


Cultural Adaptation and Psychometric Evidence of the Phubbing Scale

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Abstract: Phubbing, the act of ignoring people during a face-to-face interaction to dedicate attention to the smartphone, is a phenomenon widely observed in today's society. Therefore, this research aimed to carry out the cross-cultural adaptation of the Phubbing Scale to Brazilian Portuguese and examine its psychometric properties. The study included 1,551 Brazilian adults, 61.7% female and 29.9% male, aged from 18 to 76 years ($M = 31.6$ years; $SD = 9.6$ years). A socio-demographic questionnaire and the Phubbing Scale were used. Exploratory Factor Analysis, Confirmatory Factor Analysis, Network Analysis and Mann-Whitney Test were performed. The results confirmed the bifactorial version of the Phubbing Scale with good fit indices ($CFI = 0.99$; $TLI = 0.99$; $\alpha = 0.83$). The Phubbing Scale showed adequate psychometric properties and internal consistency for use in Brazil.

Keywords: psychometrics, behavior, smartphone, communication

Adaptação Cultural e Evidências Psicométricas da Escala de Phubbing

Resumo: Comportamento de *Phubbing*, ato de ignorar as pessoas durante uma interação presencial para dedicar atenção ao *smartphone*, é um fenômeno amplamente observado na sociedade atual, diante disto, o objetivo desta pesquisa foi realizar a adaptação transcultural da Escala de *Phubbing* para a população brasileira e examinar suas propriedades psicométricas. Participaram da pesquisa 1551 adultos brasileiros, sendo 61,7 % do sexo feminino e 29,9% do sexo masculino, com idades entre 18 e 76 anos ($M = 31,6$ anos; $SD = 9,6$ anos). Foram utilizados o questionário sociodemográfico e a Escala de *Phubbing*. Foram realizadas Análise Fatorial Exploratória, Análise Fatorial Confirmatória, Análise de Rede e Teste de Mann-Whitney. Os resultados confirmaram a versão bifatorial da Escala de *Phubbing* com bons índices de ajustes ($CFI = 0,99$; $TLI = 0,99$; $\alpha = 0,83$). A Escala de *Phubbing* apresentou propriedades psicométricas e consistência interna adequadas para utilização no contexto brasileiro.

Palavras-chave: psicometria, comportamento, *smartphone*, comunicação

Adaptación Cultural y Evidencia Psicométrica de la Escala Phubbing

Resumen El Phubbing Behavior, el acto de ignorar a las personas durante una interacción cara a cara para dedicar su atención al teléfono inteligente, es un fenómeno ampliamente observado en la sociedad actual, por tanto, el objetivo de esta investigación fue realizar la adaptación transcultural de la Escala Phubbing al portugués brasileño y examinar sus propiedades psicométricas. Un total de 1551 adultos brasileños participaron en la encuesta, 61,7% mujeres y 29,9% hombres, con edades entre 18 y 76 años ($M = 31,6$ años; $SD = 9,6$ años). Se utilizó el cuestionario sociodemográfico y la Escala de Phubbing. Se realizaron Análisis Factorial Exploratorio, Análisis Factorial Confirmatorio, Análisis de Redes y Prueba de Mann-Whitney. Los resultados confirmaron la versión bifactorial de la Escala de Phubbing con buenos índices de ajuste ($CFI = 0,99$; $TLI = 0,99$; $\alpha = 0,83$). La Escala de Phubbing mostró propiedades psicométricas y consistencia interna adecuadas para su uso en el contexto brasileño.

Palabras clave: psicometría, comportamiento, *smartphone*, comunicación

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Phubbing Behavior (PB) is the act of disregarding someone in a social setting, as those involved divert their attention toward their smartphones, thereby avoiding face-to-face interpersonal communication. The phenomenon takes place in social scenarios involving two or more people, where one or more individuals engage with their smartphones, effectively ignoring those present during in-person interactions. The term is the combination of the words 'phone' + 'snubbing,' signifying the act of ignoring others through the use of a telephone, which, in today's context, pertains to ignoring others through the use of smartphones (Karadağ et al., 2015).

PB stands at the crossroads of various technological addictions, (e.g., addiction to the internet, social media, digital games, and cell phones) and could be perceived as the outcome of the amalgamation of such addictions. In the quest to comprehend the causes of PB, researchers have investigated its psychological precursors, exploring the connection between the Big Five Personality Traits and PB and concluding that neuroticism and conscientiousness significantly predict PB. Moreover, phubbing rates are higher among women than men. The phenomenon known as Fear of Missing Out (FoMO), the tendency to remain continuously online and connected, as well as smartphone dependency, have been identified as predictors and risk factors for the development of PB. On the other hand, having strong impulse self-control skills and high levels of conscientiousness act as protective factors (Erzen et al., 2021; Ivanova et al., 2020; Karadağ et al., 2015; Lai et al., 2022; Schneider & Hitzfeld, 2021).

