Reliability and validity of the Binge Eating Scale-Turkish Form

Gülçim Bilim Baykan[1], Ayşegül Durak Batıgün[2]
[1]Clin. Psyc., Ankara, Turkey https://orcid.org/0000-0002-1890-0248
[2]Prof., Ankara University, Faculty of Languages, History and Geography, Department of Psychology, Ankara, Turkey https://orcid.org/0000-0002-8278-6419

SUMMARY

Objective: Binge Eating Disorder (BED) is defined in the DSM-5 as "consuming more food than most people can eat in a given period of time with an accompanying feeling of loss of control". Although BED has only recently been defined as a distinct diagnostic category, studies show that it is the most common eating disorder in adults. Therefore, the measurement tools that can be used in the assessment of BED gain importance at this point. The aim of this study was to determine the psychometric properties of the Binge Eating Scale, which was developed by Gormally et al.(44) and used in the assessment of BED, by adapting it into Turkish.

Method: The study was conducted on two separate samples of individuals between the ages of 18-65/68. The second sample was used only for confirmatory factor analysis. The Eating Attitudes Test, Brief Symptom Inventory and Brief Self-Control Scale were used as criterion-related validity criteria.

Results: As a result of the exploratory factor analysis, it was seen that the scale had a single-factor structure. This single-factor structure explained 32.69% of the variance. The goodness of fit values obtained from confirmatory factor analysis were also found to be excellent and acceptable (e.g., $\chi 2/sd = 2.93$). The Cronbach's alpha reliability coefficient of the scale was found to be .85, and the Spearman Brown two-half reliability coefficient was found to be .76 ($p < .001$).

Discussion: The results of the statistical analysis show that the Turkish adaptation of the scale is valid and reliable.

Key Words: Binge Eating Disorder, Validity, Reliability

INTRODUCTION

The aim of this study was to adapt the Binge Eating Scale to our culture and to conduct validity and reliability studies. Binge eating disorder (BED) is defined in DSM-5 as "consuming more food than many people can eat in a given period of time with an accompanying feeling of loss of control" (1). Although it has only recently been defined as a specific diagnostic category, studies show that it is the most common eating disorder in adults (2,3,4).

According to DSM 5, for a binge eating behavior to be considered as a binge eating episode, this behavior should be accompanied by a feeling of loss of control (1,5). Sometimes, although the amount of food consumed during a binge eating attack is not more than many people can eat in a certain period of time, people may perceive a loss of control over their eating behavior. When the amount of food consumed during binge eating is more than many people can consume in a certain period of time, it is defined as "objective binge eating"; when the individual perceives loss of control over eating even though the amount is not too much, it is defined as "subjective binge eating" (6).

The main feature that distinguishes binge eating disorder from bulimia nervosa (BN) is that recurrent binge eating episodes occur without compensatory behaviors such as vomiting, use of laxatives, excessive exercise or overly restrictive dieting to prevent the effects of a binge eating episode (1). Although individuals with binge eating disorder also report frequent diet attempts, they do not fol-

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low an overly restrictive diet between binge eating episodes as in bulimia nervosa (7,8). In BN, an overly restrictive diet usually triggers a binge eating episode, whereas in BED, binge eating behavior usually starts first, followed by diet attempts (9,10,11). Calorie intake and the type of food consumed during a binge eating episode also differ in BN and BED. A laboratory study showed that individuals with BN consumed twice as many calories as individuals with BED during a binge eating episode (12). It has also been reported that individuals with BED have less anxiety about their eating behaviors and body appearance, feel less guilt about being overweight and are more socially compatible than individuals with BN (13).

It is thought that the most common initiator of binge eating behavior in BED is negative affect (14). Interpersonal stress, negative feelings about weight, body shape or food, dietary restriction and boredom are also considered among the factors that trigger binge eating behavior (15,16,17). Although binge eating may lead to a short-term reduction or improvement in these triggering factors, especially emotions, in the long term it usually leads to discomfort and negative self-evaluations (18).

