# Expanding binge eating assessment: Validity and screening value of the Binge Eating Scale in women from the general population

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**Abstract**

There is growing recognition that binge eating is a prevalent problem with serious implications for both clinical and nonclinical samples. The current study aimed at examining the factor structure, psychometric properties and the screening usefulness of the Binge Eating Scale (BES) in a large sample of female college students and women from the Portuguese general population.

A sample of 1008 participants was collected to conduct a confirmatory factor analysis and test the BES psychometric properties; 150 participants were further evaluated through the Eating Disorder Examination 16.0D to assess the discriminant validity of the BES.

Results confirmed that the BES presents a sound one-dimensional factorial structure, with very good construct reliability and convergent validity. Also, the scale presented very good retest-reliability. Findings also offered evidence that BES is positively associated with measures of eating and general psychopathology, and BMI. Furthermore, BES revealed an excellent performance (96.7%) on discriminating clinically significant cases of binge eating, showing a sensitivity of 81.8% and a specificity of 97.8%.

Results support the validity and usefulness of the BES as an assessment and screening tool for binge eating in women from the general population.

## 1. Introduction

Binge eating has been increasingly recognized as a serious condition with severe implications in both clinical and nonclinical populations (Kessler et al., 2013; McManus & Waller, 1995). Binge eating is characterized by the occurrence of episodes of eating, in a discrete period of time, a definite large amount of food, with a sense of lack of control over eating (i.e., a feeling that one cannot stop eating or control what or how much one is eating). These episodes are often preceded by emotional distress and may be seen as a maladaptive attempt to avoid or escape disturbing thoughts and emotions (Arnow, Kenardy, & Agras, 1995; Goldfield, Adamo, Rutherford, & Legg, 2008; Heatherton & Baumeister, 1991), but these behaviours often generate great levels of shame and distress over the episode and its consequences. Binge eating behaviours are the hallmark feature of Binge Eating Disorder (BED) and Bulimia Nervosa (BN), but can also be present in Anorexia Nervosa or other forms of eating disorders (American Psychiatric Association, 2013).

Nevertheless, binge eating behaviours are also significantly prevalent among individuals without eating disorders (Johnsen, Gorin, Stone, & le Grange, 2003; Johnson, Rohan, & Kirk, 2002; Kinzl, Traweger, Trefalt, Mangweth, & Biebl, 1999). In fact, recent research reports growing prevalence rates of binge eating problems among the community (de Zwaan, 2001; Ribeiro, Conceição, Vaz, & Machado, 2014; Striegel-Moore & Franko, 2003), with women being more likely to present these problems than men (Hudson, Hiripi, Pope, & Kessler, 2007; Kessler et al., 2013). Among the female population a study revealed that up to 40% college students report binge eating symptoms (Saules et al., 2009). Also, research shows that even subclinical binge eating symptoms or partial syndromes may be very distressing and have a significant negative impact in individuals' physical and mental health

(Striegel-Moore et al., 2000). In particular, findings from both clinical and community-based studies offer evidence that suggests that binge eating is associated with psychiatric comorbidities (e.g., anxiety and depressive symptoms; Hudson et al., 2007; Preti et al., 2009; Ricca et al., 2000), overweight, obesity and poorer outcomes in weight loss treatments (Hudson et al., 2007; Kessler et al., 2013; Ricca et al., 2000; Villarejo et al., 2012; Wilfley, Wilson, & Agras, 2003).

The assessment of binge eating offers some challenges given its private nature and because it is associated with aspects that are difficult to declare (e.g., shame about the episode) and to recall (e.g., severity of the episodes). It is consensual that investigator-based interviews are the most valid method to accurately assess binge eating. Specifically, the Eating Disorder Examination – EDE (Fairburn & Cooper, 1993) is considered to be the most accurate assessment tool for eating disorders, since it allows the interviewer to define some ambiguous terms and ask additional questions to facilitate a better recall of some symptoms and the identification of their frequency and severity (e.g., binge eating episodes). However, clinical interviews require extensive preliminary training, individual administration, and are expensive and time consuming (Wilson, 1993).

