

## ARTÍCULO ORIGINAL

### Associated factors and psychometric properties of the Spanish version of the Brief Irritability Test (BITe) in Paraguayan population

#### Factores asociados y propiedades psicométricas de la versión en español del Test Breve de Irritabilidad (BITe) en población paraguaya

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## RESUMEN

**Antecedentes:** La irritabilidad, como síntoma transdimensional, está presente en varios trastornos mentales. Este estudio investigó las propiedades psicométricas de la versión española del Test Breve de Irritabilidad (BITe). **Sujetos y métodos:** el reclutamiento se realizó a través de una encuesta en línea lanzada a través de las redes sociales comunes (Facebook, Twitter) y aplicaciones de mensajería (WhatsApp, Telegram) del 1 al 31 de mayo de 2022. Los sujetos incluidos fueron personas  $\geq 18$  años de edad de ambos sexos 1920 individuos fueron calificados para el análisis de validación. El BITe ha sido traducido al español y validado mediante análisis factorial confirmatorio. Los participantes también han sido puntuados con el Cuestionario de

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Agresión (AQ). **Resultados:** la prueba de Kaiser-Meyer-Olkin (KMO) fue adecuada (KMO=0,880) y la esfericidad se probó significativamente ( $p<0,001$ ). El análisis confirmatorio confirmó que la escala es unidimensional. El ajuste del modelo fue bueno, según todos los índices de ajuste. El alfa de Cronbach también confirmó una excelente consistencia interna ( $\alpha=0,91$ ). Las puntuaciones entre las dos escalas (BITe y AQ) han mostrado una buena convergencia ( $r=0,512$ ;  $p<0,001$ ). **Conclusiones:** La versión en español del BITe es una escala unidimensional de cinco ítems tipo Likert que muestra buena validez interna y alta confiabilidad, lo que implica que esta versión tiene excelentes propiedades psicométricas tanto para hombres como para mujeres hispanohablantes.

**Palabras clave:** irritabilidad, validez, confiabilidad, análisis factorial.

## ABSTRACT

**Background:** Irritability, as a trans dimensional symptom, is present in several mental disorders. This study investigated the psychometric properties of the Spanish version of the Brief Irritability Test (BITe). **Subjects and Methods:** The recruitment has been performed through an online survey launched through common social media (Facebook, Twitter) and messaging apps (WhatsApp, Telegram) from 1st to 31st May 2022. Subjects included were individuals  $\geq 18$  years old of age of both sexes. 1920 individuals were rated for the validation analysis. The BITe has been translated into Spanish and validated through confirmatory factor analysis. Participants have been also scored with the Aggression Questionnaire (AQ). **Results:** Kaiser-Meyer-Olkin (KMO) test was adequate (KMO=0.880) and sphericity tested significantly ( $p<0.001$ ). The confirmatory analysis confirmed that the scale is one-dimensional. The model adjustment was good, according to all fit indices. Cronbach's alpha also confirmed an excellent internal consistency ( $\alpha=0.91$ ). Scores between the two scales (the BITe and the AQ) have shown a good convergence ( $r=0.512$ ;  $p<0.001$ ). **Conclusions:** The Spanish version of the BITe is a unidimensional scale of five Likert-type items that shows good internal validity and high reliability, which implies that this version has excellent psychometric properties for both male and female Spanish-speakers.

**Keywords:** irritability, validity, reliability, factor analysis.

## INTRODUCTION

Irritability is understood as the difficulty to get out of a "state of anger" as an emotional response, which is related to personality disorders in the symptom category for externalizing and internalizing disorders that alter behavior (1).

Irritability, as a trans dimensional symptom, is present in several mental disorders, such as generalized anxiety disorder, post-traumatic stress disorder, borderline personality disorder, antisocial personality disorder, substance withdrawal syndrome, pathological gambling, attention deficit hyperactivity disorder, neurodevelopmental disorders and Alzheimer's disease (2).

Understanding irritability as a mood state requires holistic research, with the aim of considering variables such as age, gender, mood states in response to specific situations, quality of life, stress management, work or academic performance, and substance use to avoid biased results (3).

The understanding of irritability has been limited by the measurement tools available to assess this construct (4). Most of the research on irritability has been based on single-item assessments, which yield less reliable and valid results than multi-item scales (5).