Although binge eating behavior can be observed in people of any weight (19), it is known to be more common in overweight and obese individuals (2). The rate of obesity in individuals with BED is 2-fold increased compared to the normal sample (20). However, binge eating disorder and obesity are two different conditions (21). Although obesity rates are very high in the society (>66%), only 2-3% of people meet the diagnosis of BED (2). Although binge eating behavior is occasionally observed in some obese individuals, most of them do not exhibit repetitive binge eating behavior (22).

Studies on the prevalence of eating disorders show that BED is the most common eating disorder in adults (2,3,23,24). Increasing obesity and obesity-related mortality rates both in Turkey and in the world make BED and binge eating behavior a common and serious public health problem (25,26). For these reasons, it can be said that it is important to evaluate binge eating behavior. When the literature is examined, it is seen that many scales have been developed to measure eating behaviors and eating disorders in general and these scales have been adapted into Turkish. Eating Attitude Test (27,28), Dutch Eating Behavior Questionnaire (29,30), Three-Factor Eating Questionnaire (31,32), Yale Food Addiction Scale (33,34), Emotional Appetite Questionnaire (35,36), BITE-Edinburg Test (37,38), Eating Awareness Scale (39,40) and Eating Disorder Assessment Questionnaire (41,42,43) are among these. When these measurement tools that have been studied in our country are examined, it is seen that binge eating behavior is either not included at all or evaluated with a few open-ended questions (41,42,43). Abroad, the most frequently used scale in the evaluation of binge eating behavior is the Binge Eating Scale (BES) developed by Gormally, Black, Daston, and Rardin in 1982 (44). This scale, which was used to assess binge eating behavior in obese and overweight individuals before the diagnosis of BED was developed, is currently used to assess behavioral, cognitive and emotional characteristics related to binge eating behavior in clinical and normal samples. It has been adapted into many languages such as Italian (45), Arabic (46), Spanish (47), Portuguese (48), Chinese (49) and Malay (50). In these adaptation studies, a single-factor structure was determined and its psychometric properties were found to be quite satisfactory.

As can be understood from all of the above, there is no scale that directly assesses binge eating behaviors in our country. Therefore, the aim of the present study is to conduct adaptation and validity and reliability studies of the Binge Eating Scale, which was developed by Gormally, Black, Daston, and Rardin (44) to assess binge eating behavior and is frequently used abroad. For this purpose, the Turkish translation study of the scale was conducted first. Then, construct validity was tested with exploratory and confirmatory factor analyses, and criterion-related validity analyses were also conducted. For reliability values, Cronbach alpha internal consistency and Spearman-Brown two-half reliability correlation coefficients were calculated.

METHOD

Sample

The current study was conducted on two separate samples. The first sample consisted of 397 adults between the ages of 18-68 (mean=33.99, SD=12.51) residing in Turkey, and the second sample consisted of 858 adults between the ages of 18-65 (mean=33.58, SD=12.54) residing in Turkey. These individuals were reached through convenience sampling technique. The second sample was used only for confirmatory factor analysis and all other analyses were conducted on the first sample. Detailed information about the characteristics of both samples is given in Table 1.

Data Collection Tools

Demographic Information Form: It is a form prepared by the researchers to determine the demographic characteristics of the participants such as age, gender, education level and eating-related characteristics (height, weight, eating frequency, etc.).

Binge Eating Scale (BES): It was developed by Gormally, Black, Daston and Rardin (44). It is a self-report scale consisting of a total of 16 items. For each item, the participants are asked to choose one of the three or four appropriate responses. Items 6 and 16 of the scale have three responses (scoring between 0-2) and the other items have four responses (scoring between 0-3). In the scale, 8 items describe emotions and cognitions related to binge eating (e.g. guilt, feeling loss of control), while 8 items describe behaviors (e.g. fast eating, secret eating). The Turkish version of the scale was prepared in accordance with the original. High scores obtained from the scale consisting of a single factor indicate an increase in the severity of binge eating. The internal consistency coefficient of the original form was .85 and the test-retest reliability coefficient was .87 (44).