In order to overcome some of these constraints, there has been an effort on the examination of measures that may provide a rigorous assessment of behaviours and attitudes that characterize eating psychopathology, but that diminish the costs and burden in both the participant and researcher caused by interview-based methods (Celio, Wilfley, Crow, Mitchell, & Walsh, 2004). In particular, self-report measures have been highlighted as useful alternatives to assess the experience of binge eating, such as the Questionnaire on Eating and Weight Patterns – QEWP-R (Yanovski, 1993), the questionnaire version of the EDE, the Eating Disorder Examination

Questionnaire – EDEQ (Fairburn & Beglin, 1994), and the Binge Eating Scale – BES (Gormally, Black, Daston, & Rardin, 1982).

The Binge Eating Scale (Gormally et al., 1982) was originally developed to assess affective/cognitive aspects and behavioural manifestations of binge eating problems in obese persons. This instrument has been widely used as a dimensional measure of the severity of binge eating, as a screening tool (Freitas, Lopes, Appolinario, & Coutinho, 2006; Greeno, Marcus, & Wing, 1995) and as a useful instrument of treatment outcomes (e.g., Katterman, Kleinman, Hood, Nackers, & Corsica, 2014; Telch, Agras, & Linehan, 2001). Studies, mainly conducted in obese patients and bariatric surgery candidates, have demonstrated that the BES has high sensitivity and specificity for discriminating between binge eaters and non-binge eaters, presenting similar results to those obtained by reliable and supported semi-structured interviews (Celio et al., 2004; Freitas et al., 2006; Greeno et al., 1995; Grupski et al., 2013; Robert et al., 2013). Furthermore, a growing body of research has been showing that the BES presents good validity both in clinical (e.g., obese patients, BED patients; Timmerman, 1999; Dezhkam, 200; Hood, Grupsky, Hall, Ivan, & Corsica, 2013), as well as in nonclinical samples (e.g., college students; Anton, Perri, & Riley, 2000; Gordon, Holm-Denoma, Troop-Gordon, & Sand, 2012; Meno, Hannum, Espelage, & Low, 2008).

Regardless of its wide use, research on the dimensionality and psychometric properties of the BES, remains scarce. Also, most studies examining the validity of the scale have been conducted with obese women seeking or undergoing weight loss treatments (Hood et al., 2013). In particular, the adequacy of this scale and its psychometric properties in nonclinical samples is unknown. The current study aimed at examining the BES factorial structure through a confirmatory factor analysis, and

its validity in a large sample of women from the Portuguese general population. Furthermore, the current study assesses the distribution of the severity of binge eating symptoms, and the sensitivity and specificity of the BES in discriminating clinically significant binge eating.

## 2. Material and methods

### 2.1. Participants

A total of 1008 female participants were enrolled in this study. The sample comprised college students ($n$ = 553; 54.9%), mean age 20.76 ($SD$ = 2.27), and participants from the general population ($n$ = 455; 45.1%), mean age 39.48 ($SD$ = 10.05). The participants' age ranged from 18 to 60, with a mean age of 29.21 ($SD$ = 11.63). Also, participants presented a mean of 13.24 ($SD$ = 2.63) years of education. Participants' Body Mass Index (BMI) mean was 22.90 ($SD$ = 3.79). Seventy-three participants (7.2%) were underweight (BMI <18.5), 684 (67.9%) had a normal weight (18.5 $\geq$ BMI $\leq$ 24.99), 194 (19.2%) were overweight (25 $\geq$ BMI $\leq$ 29.99), and 57 (5.7%) participants were obese (BMI $\geq$ 30), according to the standard classification, which reflects the BMI distribution in the general female Portuguese population (Poínhos, 2009). In particular, the students presented a mean BMI of 21.67 ($SD$ = 3.08), and the participants from the general population a mean BMI of 24.40 ($SD$ = 4.03). There was a difference in BMI mean values between the groups ($t$ = 12.069; $p$ = .000), which was expected considering the BMI distribution in young and older adult women in the Portuguese general population (Poínhos, 2009).