With the above in mind, Holtzman et al. developed the Brief Irritability Test (BITe), which is a brief, reliable, and valid self-report

measure of irritability (suitable for use among both men and women), and which shows minimal overlap with related constructs. As a simple and easy-to-use tool, the BITe is useful in measuring irritability without creating an additional burden on patients and participants (4).

In order to have a useful tool for the measurement of irritability in the Spanish-speaking population, this research aimed to translate the BITe into Spanish and to assess its psychometric properties.

## MATERIALS AND METHODS

### Participants

Participants were recruited through an online survey, launched through common social networks (Facebook, Twitter) and messaging apps (WhatsApp, Telegram) from 1st to 31st May 2022. All participants received full information about the purpose of the study, privacy, and data processing. No payment was provided for completing the survey. Subjects included were individuals  $\geq 18$  years old of age.

The sample size was calculated using the Epidat epidemiological package. Assuming an expected frequency of response of 50% in the Paraguayan general population, with a confidence level of 95% and a precision of 2.5%, the minimum sample was established in 1537 participants (6). Finally, 1920 subjects were surveyed.

The online survey approach was employed on the base of evidences suggesting that responses to online surveys can provide similar results to those reported through “in-person” samples (7).

In this research, all measures, conditions, data exclusions, and procedure for the determination of the sample size, to the best of our knowledge, have been reported.

### Measures

#### *The Brief Irritability Test (BITe)*

The degree to which participants experienced frustration and irritability was measured using

the BITe. The BITe is a 5-item scale, suitable for use among both males and females, that displays minimal overlap with related constructs (4). The respondent uses a 6-point Likert scale (1=never, 6=always) to indicate how frequently respondents identify with each statement. The scale asks the respondent to consider their experiences over the past 2 weeks. Scores across the five items are averaged to obtain a mean irritability score ranging from 1 (least irritable) to 6 (most irritable). The BITe has been validated in both clinical and non-clinical samples and shows excellent internal consistency with a Cronbach's alpha of 0.88.

#### *The Aggression Questionnaire (AQ)*

The AQ (8) is a 29-item scale of dispositional aggression and is comprised of four subscales: verbal aggression (e.g., “tell my friends openly when I disagree with them”), physical aggression (e.g., “If I have to resort to violence to protect my rights, I will”), trait anger (e.g., “I have trouble controlling my temper”), and trait hostility (e.g., “When people are especially nice, I wonder what they want”). Items are rated on a 5-point scale (1 = extremely uncharacteristic of me to 5 = extremely characteristic of me). The Aggression Questionnaire has moderate to high internal consistency and test-retest reliability, and has shown good convergent validity with other self-report scales of aggression (9,10).

### Translation process and validation

The translation of the BITe from English to Spanish was performed following the procedures suggested for cross-cultural adaptation of self-report measures, using the back-translation method (11).

1. First, the original English version was translated into Spanish;
2. Second, a bilingual expert back-translated the Spanish version into English;
3. Third, a native English speaker compared, sentence by sentence, the back translation with the original English version, to verify if they were equivalent in meaning.

4. Finally, minor changes were made after the comparison and the Spanish version was administered to fifteen individuals, as a pilot test, to verify if the questionnaire was comprehensible.

After the pilot test, the final Spanish version was approved (available upon request to the corresponding author).

### Statistical analysis

The Kaiser-Meyer-Olkin (KMO) test for sample adequacy and the Bartlett's Test of Sphericity were used to assess the pertinence of performing a factor analysis (SPSS software - version 25). Confirmatory factor analysis (CFA) was performed using Jeffrey's Amazing Statistics Program (12). Diagonally weighted least squares (DWLS) estimation procedure was used for CFA, taking into consideration the sample size. Model fit was tested through chi-square ( $\chi^2$ ), the comparative fit index (CFI), the normed fit index (NFI), the Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMSR). These indices detect if the fit model is good (RMSEA and SRMSR  $<0.05$  and CFI and TLI  $>0.95$ ) or acceptable (RMSEA and SRMSR between 0.05 and 0.08, and CFI and TLI between 0.90 and 0.95) (13).