Eating Attitude Test (EAT): It is a 6-point Likert-type scale (1=always, 6=never) developed by Garner and Garfinkel to evaluate the symptoms of anorexia nervosa (27). The Cronbach alpha value of the original scale was reported as .79 for the clinical diagnosis group. Turkish adaptation of the scale was conducted by Savaşır and Erol and as a result of the factor analysis, a 3-factor structure was found as “diet-regime”, “obesity anxiety-overly preoccupied with obesity”, “social pressure and overly preoccupied with thinness”. In the adaptation study, the test-retest reliability calculated for the whole scale was .65 and Cronbach's alpha internal consistency coefficient was .70 (28). The scale is also widely used to assess impairments in eating attitudes and behaviors in normal samples. The Cronbach's alpha internal consistency coefficient of the scale calculated in the present study was .85.

Brief Symptom Inventory (BSI): It is a 53-item Likert-type scale (0=none, 4=very much) developed by Derogatis (51). The higher the scores obtained from the scale, the higher the frequency of the individual's psychological symptoms. As a result of the adaptation of the scale to our culture, a five-factor structure including “anxiety”, “depression”, “negative self”, “somatization” and “hostility” was obtained and the Cronbach's alpha internal

Table 1. Demographic characteristics of the participants

	1.Sample		2.Sample	
	N	**%**	**N**	**%**
Sex				
Female	228	57.4	523	61
Male	168	42.3	335	39
Education				
Primary school	18	4.6	10	1.2
High school	55	13.9	104	12.1
University student	134	33.9	239	27.9
University graduate	127	32	291	33.9
Postgraduate	60	15.2	214	24.9
Marital status				
Single	193	49	443	51.6
Married	179	45.4	373	43.5
Lost his/her wife	6	1.5	10	1.2
Divorced/Separated	16	4.1	32	3.7
Whom Lives With				
Alone	52	13.2	96	11.2
With family	318	80.5	705	82.4
Friend/Relative/Other	25	6.3	55	6.4
Income Level (Perceived)				
Lower	6	1.5	17	2.0
Lower-middle	20	5.1	83	9.7
Middle	214	54.2	438	51.2
Upper-middle	134	33.9	274	32
Upper	21	5.3	44	5.1
Body Mass Index (BMI)*				
Underweight (18.50 ve alt)	22	5.6	51	5.9
Normal Weight (18.50-24.99)	209	53.6	452	52.7
Overweight (25-29.99)	110	28.2	263	30.7
1st Degree Obese (30-34.99)	46	11.8	77	1.5
2nd Degree Obese (35-39.99)	3	0.8	13	1.5
3rd Degree Obese (40 and above)	-	-	2	0.2

* Based on the classification made by the World Health Organization.

consistency coefficients of the subscales ranged between .87 and .75 (52). In the present study, the Cronbach's alpha internal consistency coefficient of the scale was calculated as .96.

Brief Self-Control Scale (BSCS): It is a 13-item scale developed by Tangney, Baumesiter and Boone and scored on a Likert-type scale (1= completely contrary, 5= completely appropriate). An increase in the scores obtained from the scale indicates low self-control. The scale consists of a single-factor structure and its internal consistency coefficient is .85 and test-retest reliability coefficient is .87 (53). Turkish adaptation study was conducted by Nebioğlu, Konuk, Akbaba, and Eroğlu and a two-factor structure named as self-discipline (Cronbach alpha= .81) and impulsivity (Cronbach alpha= .87) was reported (54). In the present study, the Cronbach alpha internal consistency coefficient of the scale was calculated as .81.

Procedure

Before starting the study, the necessary permission was obtained from the Ethics Committee of the relevant university (Date: 09.12.2019, Decision No: 14/415). The scale was translated into Turkish by 3 clinical psychologists who are fluent in both languages, then these translations were brought together and the most appropriate equivalents for each item were determined by the researchers. The items were finalized by taking the opinions of 3 other experts in the field of clinical psychology regarding the suitability of the translated items.