Thirty participants were randomly selected from the total sample to answer to a second administration of the BES to test the scale's temporal stability (after a one-month period).

## 2.2. Measures

*Binge eating scale* (BES; Gormally et al., 1982). The BES comprises 16 items measuring key behavioural (e.g., rapid eating, eating large amounts of food), and affective/cognitive symptoms (e.g., guilt, feeling out of control or unable to stop eating) that precede or follow a binge. Each item contains 3 to 4 statements that are weighted response options, which reflect a range of severity for each measured characteristic. Participants are asked to select the statement that best describes their experience. Example:

1. I usually am able to strop eating when I want to. I know when "enough is enough".

2. Every so often, I experience a compulsion to eat which I can't seem to control.

3. Frequently, I experience strong urges to eat which I seem unable to control, but at other times I can control my eating urges.

4. I feel incapable of controlling urges to eat. I have a fear of not being able to stop eating voluntarily.

The scale's possible total scores range from 0 to 46, with higher scores indicating more severe binge eating symptoms. Individuals may be categorized into three groups as defined by established cut scores of binge eating severity (Marcus, Wing, & Lamparski, 1985): no or minimal binge eating (score $\leq$ 17), mild to moderate binge eating (score 18-26) and severe binge eating (score $\geq$ 27).

The version of the scale used in the current study underwent a rigorous adaptation procedure. Prior permission to use the BES was obtained from the authors of the original version of the scale (Gormally et al., 1982). A bilingual researcher

translated and adapted the scale into European Portuguese. The translation was analysed by researchers with a large experience in the field. The comparability of content was also corroborated through stringent back-translation procedures, with the cooperation of a bilingual researcher. An initial version of the adapted scale was then completed by 50 college students and was preliminarily analysed. A final version of the scale was obtained after conducting some minor adjustments in order to ensure the fidelity of the scale.

*Eating Disorder Examination 16.0D* (EDE 16.0D; Fairburn et al., 2008; Ferreira, Pinto-Gouveia, & Duarte, 2010). The EDE is an investigator-based semi-structured clinical interview that provides a comprehensive assessment of the frequency and intensity of key behavioural and psychological aspects of eating disorders. It comprises four subscales that reflect the severity of eating psychopathology: Restraint, Eating Concern, Weight Concern and Shape Concern. A global score may be obtained by calculating the mean of the subscales' scores. Furthermore, the EDE allows for a thorough assessment of the specific psychopathology of patients with binge eating, such as the presence and frequency of binge eating episodes, features associated with binge eating (e.g., eating much more rapidly than normal), and distress over the episode. The administration of the EDE requires an experienced interviewer and takes 60-90 minutes. Research has shown that EDE presents high values of internal consistency, discriminant and concurrent validity, and test–retest reliability (for a review see Fairburn, 2008). The Portuguese version of the EDE (Ferreira et al., 2010) was used in the current study as a diagnostic measure in a subsample of 150 participants. The EDE presented a high internal consistency, with Cronbach's alpha values ranging from .74 to .90 in the subscales, and of .94 in the total score.

*Eating Disorder Examination Questionnaire* (EDE-Q; Fairburn & Beglin, 1994; Machado, Martins, Vaz, Conceição, Bastos, & Gonçalves, 2014). The EDE-Q is the self-report version of EDE, providing a similarly comprehensive assessment of disordered eating behaviours. The EDE-Q comprises 36 items focusing on the past 28 days and provides the same four subscales of the EDE that reflect eating psychopathology severity. Research also supports that EDE-Q presents good psychometric properties (Fairburn, 2008). In this study, the Portuguese version of the EDE-Q (Machado et al., 2014) was used, which presented a Cronbach's alpha value of .95, and the subscales presented values ranging from .76 to .92.

