi^2$)* and respective degrees of freedom *(df)* were used to analyze possible significant differences between the different models.

Ethical issues

All research procedures were in accordance with the ethical standards of the committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, revised in 2000. However, the project was not submitted to the academic ethics committee.

Participants provided full consent before participation in the study. These were informed about the purposes of the investigation, being also invited to fill in a free and informed consent, in which confidentiality, anonymity, and the right to abandon the study at any time was guaranteed (Marina et al., 2020).

Results

Overall, 444 Facebook users participated in the study (77.7% female), aged between 18 and 73 years old (M = 27.30, SD = 1.83). Of these, 55.2% lived in urban areas, and 44.8% in rural areas. Regarding education level, 31.6% of participants had no more than high school, and 68.4% reported to have higher education level.

Table 1 shows the descriptive statistics (minimum, maximum, average, standard deviation, skewness, and kurtosis) for the overall score of the Portuguese version of BFAS. The mean BFAS values, considering the total sample (N = 444) stood at 11.12 ± 4.29. The Cronbach's alpha was α = .795.

Table 1. BFAS, descriptive analysis, normality of the distribution, and Cronbach's alpha

	Min-Max	Mean	Standard deviation	Skewness	Kurtosis	Cronbach's a
BFAS (total score)	6-30	11.12	4.29	-1.247	-1.831	.795

Given the previous studies about the dimensionality of BFAS (Andreassen et al., 2012; Pontes et al., 2016), we tested the proposed one-dimensional model (Table 2). Model 1, considering the complete sample, revealed a poor-quality adjustment (χ^2/ df = 7.317, CFI = .923; GFI = .952; RMSEA = .119; AIC = 89.856). Given the modification indices and correlated measurement errors, a good quality adjustment was verified (χ^2 / df = 2.029, CFI = .990; GFI = .990; RMSEA = .048; AIC = 42.204) (Figure 1).

Table 2. Summary of CFA results of BFAS from study sample

	χ^2	χ^2/df	CFI	GFI	RMSEA	AIC
1- Unifactorial model	65.856***	7.317	.923	.952	.119	89.856
3- Unifactorial model accounting for correlated error	14.204***	2.029	.990	.990	.048	42.204

χ2 = chi-square; χ^2/df = chi-square/ freedom degree; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation; AIC = Akaike information criterion; $\Delta\chi^2$ = different value of qui-square; ***p <.001.

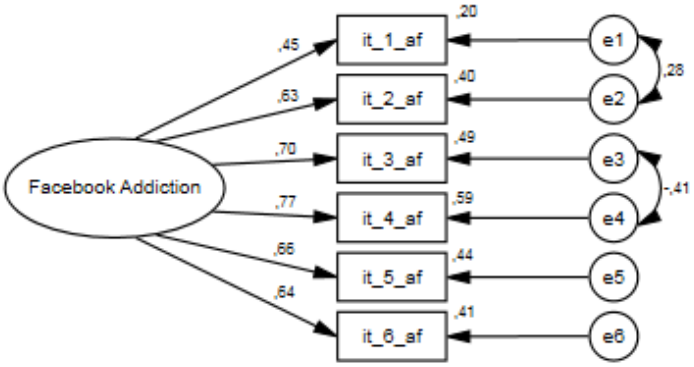

Figure 1. Unifactorial Model of BFAS - Adult Portuguese Version

Table 3 show the invariance analysis for sex and education level. First analysis of the model, with factorial weights, intercepts, and fixed variances/covariates between the samples, did not present a significantly worse adjustment when compared to the model with free parameters ($\Delta\chi^2_{\lambda}$ (5) = 2.844; p = .724; $\Delta\chi^2_{i}$ (6) = 6.036, p = .419; $\Delta\chi^2_{cov}$ (1) = 1.231, p = .267). Also, the invariance analysis for education level did not present a significantly worse adjustment when compared to the model with free parameters ($\Delta\chi^2_{\lambda}$ (5) = 10.096; p = .073; $\Delta\chi^2_{i}$ (6) = 4.425, p = .619; $\Delta\chi^2_{cov}$ (1) = 1.538, p = .215).

Table 3. Confirmatory factorial analysis adjustment indices of BFAS, for sex and educational level (invariance analysis)

Sex	$\Delta\chi^2$	Df	*P*
Measurement weights	2.844	5	.724
Measurement intercepts	6.036	6	.419
Structural covariance	1.231	1	.267
Education level[1]	$\Delta\chi^2$	Df	*P*
Measurement weights	10.096	5	.073
Measurement intercepts	4.425	6	.619
Structural covariance	1.538	1	.215

Note. χ2 = chi-quare; χ^2/df = CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation; AIC = Akaike information criterion; $\Delta\chi^2$ = diferent value of qui-square
[1)] Until high school vs. Higher education level
***p <.001

Discussion

The aim of this study was to characterize the factorial invariance of a Portuguese version of the BFAS (Andreassen et al., 2012) with a Portuguese adults' sample. We believe this instrument can promote technical and scientific enrichment in the online addictive behaviors field, specifically associated with Facebook addiction.