For both samples, approximately 70% of the data were collected through a paper and pencil test given to the volunteer participants in a sealed envelope, and approximately 30% of the data were collected online. Exploratory factor analysis and other validity and reliability analyses were conducted on the first sample (N=397), while confirmatory factor analysis was conducted on the second sample (N=858). The website www.surveey.com was utilized for online data collection. The participants were first given the Informed Consent Form, and the other scales were presented to the participants in different orders to avoid the order effect.

Before proceeding to the analysis phase, the data were cleaned and tested for suitability for statistical analysis. The z scores of the dependent variables (-3.29> z> 3.29) were calculated to determine the univariate outliers in the data set, and the Mahalanobis Distance (D2) value ($x^2(5)=11.07$, $p< .001$) was calculated to determine the multivariate outliers. Skewness and kurtosis levels were examined to evaluate whether the assumption of normal distribution was met. Since the skewness and kurtosis values of the variables met the condition of being between -2 and +2, parametric tests were used in the analysis (George & Mallery, 2010). The data were analyzed using SPSS 23 and LISREL 8.51 programs. Exploratory and confirmatory factor analysis were used to determine the construct validity of the scale, and correlation analysis was used for criterion-related validity and reliability values.

RESULTS

Construct Validity: Exploratory Factor Analysis

Exploratory factor analysis (EFA) was conducted to examine the construct validity of the Binge Eating Scale (BES). The Kaiser-Meyer-Olkin (KMO) value and the chi-square value in Bartlett Sphericity test, which were examined to evaluate whether the data were suitable for factor analysis, revealed that the data were suitable for factor analysis (KMO= .92, $x^2=1535,68$, $p>0.001$). The results of the initial factor analysis using principal component analysis and Varimax transformation sugges-ted three factors with eigenvalues higher than 1 and explaining 46.48% of the variance. In order to decide on the number of factors, a parallel analysis was also conducted. The eigenvalue results obtained from the parallel analysis were compared with the eigenvalue results obtained from the principal components analysis and if the eigenvalue results obtained from the principal components analysis were higher, that factor was accepted. The parallel analysis results indicated a single-factor structure. Since the original scale and the versions of the scale used in other languages were also single-factor and the factors did not diverge significantly, it was decided to treat the scale as a single factor and the principal components analysis was

Table 2. Binge Eating Scale (BES) factor structure

Item No	Factor Loadings	Item Total r
10	.74	.66***
3.	.70	.61***
11.	.66	.57***
16.	.64	.56***
14.	.61	.52***
9.	.61	.53***
8.	.58	.49***
15.	.57	.47***
5.	.56	.47***
4.	.55	.47***
6.	.54	.46***
7.	.54	.45***
13.	.46	.39***
12.	.44	.37**
1.	.44	.37**
2.	.39	.31**
Explained variance (%)	32.69	
Eigenvalue	5.23	
Cronbach Alfa	.85	

**p< .01 ***p< .001

performed again by forcing the scale into a single factor. The single-factor structure explains 32.69% of the variance. The factor loadings of the items, item-total correlations, Cronbach's alpha internal consistency coefficient, variance explained and eigenvalue are presented in Table 2.

Construct Validity: Confirmatory Factor Analysis

Confirmatory factor analysis (CFA) was conducted using the Lisrel 8.51 program to confirm the single-factor structure of the BES obtained as a result of the exploratory factor analysis. The results of the first model tested revealed that 16 items loaded significantly on a single factor (p <.001) and the model showed a good fit to the data. In line with the modification suggestions, the model was reanalyzed by correlating the error variances of items 4 and 5 and items 1 and 6. After each error association, the models were compared with the Chi-square difference test (x^2 difference test). The results of the comparison revealed that the model became more compatible after the error associations. The goodness of fit values for the compared models are given in Table 3, and the factorial model of the scale and the standardized coefficients for the factor-item relationship are given in Figure 1.