PB has repercussions across various aspects of life. In academic settings, it disrupts study time and negatively impacts academic performance. In romantic relationships, PB's impacts lead not only to dissatisfaction but also elevate levels of depression and anxiety, undermine trust, and foster conflicts between the couple. Additionally, in interpersonal relationships, PB hinders the perceived quality of communication and relationship satisfaction, impairing the sense of belonging and intensifying negative emotions (Abramova et al., 2017; Chotpitayasunondh & Douglas, 2018; Wang et al., 2017).

To gauge PB, Karadağ et al. (2015) devised the Phubbing Scale (PS), comprising 10 items split into two factors, each with five items. The first factor, known as the Communication Disturbance (CD) Factor (items 1, 2, 3, 4, and 10), assesses disruptions in communication that occur when individuals engage with their smartphones in face-to-face communication settings. The second factor, the Telephone Obsession (TO) Factor (items 5, 6, 7, 8, and 9), measures the extent to which people constantly rely on their cell phones in environments where face-to-face communication is absent.

The process of validating and culturally adapting the PS for diverse populations worldwide led to the development of various instrument models. Developed by Blanca and Bendayan (2018), the Spanish version of the PS included some differences compared to the original version by Karadağ et al. (2015). Unlike the factor model originally proposed, the analyses revealed that item 5 loaded onto Factor 1 (F1), while item 10 loaded onto Factor 2 (F2), giving rise to a new model.

In turn, Błachnio et al. (2021) explored variations in the PS across different countries and genders. Data were collected in 20 countries, and the results showed that items 5 and 10 exhibited low factor loadings when compared to other items on the scale, resulting in unsatisfactory fit indices. Consequently, the researchers developed a new model with eight items, excluding items 5 and 10, resulting in a two-factor structure. This model displayed robust psychometric properties in 18 countries within the sample.

Portuguese researchers García-Castro et al. (2022), conducted a study to examine the psychometric properties of the 8-item PS (PS-8) and provide further validity evidence regarding its use within the Portuguese population, while also exploring validity evidence concerning unaddressed variables from previous research. The results found satisfactory fit indexes supporting a correlated two-factor structure.

Cultural differences play a significant role in how individuals experience phubbing and how they respond to it, which may account for variations in PS models worldwide (Abeele, 2020). To comprehend cultural distinctions in large-scale research, Hofstede et al. (2010) established six dimensions that assess aspects of culture concerning their interaction with other cultures, namely: (1) Power distance — Reflects the extent to which individuals anticipate and accept unequal power distribution. (2) Uncertainty avoidance — Measures the level of comfort experienced by subjects when faced with unknown or ambiguous situations as opposed to structured, rule-based contexts. (3) Individualism x collectivism — Has to do with the relationship between individuals and the extent to which individuals are integrated into groups. (4) Masculinity x femininity — Concerns the way roles are distributed between genders and how attitudes and behaviors are presented and expressed by genders in different societies. (5) Long-term orientation x short-term orientation — Refers to people's preference for promoting values for either the future, the past, or the present. (6) Indulgence x restraint — This represents the extent to which different cultures recognize the natural human need to satisfy impulses or desires (Hofstede et al., 2010).

Given the growing interest in Phubbing research and the necessity of measuring this behavior, especially since a validated measurement instrument already exists, it becomes imperative to adapt this measure for use in Brazil, facilitating the development of research on the phubbing phenomenon at a national level. It is imperative to create standardized measures with robust psychometric properties that are developed and validated for diverse populations. Consequently, further research on the psychometric properties of the PS is essential to furnish more substantial evidence of its validity for global use, particularly within the Brazilian population. This data will assist in determining which model aligns most effectively with the Brazilian context, or if there is a necessity to propose a new model. Hence, the primary objective of this study is to undertake the cross-cultural adaptation of the Phubbing Scale for use within the Brazilian population and to assess its psychometric properties.

Method

Participants

A total of 1,551 Brazilian adults, comprising 61.7% females and 29.9% males between 18 and 76 years old ($M = 31.6$; $SD = 9.6$ years old), participated in this study. Participation was entirely voluntary and anonymous,

with participants not receiving any financial compensation for their involvement. Among the participants, 62.5% self-identified as white, while 25.8% claimed to be of mixed race. Regarding educational background, 44.3% indicated to be pursuing a master's or doctorate, and 19% reported having incomplete higher education. Participants hailed from all

five regions of Brazil, being 38.9% from the Southeast, 28% from the South, 15.5% from the Northeast, 11.3% from the North, and 6.3% from the Central-West. The inclusion criteria for the study were as follows: participants had to be over 18 years of age, Brazilian citizens, and reside in any of the Brazilian states or the Federal District.