As first steps of validation of the BFAS we assessed its internal consistency reliability and dimensionality (with factorial validity according to the proposed model), and invariant analysis of dimensionality for different subgroups.

Regarding the reliability of this Portuguese version of PFAS, we obtained acceptable results for internal consistency (Maroco, 2021; Pais-Ribeiro, 2010). This was

also found for the original version (Andreassen et al., 2012; Pontes et al., 2016), for Brazilian adults (Silva et al., 2015), and for Portuguese adolescents (Pontes et al., 2016).

The invariance analysis allows us to characterize the validity of the instrument when applied to populations with different characteristics (Fernandes & Vasconcelos-Raposo, 2010; Maroco, 2021; Vasconcelos-Raposo et al., 2013). Our results are congruent with research with this scale with different groups, with invariance, specifically for the level of gender and age. The initial validation studies of the scale found similar results when applying the scale to male and female subjects (Andreansen, et al., 2012). Thus, our results confirm that BFAS presents characteristics of external validity, regarding its application in different groups. Still, the BFAS invariance evaluation would benefit from more empirical contributions to support the debate on the use of this tool with different groups (Ali et al., 2022; Atroszko et al., 2022; Duradoni et al. 2020). Given the study of Andreassen et al. (2012), our results remain congruent with the theoretical model BFAS presented so far. Thus, the results for construct validity of BFAS are satisfactory, with excellent adjustment indices for the unidimensional factor, including the six items previously proposed (Andreassen et al., 2012), that integrate the guidelines of Griffiths (2005). We emphasize the importance of these model components of Griffiths (2005), as it has been derived from a broad theoretical framework about online additive behaviors (e.g., Andreassen et al., 2012; 2015; 2016; Pontes et al., 2014; 2016; Rodrigues-Fernandes et al., 2016).

Our study gains from looking at and discussing its limitations. First, other procedures for analyzing the external validity of the instrument could have been considered. Preliminary studies (e.g., Rodrigues-Fernandes et al., 2016) showed association between Facebook addiction and personality factors, similarly to the initial studies of the scale (e.g., Andreassen et al., 2012). Second, we mainly explored analyses of invariance related to gender and age group. These groups exhibit some asymmetries in their composition that need to be better explored in future studies. Statistics on Facebook user profiles indicate that men are more prevalent than women (56.5% of men), and people aged 25-34 years (19%) represent the highest share of users, with 5.2% of Facebook users being over 65 years old (Statista, 2023). Thus, the high percentage of women participating in our study should be attended to in the future, though other studies showed similar statistics in terms of participation by gender (Veiga et al., 2019). Regarding age, our data is congruent with the population of Facebook users. Third, comparison between clinical and non-clinical groups were not considered in terms of our invariance analysis. For example, Ali et al. (2022) found indicators of invariance for several subgroups of women with eating disorders.

More studies need to be done with longitudinal designs (test-retest method) and seeking to verify the relationship between Facebook addiction with personality, behavioral inhibition, Facebook attitudes or addictive's tendencies (Andreassen et al., 2012), gathering more knowledge about convergent/divergent validity of this scale (Pais-Ribeiro, 2010). Upcoming research may also focus on samples from individuals of older age groups and with more representative male samples. Furthermore, it is important to develop studies to help to understand this instrument's effectiveness for clinical diagnosis, mainly with online additive behavior. Specifically, it is necessary to understand online additive behavior, considering the participation in the various social networks (Griffits, 2012); so, future studies should be focused on building knowledge of online additive behaviors in all social networks.

In conclusion, our study is a contribute to the process of adaptation and validation of BFAS (Andreassen et al., 2012), following the study of Pontes et al. (2016), with Portuguese adolescents. More than the contribution to the validation of a measure covering an emerging global reality (Andreassen et al., 2012; 2016; Pontes et al., 2014; 2016; Rodrigues-Fernandes et al., 2016; Silva et al., 2015), we sought to propose a scale that can be used for in studies about Facebook addiction.

At last, we emphasize the importance of identifying predictors of Facebook addiction, and social media in

general, given their growing impact on a global scale. This is a crucial avenue for enhancing the effectiveness of psychological intervention in the arena of online addiction.

Conflict of Interest

The authors declare that they have no conflict of interest.

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