*Emotional eating scale* (EES; Arnow et al., 1995; Portuguese version by Duarte & Pinto-Gouveia, 2014). The EES is a self-report measure that assesses the tendency to overeat in response to emotional stimuli. It includes 25 distinct emotions (e.g., discouraged, irritated, angry) that comprise 3 subscales – Anger/Frustration, Anxiety, and Depression. Participants are asked to rate, using a 5- point Likert scale (ranging from 0 = "no desire to eat" to 4 = "an overwhelming urge to eat"), the degree to which they desire to eat in response to each mood state. For the purpose of this study, only the total score of the EES was considered. The scale presented good construct and discriminant validity as well as good internal consistency (Arnow et al., 1995). The scale also revealed good psychometric properties in its Portuguese version (Duarte & Pinto-Gouveia, 2014). The scale revealed very good internal consistency in this study, with a Cronbach's alpha of .92.

*Depression Anxiety and Stress Scales – 21* (DASS21; Lovibond & Lovibond, 1995; Portuguese version by Pais-Ribeiro, Honrado, & Leal, 2004). The DASS21 measures levels of Depression, Anxiety and Stress symptoms. The scale comprises 21 items with the 3 subscales including 7 items each. Participants are asked to rate the

frequency, using a 4-point Likert scale (0 = "Did not apply to me at all" to 3 = "Applied to me very much or most of the time"), with which they experience the symptoms. Higher scores reflect increased levels of psychopathology symptoms. The scale shows adequate internal consistency in its original and Portuguese versions (Lovibond & Lovibond, 1995; Pais-Ribeiro et al., 2004). Cronbach's alpha values of .87, .84 and .90 were verified in the current study for the subscales Depression, Anxiety and Stress, respectively.

*BMI.* Participants' BMI was calculated by dividing self-reported current weight (in kg) by height squared (in m).

## 2.3. Procedure

Data collection followed ethical requirements, with all participants being fully informed about the voluntary nature of their cooperation, the confidentiality of the collected data, and after they provided their informed consent. The study aims and instructions were standardized for all participants and measures were administered in the presence of one of the researchers. The students completed the set of self-report measures at the end of a lecture with the consent of the respective educational institution's board. The remainder participants comprised the staff of distinct institutions (e.g., schools, private companies, retail services). The study was presented to and approved by the professional institutions' boards, which publicized the study to their staff. One researcher was present at an authorized break to provide the self-report measures and standardized instructions to participants who voluntarily agreed to participate.

Furthermore, of the total sample, 150 participants were further assessed by a semi-structured clinical interview for eating disorders (EDE 16.0D; Fairburn, Cooper,

& O'Connor, 2008). This subsample comprised 92 (61.3%) college students, with a mean age of 21.20 (*SD* = 1.81) and a mean BMI of 22.57 (*SD* = 3.55); and 58 (38.7%) women recruited within the general population, with a mean age of 39.57 (*SD* = 9.43), and a BMI mean of 24.44 (*SD* = 4.29). These participants were recruited with the assistance of undergraduate Psychology students who were offered 0.5 credits for their cooperation in recruiting potential participants for the study (female college students and women from the general population) who would be required to attend the research unit for an individual assessment. Each participant was given the same standardized information and instructions, and filled the same set of self-report questionnaires; on a date previously scheduled with each participant, the participants were asked to return the self-report measures in a sealed envelope and were afterwards assessed by an interviewer blind to the self-report measures' scores.

### 2.3.1. Calculation

The structure of the scale was analysed through a Confirmatory Factor Analysis. The MPLUS software (Analysis of Momentary Structure, software version 18, SPSS Inc. Chicago, IL) was used, given the non-normal categorical type of this scale. The construct reliability and convergent validity of the scale were further established through the calculation of the internal consistency, Composite Reliability and Average Variance Extracted.

The association between the BES and the other eating and general psychopathology self-report measures, and BMI, was assessed by computing Pearson product-moment correlation coefficients. Retest reliability was analysed through the comparison of the first and second administration (after a one-month period) mean

values of the scale through t-Tests for Dependent Samples and through Pearson product-moment correlations.