Criterion-Related Validity

In order to evaluate the criterion-related validity of the BES, its correlations with the EAT, BSI, and BSCC were examined. The correlation results showed that the correlation coefficients ranging from .32 (p< .01) to .44 (p< .001) with the other scales (See Table 4).

Reliability Findings

In order to assess reliability, Cronbach's alpha internal consistency coefficient, item-total correlations and two-half reliability were calculated. The Cronbach's alpha internal consistency coefficient was calculated as .85, which was consistent with the original scale. Item-total correlations were found to be in the expected direction and between .31 (p< .01) and .66 (p< .001) (See Table 1). The Spearman-Brown two-half reliability correlation coefficient, which was calculated by separating the items into odd and even, was found to be .76 (p< .001).

DISCUSSION

When the above-mentioned findings are evaluated, it can be said that the BES, which consists of 16 items, is a valid and reliable scale. As a result of EFA, it is seen that the items loaded on a single factor with high coefficients. As it is known, the factor loading value is a coefficient that explains the relationship between the items and the factors, and a high factor loading value indicates that the item has a strong relationship with the factor in question. These loadings of .30 and above are considered sufficient (55). As a result of the factor analysis conducted for the BES, the lowest factor loading was .39 (Item 2).

The CFA was conducted on a different sample (Sample II) than the EFA. When the related literature is examined, testing the EFA results with

Table 3. BES Goodness of Fit Values

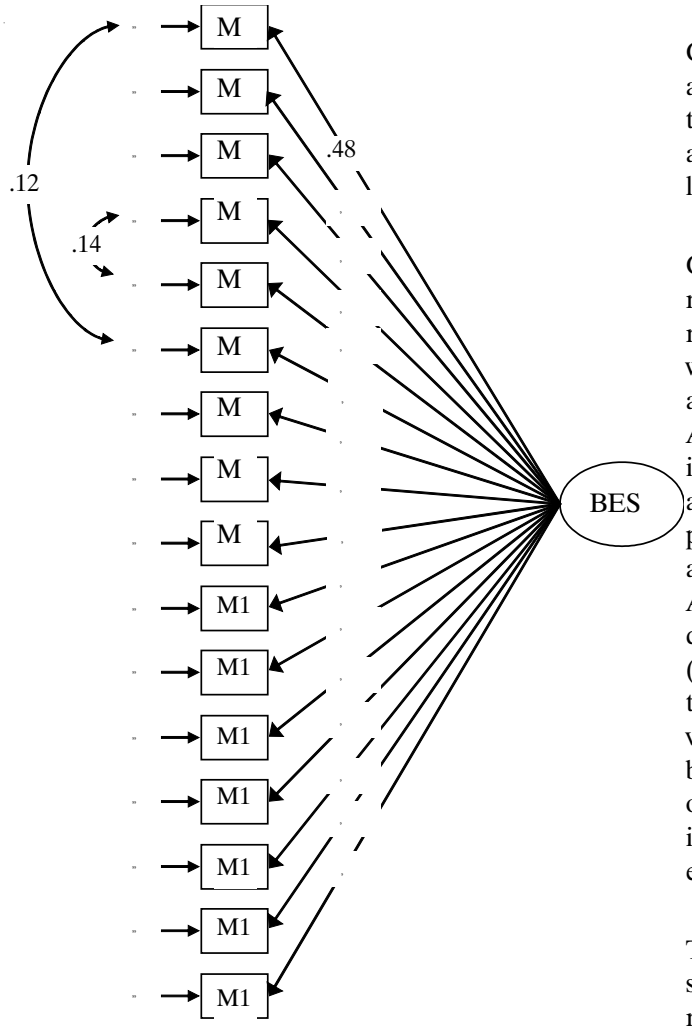
	χ^2/sd	CFI	NFI	GFI	AGFI	RMSEA
First Model	3.54	.95	.93	.95	.93	.054
Latest Model (Two errors are associated)	2.93	.96	.94	.96	.94	.048