Table 1

Description of response frequency and the percentage of valid responses within the sample in Brazilian states.

	Frequency	Valid Percentage
Acre (AC)	27	1.7
Alagoas (AL)	29	1.9
Amazonas (AM)	110	7.1
Bahia (BA)	43	2.8
Ceará (CE)	52	3.4
Distrito Federal (DF)	17	1.1
Espírito Santo (ES)	12	0.8
Goiás (GO)	45	2.9
Maranhão (MA)	18	1.2
Mato Grosso (MT)	21	1.4
Mato Grosso do Sul (MS)	14	0.9
Minas Gerais (MG)	167	10.8
Pará (PA)	17	1.1
Paraíba (PB)	40	2.6
Paraná (PR)	233	15.0
Pernambuco (PE)	16	1.0
Piauí (PI)	10	0.6
Rio de Janeiro (RJ)	82	5.3
Rio Grande do Norte (RN)	24	1.5
Rio Grande do Sul (RS)	138	8.9
Rondônia (RO)	4	0.3
Roraima (RR)	6	0.4
Santa Catarina (SC)	64	4.1
São Paulo (SP)	342	22.1
Sergipe (SE)	8	0.5
Tocantins (TO)	12	0.8
Total	1551	100.0

Instruments

The following instruments were employed in this research:

Sociodemographic Survey: This instrument investigates sociodemographic characteristics, such as gender, age, marital status, education, place of residence, and sexual orientation, among other pertinent data.

Phubbing Scale — Portuguese version: The scale consists of 10 items designed to gauge levels of Phubbing behavior in individuals. The Phubbing Scale was

developed by Karadağ et al. (2015) and is answered using a five-point Likert scale, with 1 representing “never” and 5 signifying “always.” The scale measures two factors: (1) Communication Disruption, where higher scores indicate that participants frequently disrupt their ongoing conversations when handling their cellphones in a face-to-face communication environment — this factor is comprised of items 1, 2, 3, 4, and 10; and (2) Phone Obsession, where higher scores indicate that participants constantly rely on their cellphones in environments lacking face-to-face communication — this factor is composed

of items 5, 6, 7, 8, and 9. In the scale validation study, the *Cronbach's* alphas for these factors were as follows: 0.87 for Factor (1) Communication Disturbance, and 0.85 for Factor (2) Telephone Obsession.

Procedures

For this study, we adhered to the guidelines recommended by the International Test Commission (2017) for appropriately adapting instruments to different cultures. The original English version of the Phubbing Scale (Karadağ et al., 2015) was employed for cross-cultural adaptation to the Brazilian context and to verify its validity, with the authors' consent. The translation process involved two bilingual professionals who translated the instrument into Brazilian Portuguese and then back into English. The two translated versions were subsequently reconciled and assessed by three expert judges specializing in behaviors related to social network use. Highly favorable results were obtained regarding semantic equivalence, based on the reference. The version adapted for this study proved faithful to the original items' order and interpretation. Suggestions for translating items were reviewed and validated by the original authors. To further refine the adapted version, a pilot study was conducted with thirty representatives from the study's target audience, recruited through a digital invitation available on a messaging application. Participants offered feedback on the clarity, comprehensibility, and writing quality of the items, and when necessary, provided insights into any aspects that could hinder understanding of the item phrasing. Minor grammatical adjustments were made, resulting in the final version utilized in the empirical study conducted within the Brazilian context.

Data collection. Data collection was conducted using a self-administered form within the Google Forms tool, facilitating *web*-based surveys. The sample was assembled through promotional efforts on various social networks, such as Facebook, WhatsApp, email, and Instagram, and included a link and a description of the research's objectives and intended population. On average, participants spent approximately five minutes completing the instruments. Upon accessing the provided link, individuals encountered a page featuring and informed consent form. After reading and agreeing to the informed consent form, participants were given access to a copy of the form via a provided link. Data collection took place between June 20th and August 31st, 2022.

Data analysis. A cross-validation approach was employed to scrutinize the internal structure of the PS. The sample was split into two groups, following the procedure outlined by Karadağ et al. (2015), with the first sample ($N = 750$), we performed an exploratory factor analysis (EFA) using the FACTOR program (Lorenzo-Seva & Ferrando, 2013).