Reliability was measured with Cronbach's alpha. Alpha values are described as excellent (0.93–0.94), strong (0.91–0.93), reliable (0.84–0.90), robust (0.81), fairly high (0.76–0.95), high (0.73–0.95), good (0.71–0.91), relatively high (0.70–0.77), slightly low (0.68), reasonable (0.67–0.87), adequate (0.64–0.85), moderate (0.61–0.65), satisfactory (0.58–0.97), acceptable (0.45–0.98), sufficient (0.45–0.96), not satisfactory (0.4–0.55), and low (0.11) (14).

Convergent validity was measured via the correlations of the BITE with the AQ using Pearson correlations in SPSS. These correlations are defined as strong ( $r \geq 0.50$ ), moderate ( $r$  values between 0.30 and 0.49), and weak ( $r$  values between 0.10 and 0.29) (15).

### Ethical considerations

The study was approved by the Department of Medical Psychology of the National University of Asuncion, School of Medical Sciences (Paraguay). Data were treated with confidentiality, equality, and justice, respecting the Helsinki principles. Participants who required feedback from the survey were invited to write down their email address and received information or specific helpful suggestions.

## RESULTS

### Participants

A total of 1920 subjects were surveyed, of whom 67.6% were women. Ages ranged from 18 to 85 years with a mean of  $31.66 \pm 9.6$  years and a median of 30 years. The subjects' characteristics are shown on Table 1.

Characteristic	n	%
<b>Gender</b>		
Male	622	32.4
Female	1298	67.6
<b>Social status</b>		
Living with friends	30	1.6
Living with family/partner	1742	90.7
Living alone	148	7.7
<b>Education</b>		
Primary education	4	0.2
Secondary education	218	11.4
University education	1698	88.4
<b>Civil status</b>		
Married	466	24.3
Divorced	84	4.4
Single	1362	70.9
Widowed	8	0.4
<b>Income level</b>		
Equal to 1 (one) minimum wage	272	14.2
More than 1 (one) minimum wage	1241	64.6
Less than 1 (one) minimum wage	407	21.2

Table 1. The subjects' characteristics (N=1920).

## Preliminary analysis

The mean BITe total score was  $3.3 \pm 1.05$  (item mean scoring) and  $16.51 \pm 5.25$  (item summation scoring), and the measure demonstrated excellent internal consistency

( $\alpha=0.91$ ) (14). Each of the 5 items reported acceptable corrected item-total correlations (range=0.609 to 0.789) (16). The BITe total scores were correlated with age ( $r=-0.204$ ,  $p<0.001$ ), whereas the other associations are shown in Table 2.

Characteristic	Mean	SD	p-value
<b>Gender</b>			
Male	3.13	1.09	$p<0.001$
Female	3.39	1.02	
<b>Social status</b>			
Living with friends	3.54	1.13	$p=0.429$
Living with family/partner	3.30	1.04	
Living alone	3.33	1.11	
<b>Education</b>			
Primary education	3.85	1.89	$p=0.575$
Secondary education	3.31	1.14	
University education	3.30	1.04	
<b>Civil status</b>			
Married	3.05	1.04	$p<0.001$
Divorced	3.03	0.88	
Single	3.41	1.04	
Widowed	2.30	0.70	
<b>Income level</b>			
Equal to 1 (one) minimum wage	3.48	1.12	$p<0.001$
More than 1 (one) minimum wage	3.20	1.02	
Less than 1 (one) minimum wage	3.51	1.06	

**Table 2.** The subjects' characteristics associated with the BITe total score mean (N=1920).

The mean total score for the AQ was  $2.5 \pm 0.63$ , while the mean score of the subscales were  $2.05 \pm 0.66$ ,  $2.63 \pm 0.81$ ,  $2.82 \pm 0.75$  and,  $2.64 \pm 0.90$ , respectively. The measure demonstrated also an excellent internal consistency ( $\alpha=0.899$ ) (14).

## Factorial analysis

KMO test was adequate (KMO=0.880) and sphericity tested significantly ( $p<0.001$ ). The original one-dimensional model was assessed with confirmatory factorial analysis. The model adjustment was good, according to all fit indices (S-B  $\chi^2=9.819$ ,  $df=5$ ,  $p<0.05$ ;

RMSEA=0.022; CFI=0.999, NFI=0.999, TLI=0.999, SRMSR=0.021). This confirms that the model of the Spanish version of the BITe may reproduce the same one-factor model of the original version and all items had standardized factor loadings higher than 0.40 ( $p<0.001$ ). Items- means and standard deviations, factor loadings, and communalities ( $h^2$ ) for the one-factor model of the BITe are shown in Table 3.