Table 4. Correlation coefficients between BES total score and other scales

	2	3	4
1. Binge Eating Scale (BES)	.37**	.32**	.44***
2. Eating Attitude Test(EAT)	-	.19**	.12*
3. Brief Symptom Inventory (BSI)		-	.47***
4. Brief Self-Control Scale (BSCC)			-

* p< .05, ** p< .01, *** p<.001

Figure 1. BES Confirmatory Factor Analysis Results



another sample is a frequently recommended and practiced method (56,57). During CFA, the error variances of the items were correlated in line with the recommendations of the model. While correlating the error variances, correction suggestions were taken into consideration and the correlation was started from the modification index value that would give the biggest change (58).

During CFA, some values are used to test the fit of the data. The most important of these is the ratio of x^2 to degrees of freedom (x^2/sd). A ratio below 3 is considered to be an excellent fit, while a ratio below 5 is considered to be an acceptable fit (59). Other criteria used to evaluate the fit of the data are CFI (Comparative Fit Index), GFI (Goodness of Fit Index), NFI (Normed Fit Index), AGFI (Adjustment Goodness of Fit Index) and RMSEA (Root Mean Square of Approximation). .08 and below for RMSEA (60), .90 and above for NFI and CFI, and .85 and above for GFI (61) are shown as acceptable values. It is noteworthy that especially the x^2/sd ratio is excellent in the present study. In addition, other values are also within acceptable limits.

Correlation analyses conducted to assess criterion-related validity provided evidence for the criterion-related validity of the scale by showing that there were significant relationships between the EAT and other scales in the expected direction. Accordingly, as individuals' binge eating behaviors increase, the deterioration in their eating attitudes and psychological symptoms increase, and their perceived self-control decreases. These findings are consistent with the literature. For example, Alvarenga et al. reported that eating attitudes deteriorated as binge eating behavior increased (62). In addition, there are studies showing that there is a relationship between binge eating behavior and general psychological symptoms (63); binge eating disorder is accompanied by high levels of other psychopathologies (2,64) and binge eating is associa-ted with a decrease in self-control in general (65).

The Cronbach's alpha reliability coefficient of the single factor obtained is .85. In psychological research, .70 and above is generally accepted as a satisfactory value (66). Therefore, it can be said that the scale has a high internal consistency coefficient. The item-total correlation coefficients of the scale are also satisfactory. It is stated that these coefficients should generally be .30 and above (67). As seen in Table 2, the coefficients obtained are above this value. Another method that can be used to determine the reliability of scales is the halving method (68). The correlation coefficient between the two half-tests formed from the single and double items of the scale also provided additional information about the reliability of the scale.

As a result, it can be concluded that the BES is a valid and reliable instrument. The low number of items, ease of scoring and interpretation make the scale practical for studies in clinical psychology and health psychology. In addition, considering the limited number of studies on binge eating in Turkey and the lack of a measurement tool that directly

measures binge eating behavior, it can be said that this scale will fill an important gap in the field.

This study has some limitations. First of all, since the sample was formed with the convenience sampling method, the representativeness of the population is low. In addition, the cross-sectional nature of the study does not allow causal inferences to be made. The fact that the data were collected with self-report scales creates limitations such as giving socially desirable answers, response bias, and misremembering. In particular, the fact that the information about eating behavior is based on self-report suggests that it may create limitations due to situations such as participants' low awareness of the behavior or denial. In addition to all these, the validity results of the BES were determined not on individuals diagnosed with binge eating disorder, but on secondary criteria such as the Eating Attitude Test, Brief Symptom Inventory and Brief Self-Control Scale. This did not allow the development of cut-off scores required for the practical use of the scale. This can be considered as an important limitation of the study.

Correspondence address: Prof., Aysegul Durak Batigun, Department of Psychology, Ankara University, Ankara, Turkey batigun@αnkara.edu.tr

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