With the second sample ($N = 801$), a confirmatory factor analysis (CFA) was conducted to assess two models, each comprising two factors: a) Model 1 — corresponding to the structure proposed by Karadağ et al. (2015), and b) Model 2 — a new proposal with item loadings on the factors

were proposed, with a theoretically justified adaptation for the Brazilian context. The analysis employed the Robust Diagonally Weighted Least Squares (RDWLS) estimation method (Distefano and Morgan, 2014).

The adjustment indexes used for assessment included: chi-squared (c^2), chi-squared divided by degrees of freedom (c^2/gl), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Standardized Root Mean Residual (SRMR), and Root Mean Square Error of Approximation (RMSEA). C^2 values should not be significant; the c^2/gl ratio must be < 5 or, preferably, < 3 ; CFI and TLI values must be > 0.90 and preferably above 0.95; RMSEA values must be < 0.08 or, preferably < 0.06 , with a confidence interval (upper limit) of < 0.10 (Brown, 2015).

To assess the stability of the factors, the *H* index (Ferrando & Lorenzo-Seva, 2018), was employed. The *H* index evaluates how well a set of items represents a common factor (Ferrando & Lorenzo-Seva, 2018). *H* values range from 0 to 1. High *H* values (> 0.80) indicate a well-defined latent variable, which is more likely to remain stable across various studies. Low values of *H*, suggest a poorly defined latent variable, which is likely to be unstable across different studies (Ferrando and Lorenzo-Seva, 2018).

To compare how the two dimensions of the Phubbing Scale were presented concerning men and women within the sample, the Mann-Whitney U test was selected. Subsequently, to examine the relationships among the scale items, the multivariate Network Analysis technique was employed. By using the Extended Bayesian Information Criterion (EBIC) index, low-weight partial correlations are constrained to zero, reducing spurious correlations between items. This enhances the precision of factors, their graphical representation, and the dynamic interconnections among the items, as described by Golino and Epskamp in 2017.

Ethical Considerations

The present study underwent evaluation by the Ethics Committee for Research with Human Subjects at the Universidade Federal do Amazonas and approved under opinion No. 5,454,908, with the Brazilian CAAE reference: 57703322.3.0000.5020. All participants were included upon reading and accepting the informed consent form.

Results

The *Phubbing* Scale (PS), consisting of 10 items originally developed by Karadağ et al. (2015) is based on a two-factor model. Factor 1, labeled 'Communication Disorder,' encompasses items 1, 2, 3, 4, and 10, while Factor 2, assessing 'Telephone Obsession,' includes items 5, 6, 7, 8, and 9. During the process of adapting the PS to the Brazilian context and conducting exploratory and confirmatory factor analyses (EFA and CFA, respectively), it was observed that the factorial structure did not align with the original model, resulting in inconsistent adjustment outcomes.

Exploratory Factor Analysis

A combination of exploratory and confirmatory analysis techniques was employed in the pursuit of a model with satisfactory psychometric properties and theoretical consistency. In the exploratory phase, utilizing half of the sample ($N = 750$), two factors were extracted through the Kaiser-Gutman method, Parallel Analysis (as proposed by Timmerman and Lorenzo-Seva, 2011), and Network Analysis (following Golino and Epskamp, 2017). The polychoric correlation matrix of the items adhered to the assumptions for

exploratory factor analysis (EFA), as confirmed by a Kaiser-Meyer-Olkin (KMO) value of 0.87 and a significant Bartlett test result ($\chi = 3431.8$; $df = 45$; $p < 0.001$). Communalities and factor loadings exceeded 0.3 and 0.5, respectively (as detailed in Table 2). Consequently, the EFA, conducted with the original ten items of the scale, revealed the presence of two correlated factors, namely ‘Communication Disorder’ and ‘Telephone Obsession’ ($r = 0.60$; $p < 0.001$). This indicates that the empirical data obtained from the Brazilian sample aligns well with the theoretical framework of the original scale.

Table 2

Factor Structure of the Phubbing Scale

Items	Factor 1	Factor 2	Commonality
PS1. My eyes are set on my cellphone when I'm with other people	0,80		0.65
PE2. I'm always busy with my cell phone when I'm with friends	0,85		0.72
PE3. People complain about how I handle my cell phone.	0,63		0.39
PE4. I use my cell phone when I'm at dinner with friends.	0,79		0.62
PE5. I don't think I bother my partner (or family members, in case I don't have a partner) when I'm busy on my cellphone.	0,25		0.06
PE6. My cellphone is always within reach.		0,59	0.35
PE7. One of the first things I do when I wake up is check the messages on my cellphone.		0,56	0.31
PE7. One of the first things I do when I wake up is check the messages on my cellphone.		0,67	0.45
PE9. I increase the use of my cellphone with each passing day.9. I spend increasingly less time on social, personal, and professional activities due to cellphone use.		0,64	0.41
PE10. I spend increasingly less time on social, personal, and professional activities due to cellphone use.		0,60	0.36
Composite Reliability	0,85	0.75	
H-latent	0,90	0.89	
H-observed	0,91	0.90	