The concurrent validity of the BES was further assessed ($n$ = 150) by calculating the sensitivity, specificity, and overall prediction of the scale through a binary logistic regression. Specifically, we tested the ability of the BES at the cut-off of 17 (i.e., mild to moderate binge eating; Marcus et al., 1985) to correctly identify individuals with clinically significant binge eating (as determined by the EDE 16.0D; Fairburn et al., 2008). This threshold was selected, instead of 27 (i.e., severe binge eating), to avoid false negatives. The Receiver Operating Characteristic curve (ROC) was further used to examine the association between the sensitivity and specificity of the scale, illustrating the scale's discriminant performance (Hosmer & Lemeshow, 2000).

These analyses were conducted using IBM SPSS Statistics 20 (Statistical Package for the Social Sciences, Chicago, IL, USA).

## 3. Results

### 3.1. Descriptives

The BES total score mean was 6.95 ($SD$ = 6.62), with values ranging from 0 to 39. Also, no significant differences were observed between the students ($M$ = 7.31; $SD$ = 6.67) and participants of the general population ($M$ = 6.51; $SD$ = 6.54) that comprised the sample ($t_{(1006)}$ = 1.922; $p$ = .055). The distribution of BES responses scores within the established cut-offs was 92.7% ($n$ = 935) for absent to minimal binge eating, 5.5% ($n$ = 55) for mild to moderate binge eating, and 1.8% ($n$ = 18) for severe binge eating. The means and standard deviations of the remaining study

variables (Table 1) were similar to those obtained in previous studies with nonclinical samples (Duarte & Pinto-Gouveia, 2014; Fairburn, 2008; Henry & Crawford, 2005). Furthermore, the participants' BMI mean was within the normal weight range.

*Table 1.*

Means (*M*), Standard Deviations (*SD*), and Product-moment Pearson correlations between the BES and EDE 160.D (*n* = 150), and the self-report measures (*N* = 1008).

|  | M | SD | BES |
|---|---|---|---|
| BES | 6.95 | 6.62 | - |
| EDE 16.0D - Restraint | 1.15 | 1.31 | .55*** |
| EDE 16.0D - Eating Concern | 0.31 | 0.74 | .66*** |
| EDE 16.0D - Shape Concern | 1.29 | 1.28 | .58*** |
| EDE 16.0D - Weight Concern | 1.20 | 1.24 | .59*** |
| EDE 16.0D - Total | 0.99 | 1.02 | .66*** |
| EDEQ - Restraint | 0.80 | 1.09 | .36*** |
| EDEQ - Eating Concern | 0.53 | 0.85 | .69*** |
| EDEQ - Shape Concern | 1.42 | 1.46 | .66*** |
| EDEQ - Weight Concern | 1.34 | 1.36 | .66*** |
| EDEQ - Total | 1.02 | 1.05 | .67*** |
| EES - Total | 46.27 | 15.97 | .55*** |
| DASS21 - Depression | 3.56 | 3.94 | .31*** |
| DASS21 - Anxiety | 3.09 | 3.72 | .24*** |
| DASS21 - Stress | 6.28 | 4.68 | .30*** |
| BMI | 22.90 | 3.79 | .35*** |

Note: *** $p < .001$

## 3.2. Confirmatory Factor Analysis

A CFA was conducted to confirm the BES one-dimensional factorial structure using the robust weighted least squares estimator, which accounts for non-normal categorical distributions (Flora & Curran, 2004; Wirth & Edwards, 2007). Each item was specified to load on a single factor, as initially suggested by the original authors of the scale (Gormally et al., 1982) and consistent with the common use and interpretation of the scale. The following goodness of fit indices were selected to evaluate the adequacy of the tested model: the chi-square goodness-of-fit ($\chi^2$); the Comparative Fit Index (CFI) and the Tucker Lewis Index (TLI), with values $\geq$ .95 indicating an excellent model goodness of fit; the Root Mean Square of

Approximation (RMSEA), which suggest an excellent model fit with values $\leq$ .06; and the Weighted Root Mean Square Residual (WRMR), with values close to 1.0 being considered indicators of excellent fit (Hu & Bentler, 1999).