BITE item	Mean	SD	Factor loading	h2
1	3.40	1.02	0.801	0,765
2	3.14	1.28	1.019	0,722
3	3.47	1.24	0.966	0,631
4	3.17	1.29	1.096	0,621
5	3.34	1.29	1.132	0,603

SD: standard deviation

h2: communalities

**Table 3.** BITE: Items- means and standard deviations, factor loadings, and communalities.

### Convergent validity

Convergent validity of the BITE was assessed by evaluating the correlations of the BITE with the AQ. The correlation between the BITE and the AQ was direct and significant ( $r=0.512$ ;  $p<0.001$ ), which suggests a good construct validity.

### DISCUSSION

The purpose of this research was to validate the Spanish version of the Brief Irritability Test (BITE) and to examine whether it reproduced the same construct as the original English version (4). First, the irritability values found are higher than in the original version (16.51 vs. 12.95) (4), as well as in the Turkish version (12.99) (17), but similar to the French version (15.36) (18). As with the validation studies in French and Turkish, the majority of the sample in our study is made up of women; this could be explained by the type of methodology used in these studies (17,18).

In our study, women were found to have higher irritability scores. This is in agreement with other research showing a higher rate of irritability in women than in men (19,20), always taking into consideration the cultural differences specific to each country and language.

The results of our study show that there is sufficient evidence to affirm that the Spanish version can be explained by a unidimensional five-item model; therefore, the construct of irritability can be explained by this version of the scale. Of course it should be kept in mind

that the original version used item response theory, therefore, it is to be expected that only one dimension was found (4). Our Spanish version, as well as the Turkish and French versions, used factor analysis, also finding only one dimension (17,18).

The correlations between the scale and the aggressiveness questionnaire also show evidence in favor of construct validity, since the correlation is direct and significant. As for related factors, no relationship was found between irritability and the social status or educational level of the participants. Differences were found with marital status, since those who were single had higher irritability scores than those who were married. This could be related to the protection provided by social support (17). Also, as indicated by some publications, irritability was also higher in those with lower income (21).

As for reliability, in our sample it was  $=0.91$ , which shows excellent internal consistency, as did the English ( $\alpha=0.91$ ) (4), French ( $\alpha=0.80$ ) (18), and Turkish ( $\alpha=0.86$ ) versions (17).

Limitations of this research may include the lack of data to determine if there were any other differences in sociodemographic factors (e.g., race, ethnicity, etc.) or clinical characteristics (e.g., comorbidity) that could influence the results. Furthermore, the scope of this article could have been greater if additional data had been available (e.g., information on discriminant association with other disorders). Another limitation may include the fact that we completely relied on self-report measures. Finally, test-retest reliability was not calculated,

since contact information of recruited subjects were not collected for a second assessment.

A strength point of this research is the measurement of psychometric properties of the Spanish version of the BITE: this might suggest a valuable assessment tool for Spanish-speaking populations.

In conclusion, the Spanish version of the BITE is a unidimensional scale of five Likert-type items that shows good internal validity and high reliability, which implies that this version has excellent psychometric properties for both male and female Spanish-speakers.

### Authors' contribution statement:

Iván Barrios Coronel, José Almirón-Santacruz, Marcelo Gerardo O'Higgins, Noelia Ruiz Díaz, Rodrigo Eduardo Navarro, Oscar Enrique García, Osvaldo José Melgarejo, Diego Amarilla Salvioni, Julio Torales: conception and design of the study, analysis and interpretation of the results and conclusions, critical revision of the manuscript. Anthon Daniel Torres-Romero, Matías Franco Di Giuseppe, Elías René Rolón-Mendéz, Patricia Lorena Martínez-López, Katja Victoria Heinichen-Mansfeld: drafting of the manuscript, literature search. Iván Barrios, João Mauricio Castaldelli-Maia, Antonio Ventriglio, Julio Torales: critical revision of the manuscript, final approval of the manuscript.

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