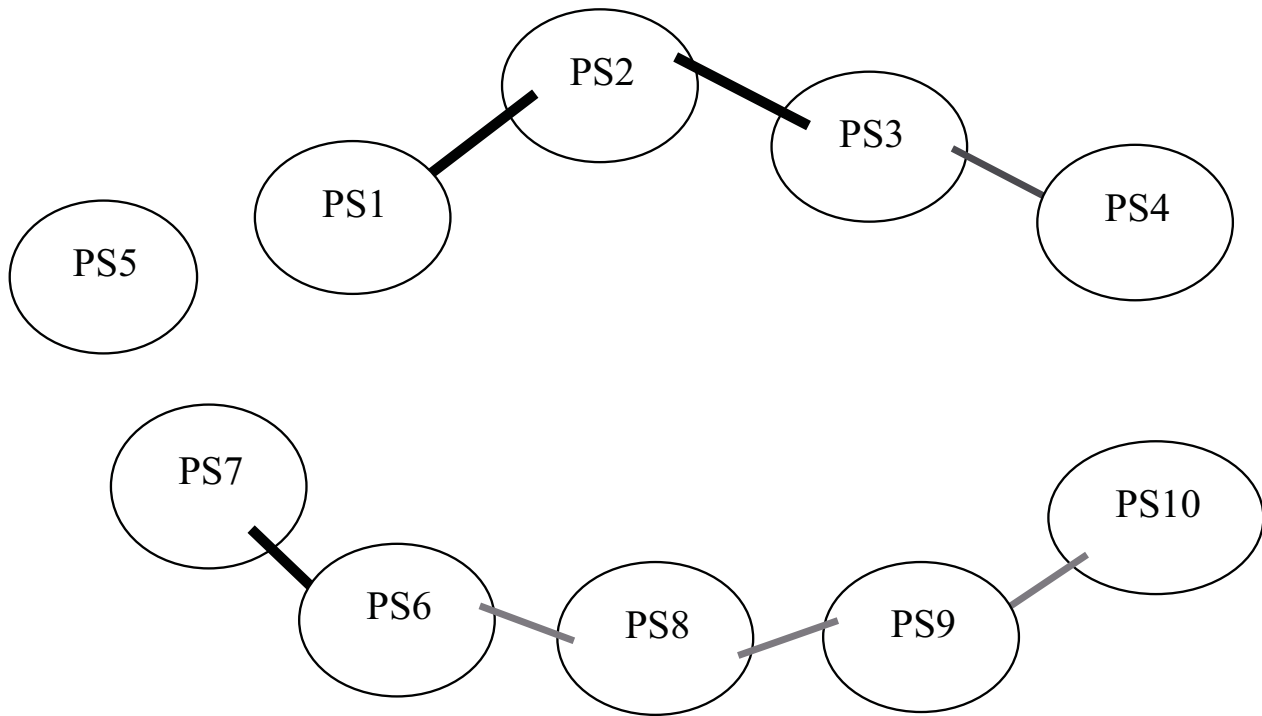
Note: All parameters presented $p < 0.001$. The standardized loadings marked in bold were retained within the scale structure associated with their respective factors.

The items exhibited satisfactory factor loadings, with strong associations between each item and its designated factor. However, item 5 displayed a factor loading below 0.30, and item 10 exhibited a stronger association with Factor 2, Telephone Obsession.

Hence, the number of factors was confirmed, allowing for the exploration of the graphical representation of the structure and the dynamic relationships among the items. Figure 1, derived from the network analysis, provides support for the two-factor model as described in Table 2. Specifically, items PS1, PS2, PS3, and PS4 belong to the Communication Disorder (CD) factor, while items PS6, PS7, PS8, PS9,

and PS10 align with the Telephone Obsession (TO) factor. The thickness and intensity of the edges in Figure 1 signify the magnitude of correlations between items. Furthermore, the network analysis affirms the alteration in the factor assignment of item PS10. As observed in Figure 1, this item displays a notably stronger association with the items within the Telephone Obsession factor. With this in mind, the two-dimensional structure of the instrument remains consistent with the model proposed by Karadağ et al. (2015). However, due to the low factor loading and the observed magnitude of PS5 in the network analysis, a new 9-item model is established for the Brazilian context.