Results indicated a very good fit to the data [$\chi^2_{(104)}$ = 380.556; $p$ < .001; CFI = .97; TLI = .96; RMSEA =. 05 (.05 to .06; $p$ = .333); WRMR = 1.22]. Regarding the local adjustment indices, all items revealed Standardized Regression Weights (SRW) above the recommended cut-off point of .40, that ranged between .45 (item 13) and .82 (item 10). The Squared Multiple Correlations (SMC) results confirmed the instrument reliability, with all items presenting values ranging from .20 (item 13) to .67 (item 10; Tabachnick & Fidell, 2013).

The model was further evaluated through the examination of the modification indices. A large modification index was verified between the errors of items 14 and 6 (74.21), which were correlated. This procedure resulted in an improvement of the global adjustment indices, with the model presenting an excellent fit [$\chi^2_{(103)}$ = 309.144; CFI = .98; TLI = .97; RMSEA = .05 (CI = .04 to .05; $p$ = .940); WRMR = 1.09]. The quality of the model was also examined through the local adjustment indices (Table 2). Results confirmed that all items revealed adequate SRW, and SMC's results confirmed the instrument reliability.

*Table 2.*

Standardized regression weights (SRW), Squared Multiple Correlations (SMC), corrected Item-total correlations (*r*) and Cronbach's Alpha if item deleted (*N* = 1008)

| Items | SRW | SMC | r | α |
|---|---|---|---|---|
| 1 | .69 | .48 | .48 | .87 |
| 2 | .56 | .31 | .42 | .88 |
| 3 | .74 | .55 | .58 | .87 |
| 4 | .76 | .58 | .44 | .87 |
| 5 | .60 | .36 | .47 | .87 |
| 6 | .70 | .50 | .57 | .87 |
| 7 | .81 | .65 | .62 | .87 |
| 8 | 73 | .53 | .60 | .87 |
| 9 | .68 | .46 | .55 | .87 |
| 10 | .82 | .68 | .67 | .86 |
| 11 | .76 | .58 | .60 | .87 |
| 12 | .69 | .47 | .52 | .87 |
| 13 | .45 | .20 | .27 | .88 |
| 14 | .76 | .58 | .65 | .86 |
| 15 | .69 | .48 | .55 | .87 |
| 16 | .65 | .42 | .49 | .87 |

## 3.3. Reliability Analysis

Results indicated that the BES presented a Cronbach's alpha value of .88. All items revealed moderate to high item-total correlations (above .42, with the exception of item 13, which revealed a correlation of .27), pointing out the quality and suitability of the items. Furthermore, the removal of any item would not increase the internal consistency of the scale (Table 2).

The scale's reliability was further examined through the Composite Reliability (CR) and Average Variance Extracted (AVE), which were manually calculated using the respective formulas (Fornell & Larcker, 1981). Results revealed a CR of .96, which indicate very good construct reliability. Regarding the AVE, results indicated a value of .61, confirming the instrument convergent validity.

### 3.4. Temporal stability

Results showed a high significant positive correlation between the first and second administrations of the BES ($r$ = .84). Results of the t-Tests for Dependent Samples showed that there were no significant differences between the first ($M$ = 6.43; $SD$ = 6.54), and the second ($M$ = 6.47; $SD$ = 6.88) assessment moments ($t_{(29)}$ = .05, $p$ = .962).

### 3.5. BES association to other measures

Product-moment Pearson correlation coefficients  (Table 1) revealed positive and high associations between the BES and EDE 16.0D total score and subscales. Regarding the correlations between the BES and EDE-Q, a self-report measure of eating psychopathology, results indicated a positive and high correlation between the BES and the EDE-Q total score, and the subscales shape and weight concern and, especially, eating concern. A positive but moderate correlation was found between the BES and EDE-Q restraint subscale. Furthermore, binge eating, as measured by the BES, was positively and strongly correlated with emotional eating (EES).

Regarding the association between the BES and overall psychopathology, results indicated significant positive correlations with DASS21 subscales of depression, stress and anxiety.