Figure 1
Phubbing Scale Network



Confirmatory Factor Analysis

In the confirmatory phase, utilizing the portion of the sample not previously used in the exploratory phase ($N = 801$), the objective was to determine whether the two-dimensional model aligns with the polychoric correlation matrix of the items. Employing the sample division approach can indeed be valuable for the validation of the instrument. The analysis employed the *Robust Diagonally Weighted Least Squares* (RDWLS) estimation method (Distefano and Morgan, 2014).

Based on the information provided, two measurement models were tested, each with nine items and factors

‘Communication Disorder’ and ‘Telephone Obsession’ correlated. The models were referred to as Model 1 and Model 2. In Model 2, errors for items PS6 and PS7 were correlated. The decision to correlate both items in Model 2 was driven by the *Modification Index* (Mi), which reached 15.302, indicating a significant correlation between the residuals of these items. Justifiably, these items share semantically linked content: PS6 pertains to keeping the cell phone within reach at all times, and PS7 concerns the habit of checking messages on the cell phone as one of the first actions upon waking up. As a result, Model 2 demonstrated superior fit indices compared to the first model, as depicted in Table 3.

Table 3
Phubbing Scale Model Fit Indexes

Model	X^2 (gl)	X^2 /gl	CFI	TLI	SRMR	RMSEA (90% IC)
Model 1	65.700* * (34)	1.932	0.991	0.988	0.040	0.034 (0.021-0.046)
Model 2 – Correlated PS6 and PS7	50.330* * (33)	1,525	0.995	0.993	0.033	0.026 (0.009-0.039)

Note: c2 = chi-square; gl = degrees of freedom; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; SRMR = Standardized Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation; ** $p < 0.001$.

Both model 1 and model 2 are acceptable within the Brazilian context. Therefore, the final two-dimensional model, with its respective standardized factor loadings and correlated factors ($r = 0.60$; $p < 0.001$), presented psychometric robustness and theoretical coherence. The reliability indexes (McDonald's Omega), Factor 1 — Communication Disorder $\omega = 0.83$, and Factor 2 – Telephone Obsession $\omega = 0.76$, while the overall omega of the scale is $\omega = 0.80$.

Spearman correlations were employed due to the absence of normality for the dimensions to examine the relationships between the dimensions. The results revealed moderate and positive associations between the dimensions, signifying that the scale effectively assesses behaviors related to neglecting people while using the phone to access social networks and that these dimensions do not overlap (Table 4).

Table 4

Means, Standard Deviations, and Correlations with Confidence Intervals

Factors	<i>M</i>	<i>SD</i>	1
1. Communication Disorders	8.5	2.9	
2. Phone Obsession	16.4	4.2	0.48** [.44, .52]

Note: *M* = Mean, *SD* = Standard deviation, [] = values in brackets indicate the 95% confidence interval for each correlation, * = $p < 0.05$. ** = $p < 0.01$.

A Mann-Whitney test was conducted to assess the equivalence of the *Phubbing* Scale factors between men and women. The results indicated that there are no significant differences between men and women in the levels of

Communication Disorder ($U = 237546.5$, $z = -1.694$, $p = 0.090$) and Telephone Obsession ($U = 235032.5$, $z = -2.005$, $p = 0.045$). The effect size for Factor 2 (Phone Obsession) concerning gender was found to be medium (See Table 5).

Table 5

Differences in Phubbing Scale Dimension Means for Gender (N=1,551)

	CD <i>M(SD)</i>	<i>Z</i>	<i>R</i>	TO <i>M(SD)</i>	<i>Z</i>	<i>r</i>
GENDER						
Women	8.6(2.9)	-1.69	0.04	16.6(4.2)	-2.00	0.05
Men	8.4(2.9)			16.1(4.1)		

Note: * $p < 0.05$; CD = Communication Disorder; TO = Telephone Obsession.

It's crucial to emphasize that the indicators of one-dimensionality, including *Unidimensional Congruence* (UniCo) = 0.90, *Explained Common Variance* (ECV) = 0.81, and *Mean of Item Residual Absolute Loadings* (MIREAL) = 0.29, as per the criteria established by Ferrando and Lorenzo-Seva in 2018, did not provide support for the unidimensional nature of the scale.

Discussion

The primary aim of this study was to perform a Brazilian cultural adaptation of the Phubbing Scale (PS) and provide empirical evidence regarding its psychometric properties. The exploratory analysis revealed that the Brazilian version of the scale encompassed two factors, namely, Communication Disorder (CD) and Telephone Obsession (TO), aligning with the definitions presented by Karadağ et al. (2015). However, contrary to the model initially proposed by the authors, the analyses indicated that item 5 did not exhibit a satisfactory factor loading, and item 10 loaded onto

the TO Factor, consistent with the findings in the study by Blanca and Bendayan (2018).

In Blanca and Bendayan's (2018) Spanish version of the PS, items 5 and 10 similarly changed factors. In the study by Błachnio et al. (2021), these same items were removed from the scale due to their unsatisfactory factor loadings. Thus, since these two previous adaptations of the PS, items 5 and 10 have displayed psychometric variability compared to the original version of the scale as proposed by Karadağ et al. (2015). It is worth noting that in none of the aforementioned studies did the authors provide a comprehensive theoretical discussion regarding the findings related to these items, which leaves room for interpretation. Therefore, the current research aims to address this gap by discussing such findings based on the theoretical understanding of the factors and a semantic analysis of the items.

Originally, item 5 was assigned to the TO factor, in line with Karadağ et al. (2015). However, the results in this study indicated that it loaded onto the CD factor, consistent with the Spanish model developed by Blanca and Bendayan (2018). In that particular study, item 5 demonstrated satisfactory

factor loadings, whereas, in the current research, the same item exhibited a factor loading below 0.30, aligning with the findings of Błachnio et al. (2021). Consequently, it was excluded from the Brazilian version of the PS, leading to the formulation of a new model for the scale.

The challenge of addressing the diversity of measures used to assess the same construct in different studies remains a significant issue. This study, while contributing to the adaptation of the scale to the Brazilian context, did not directly address the matter of reducing model variability. Błachnio et al. (2021) pointed out various possible reasons for poor or low PS equivalence between cultures, such as issues related to the quality of item translation, data quality, and interviewee motivation. However, it is essential to consider the role of culture in understanding this variability of PS models.

Considering the cultural variable, Wang et al. (2020) examined the relationship between parental PB and depressive symptoms in adolescents and highlighted that a country's cultural orientation, whether collectivistic or individualistic, can yield different results. This is just one example of how cultural differences can influence the outcomes of research on PB. The aforementioned research was a correlational study between PB and depressive symptoms, however, cultural differences can also help to explain and understand the variety of PS models in adaptation and validation studies. This research aimed to address this aspect.

To account for cultural differences in research, dimensions were created to capture cultural aspects that can be measured across various cultures (Buja, 2016). In discussing the influence of culture on the variability of PS models, two dimensions, Individualism and Uncertainty Avoidance, were considered, have been identified by Abeele (2020) as pertinent aspects to explore, highlighting that research on PB has primarily been conducted in North American and European cultures, and future research should investigate whether these findings hold true in cultures that differ with regard to these dimensions, such as Latin American cultures.

Individualism is closely associated with how individuals integrate into social groups. In individualistic cultures, interpersonal ties are typically looser, whereas collectivist cultures emphasize a sense of belonging to a community, with one's identity primarily derived from group affiliation. Notably, individualism is more prevalent in developed and Western countries, while collectivism prevails in less developed and Eastern countries (Buja, 2016).

Therefore, the dimension of individualism emerges as a crucial cultural factor to consider when evaluating PB. The variables related to social relationships and interactions are fundamental, and what defines communication disruption or a decline in communication quality can vary significantly from one culture to another. Acknowledging these cultural differences can contribute to the understanding that PB should be assessed using instruments that consider the individualism dimension of each country. In other words, an instrument applied in the USA may not be equally

effective in China, as these countries occupy different positions on the individualism dimension. This rationale justifies the existence of numerous PS models adapted to specific cultural contexts.

Regarding gender, the results indicated that there are no significant differences between men and women in terms of Communication Disorders, aligning with Ivanova et al. (2020) who also did not identify differences between men and women in the CD subscale scores. These findings contrast with the results in other studies, such as those conducted by Błachnio et al. who identified higher rates of Communication Disorder among women. Additionally, Błachnio and Przepiórka (2018) found that women scored higher than men in both factors, while Chi et al. (2022) identified that men present higher *phubbing* rates than women. Regarding the Telephone Obsession Factor, the effect size was medium concerning gender, having greater robustness for men and women and being slightly more significant for women, corroborating Błachnio et al. (2021), Błachnio & Przepiórka (2018) and Ivanova et al. (2020) who identified that telephone obsession is more prevalent among women.

A high score in the TO factor suggests that the respondent frequently feels the need to have their *smartphone* nearby when there is not enough face-to-face communication. The TO was robust for both genders with little difference between them. While it is essential to discuss these gender differences, it is worth noting that TO was highly significant for both men and women. It can be argued that the disparities between men and women in the level of smartphone obsession stem from how each gender perceives *smartphones* and their utility. Women tend to view the device primarily as a communication tool, while men see it more as a device for pragmatic functions such as accessing information and entertainment. Consequently, when there is insufficient face-to-face communication, cell phone obsession in women may manifest as a means of communicating with others to mitigate the sense of social exclusion. In contrast, in men, it may manifest more often as excessive internet use or *smartphone* gaming (Ivanova et al., 2020).