Finally, a positive moderate correlation was found between the BES and BMI.

### 3.6. Concurrent validity

Of the 150 participants who were assessed through the EDE 16.0D, 11 participants were identified as presenting clinically significant binge eating, with 9 (6%) meeting the diagnostic criteria for BED and 2 (1.33%) meeting the diagnostic

criteria for BN (American Psychiatric Association, 2013).

Results indicated that when applying the cut-off score of ≤ 17, the proportion of correctly classified cases was 96.7%. The BES showed a sensitivity value of 81.8% and a specificity value of 97.8%. The results of the ROC curve (Figure 1) confirmed that the BES presents an excellent precision in the detection of clinically significant cases of binge eating in the general population, with an area under the curve (AUC) of .90 (CI = .76, 1.00; $p < .001$; Hosmer & Lemeshow, 2000).
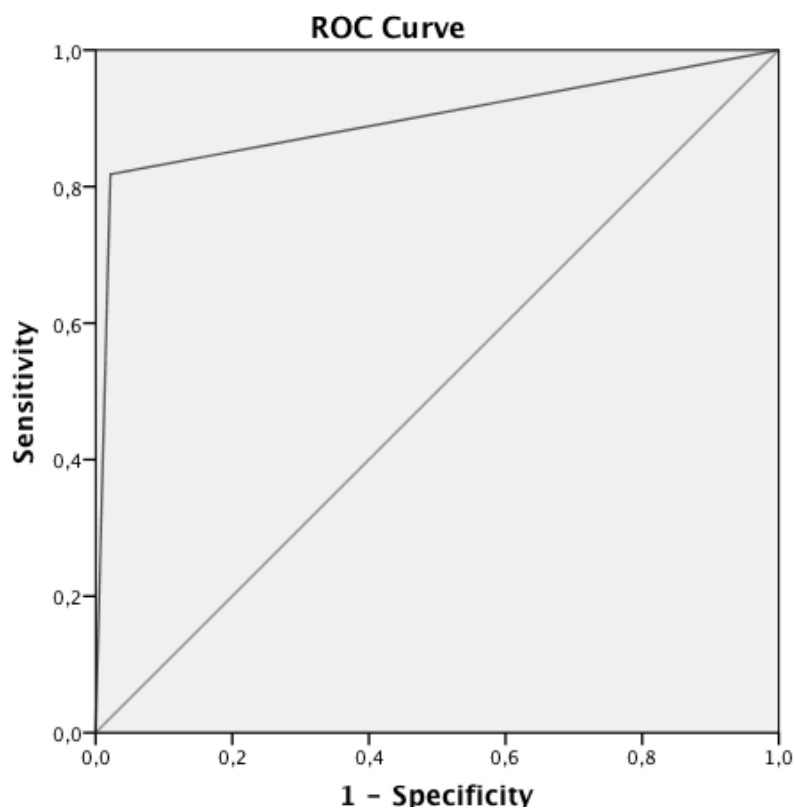


**Figure 1.** ROC curve showing BES accuracy as a screening tool for binge eating, with 95% confidence intervals.

## 4. Discussion and conclusions

The BES is one of the most widely used measures of binge eating attitudinal and behavioural manifestations. Also, it has been recognized as a valid instrument to assess binge eating symptoms from a dimensional perspective, both in clinical and nonclinical samples. Nevertheless, the BES factorial structure and validity were never formally assessed in women from the general population. The current study aimed at testing the adequacy of the BES as a one-dimensional measure of binge eating severity, as well as its psychometric properties and utility in discriminating women with clinically significant binge eating, within a large community sample.

A CFA confirmed that BES has a sound factorial structure, supporting its use as a measure of the severity of binge eating in the general population. Specifically, the global and local adjustment indices confirmed the suitability of a one-factor model, as it has been commonly interpreted. The analysis of the local adjustment indices supported the adequacy of the model (Tabachnick & Fidell, 2013).