This result indicates that when individuals are not engaged in face-to-face interactions with others, they dedicate a significant portion of their time to using their *smartphones*, becoming nearly incapable of engaging in activities that do not involve the use of their devices for extended periods. Chen et al. (2017) referred to this as "obsessive use," suggesting that individuals in question may be experiencing significant disruptions in their lives due to the excessive and constant use of *smartphones*, which dominates their behavior, generates adverse emotional impacts, and impairs their ability to control their usage.

The obsession with smartphones, both among men and women, can be explained by the functional evolution of cell phone use, as it combines internet and mobile phone services, offering a variety of qualitative benefits and conveniences, such as access to information and instant communication with people, regardless of their geographic location. This makes

it highly convenient to keep smartphones close at hand, given their portability and accessibility, enabling their use virtually anywhere and for any duration (Cha & Seo, 2018).

However, it is also very easy to cross the line between beneficial use and problematic use. It's evident that dependence on *smartphones* for everyday activities, coupled with their ubiquity, can lead to problematic usage patterns. This, in turn, can negatively impact face-to-face interactions and individuals' overall well-being (Pancani et al., 2020).

This study aimed to carry out the cross-cultural adaptation of PE for the Brazilian population and obtained satisfactory results. In short, the results showed that the Brazilian version of the PS is a short and easy-to-administer tool, suitable for assessing PB in Brazilian adults with adequate psychometric properties and internal consistency that support a two-factor structure — Communication Disorder and Obsession with Telephone.

Age was a bias factor, as the majority of participants were members of the academic community, which limited the sample to a specific age group. The research sample primarily consisted of members of Generation Z, with 32% ($n=496$) born between 1997 and 2012, and Millennials, with 51.1% ($n=792$) born between 1981 and 1996. These groups span from 25 to 41 years old. This demographic makeup could have influenced the results, such as the unsatisfactory factor loadings for item 5, as the scale was predominantly answered by those who might perceive problematic phone use as a normative behavior, not recognizing its impact on communication partners' discomfort.

Cultural factors can influence the assessment of a construct in different cultures, but there are still limited studies addressing the role of culture in PB and its assessment in a more specific and detailed manner. Hence, it is recommended that future research explores how PB is influenced by cultural factors and, based on this, initiates a discussion on the feasibility of a universal PE or whether, owing to the cultural variable, the development of national scales might be more suitable for countries seeking to investigate this phenomenon within their populations. In such instances, a well-executed idiomatic and semantic adaptation may not suffice. For instance, item 5 might not be semantically as closely aligned with the original version, even if it effectively evaluates its content within the Brazilian context. It may be that certain constructs in specific cultures cannot be adequately assessed using adapted instruments, which might necessitate the creation of culture-specific assessment tools.

There were several limitations observed in this study, one of which pertained to the composition of the sample, which predominantly consisted of individuals from the academic community, and as a result, exhibited a high level of education. This demographic does not accurately reflect the broader Brazilian population. The reason for this was the extensive dissemination of the research among undergraduate and postgraduate programs at various higher education institutions in Brazil. Despite efforts to disseminate the study beyond academic circles, it failed

to attract a substantial number of participants from the general population. This reflects the challenges in engaging everyday citizens in scientific research, whether due to reluctance, lack of interest, or the inability of the research to reach a significant layer of the population. Furthermore, the sample was non-probabilistic for convenience, which did not allow all Brazilian states to be sampled proportionally and all subcultures from the five regions of the country to be probabilistically represented, becoming a limitation for the generalization of the results.

Another limitation was the data collection method, which was conducted through a Google *online* form. This format inadvertently excluded a segment of the population, either due to limited *internet* access, a lack of devices capable of accessing the research platform, or the inability to operate such devices necessarily to complete the *online* questionnaire. The dissemination and utilization of *online* research are associated with various limitations and biases, given that *internet* access and the required devices are more readily available to younger individuals with a stronger digital presence, are more adept at using technological devices, have higher levels of education, and enjoy a more favorable economic status.

Therefore, it is advisable to conduct research that delves into the relationship between PB, educational background, and generational age issues. While both of these aspects represented biases in the present study, they were not the primary focus, and an extensive discussion on these factors was not feasible without deviating from the intended research objectives. In conclusion, future research endeavors within the Brazilian context must confirm the validity of the model presented in this study using a sample that more accurately represents the Brazilian population, while testing the applicability of this model in a clinical context is warranted.

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