Moreover, results indicated that the BES is a reliable self-report instrument. In fact, the scale revealed a high internal consistency, with a value similar to what was found in other nonclinical samples (Anton et al., 2000; Gordon et al., 2012; Meno et al., 2008). Also, most items presented moderate to high item-total correlations confirming the quality and adequacy of the items comprising the overall scale. The scale's reliability and items' convergent validity were also confirmed through the high values of CR and AVE, respectively. The BES was also shown to present high test-retest reliability.

Furthermore, results revealed that binge eating as assessed by the BES was positively associated with increased severity of eating psychopathology as measured by a gold standard interview of eating psychopathology – EDE 16.0D (Fairburn et al.,

2008) – and the adapted self-administration version of this interview (EDE-Q; Fairburn & Beglin, 1994). These findings are in line with prior research that has demonstrated that binge eating is associated with greater body image and eating-related psychopathology (Anton et al., 2000; Striegel-Moore et al., 2000). Moreover, findings indicated that the BES is associated with a higher tendency to eat in response to negative affective states, as measured by the EES (Arnow et al., 1995). These findings corroborate theoretical and empirical accounts on binge eating, supporting the conceptualization of binge eating as a maladaptive reactive attempt to cope with negative and undesirable emotional states (Arnow et al., 1995; Goldfield et al., 2008; Heatherton & Baumeister, 1991).

Aditionally, results indicated that in women from the general population binge eating is also significantly linked to higher levels of depressive, stress and anxiety symptoms. These findings add to prior evidence on the association between binge eating and indicators of poor mental health and well-being (Hudson et al., 2007; Kessler et al., 2013). Moreover, a positive and moderate association between binge eating and increased BMI was found, which also supports previous research (Villarejo et al., 2012; Wilfley et al., 2003).

Findings are consistent with prior evidence suggesting that binge eating problems are present in female samples of the general population in varying degrees of severity (Anton et al., 2000; Kessler et al., 2013; Ribeiro et al., 2014). The current study confirmed these findings and extends them by supporting the adequacy of a self-report measure to identify women within the community that present clinically significant levels of binge eating problems.

In fact, this study further allowed attesting for this measure's ability to predict and discriminate cases from non-cases of binge eating in women from the general

population. The ROC curve analysis indicated that when the commonly applied cut-off score of $\leq 17$ is used, 81.8% of women with clinically significant binge eating symptoms (sensitivity) and 97.8% of women without clinically significant binge eating (specificity) were correctly identified. These findings are similar to those reported in other studies conducted with clinical samples (e.g., patients seeking behavioral or surgery weight loss interventions; Freitas et al., 2006; Grupski et al., 2013; Ricca et al., 2000). However, these studies reported slightly higher sensitivity and lower specificity, which may be explained by the characteristics of the samples investigated. To our knowledge, this is the first study that used a sample of women from the general population with a wide age and BMI ranges. These findings offer support for the use of the BES as a screening instrument of clinically significant binge eating symptoms, which may be particularly useful in epidemiological and community-based intervention programmes for disordered eating behaviors.

This study's findings need to be interpreted taking into consideration some limitations. Since this is the first study that examined the factorial structure and psychometric properties of the BES in the general population, future research should be conducted to corroborate these findings. Studies should further investigate whether the one-dimensional model confirmed in this study remains invariant in other samples. This model should be tested in other female samples comprising different age ranges, for instance older women. Furthermore, the findings regarding the classification accuracy of the BES should be corroborated in future research using larger samples in order to confirm the ability of the BES to discriminate clinically significant cases of binge eating problems in the community. Also, even though research is consistent on demonstrating that women present higher levels of binge eating than men, the prevalence of binge eating in men, although lower, is not

negligible. Thus, future studies should test the adequacy of this scale in addressing binge eating symptoms in men.

Nonetheless, the current study confirms that the BES has a sound psychometric structure and is a reliable and useful measure to assess binge eating severity in women from the general population. Furthermore, this study offers new contributions on how BES operates on the identification of clinically significant levels of binge eating, further supporting the use of this measure to describe and investigate this serious condition.

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*Authors Disclosure*

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