Standardization of the Binge Eating Scale among Iranian Obese Population

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Objective: The purpose of this study was to adopt the Binge Eating Scale (BES) among the Iranian obese population .

Methods: BES and a semi-structured interview based on DSM-IV criteria for binge eating disorder were administered among 60 obese subjects aged 20 to 50 years. In order to evaluate test-retest reliability, 30 obese subjects were asked to complete the BES again 9 to 20 days later. In addition, to assess the discriminate validity, 60 normal-weight control subjects were asked to complete the BES. The obese and the normal weight control group were matched for age and sex .

Results: The Persian version of the BES showed a sensitivity of 84.6% and specificity of 80.8% in identification of binge eating disorder. The test-retest reliability and internal consistency of BES were 0.71 and 0.85 respectively. The BES effectively discriminated obese persons from the normal weight subjects.

Conclusion: These findings suggest that the Persian version of BES is a valid instrument for screening binge eating disorder in the Iranian obese population.

Key words: *Binge Eating Disorder, Iran, Obesity, Psychological tests, Psychometrics*

Early clinical observations (1) suggested that there is a distinct subgroup of obese patients who experience recurrent binge eating episodes without inappropriate compensatory behaviors, as seen in bulimia nervosa (BN). This phenomenon is defined as binge eating disorder (BED) in the appendix of the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (2). A number of instruments have been developed for the assessment of BED such as Questionnaire on Eating and Weight Patterns–Revised (3); Eating Disorders Examination (Edition 16.0D) (4); Eating Disorders Examination-Questionnaire (EDE-Q 6.0) (5), and Binge eating scale (6).BES (6) is a self-report measure which has been designed to assess cognitive and behavioral aspects of binge eating problems, specifically among the obese population. This instrument has been used to diagnose binge eaters (7), to assess binge eating severity (8-10), and to evaluate treatment outcomes (7, 11).

Psychometric properties of BES have been the focus of several researches. There is considerable evidence about acceptable internal consistency and test-retest reliability of BES (6, 12, 13). In addition, some studies compared the concordance between BES and other instruments. Greeno et al. (14) compared BES with Eating Disorder Examination (EDE), a semi-structured interview, among treatment-seeking obese women. BES precisely identified 92.9% of non-binge eaters (cutoff value≤17), but identified only 51.8% of binge eaters accurately (cutoff value≥27). However, Celio et al. (15) reported higher agreement between BES and EDE. They found that 85% of patients with BED and 20% of patients without BED are accurately identified by BES (cutoff value≥27). Similarly, a study in Brazil (12) reported a sensitivity of 97.8% and a specificity of 47.7% for the Portuguese version of BES (cutoff value>17). In another study using clinical interview based DSM-IV criteria for BED, the sensitivity and specificity of BES were 84.8% and 74.6% respectively (cutoff value>17) (16). In addition, Timmerman (1999) investigated the correlation between BES scores and binge eating severity from a -28- day food record. BES scores had significant and moderate relationship with binge eating severity (r=.29 to .48, p<.05).

However, there is no evidence about psychometric properties of the Persian version of BES. As a result, the aim of the present study is to assess the reliability

and validity of the Persian version of BES among the Persian obese population.

Materials and Methods
Participants
Participants included 60 (39 female and 21 male) obese persons and 60 (39 female and 21 male) normal-weight subjects selected from the Tehran Lipid and Glucose Study (TLGS). The TLGS is a community-based project carried out on a representative sample (n=15005) of inhabitants in the district 13 of Tehran, Iran to prevent non-communicable diseases (17). This study started in 1999 and will be continued until 2019. Inclusion criteria in the obese participants were as follows: age range of 20 to 50 years, having Body Mass Index of (BMI) ≥30, and at least 9 years of schooling. Exclusion criteria included severe mental disorders or medical problems that affect weight. Inclusion criteria among the normal-weight group were as follows: age range of 20 to 50 years, having normal weight (18.5≤ BMI ≤ 24.99) (18), and at least 9 years of education. In addition, they shouldn't have severe mental disorders or medical problems that affect weight. Excluding participants with mental disorders was conducted according to the TLGS manual. The normal weight group was matched with obese participants by sex and age. The method of matching age was adapted from the Waller study (19). Matching criteria for the two groups were that they had to have the same mean age; and their inter-individual age difference should not have exceeded 5 years. The mean age of obese participants was 39.21 (SD=8.36). The normal-weight group had a mean age of 38.78 (SD=8.62). Age difference was not significant between the two groups (F=0.08, df=1,118), indicating that the matching procedure was successful.

The mean BMI of the obese subjects was 34.53 (SD=4.36; rang=30.02 to 54.94). The mean BMI of the normal weight participants was 22.30 (SD=1.52; rang=19.14 to 24.80). Table 1 demonstrates the participants' demographic information. No significant difference was observed between the two groups in marriage status (χ^2=1.76, df=1, P=0.19), level of education (χ^2=3.76, df=2, P=0.15) and occupational status (χ^2=2.77, df=2, P=0.25).

Measurements
Semi-Structured clinical Interview: For this study, a semi-structured clinical interview was developed to diagnose BED according to DSM-IV criteria for binge eating disorder (2). The Content validity of the interview was established by two clinical psychologists with considerable experience on eating disorders. The interview is available on request through the second author.

Binge Eating Scale: The BES (6) was developed to identify binge eaters among the obese population. It consists of 16 items; each including three or four statements. Subjects are asked to select the statement which describes them best. The total score of BES can vary form o to 46. According to BES scores, patients are classified into three categories: 1) patients who score 17 and less are defined as "non-binge eaters"; 2) those who score 18 to 26 are "moderate binge eaters" ;3) those who score 27 or more are considered as "severe binge eaters" (6, 20).

Demographic Information: Demographic information was collected through the researcher designed questionnaire covering gender, age, marital and socioeconomic status and level of education.

Procedure
The BES was translated into Persian. Then, the Persian version was back translated into English by an independent translator and a psychiatrist. After that, the Persian and English versions of BES were given to two clinical psychologists whose knowledge of English was fine. They found that the translated version is consistent with the original version. This version was then given to two clinical psychologists and a nutritionist for assessing content validity. After that, the Persian version of BES was given to 10 obese students and employees of Shaheed Beheshti University of medical sciences to detect vague statements. No statement was changed. To select samples, 60 obese and 60 normal-weight subjects were recruited from the TLGS study. The height and weight of the participants were measured by a trained health worker in the TLGS center. Then, obese subjects completed the BES and demographic questionnaire and were interviewed by the second author (with two years experience in assessment and treatment of eating disorders) who was blind to the BES results. To determine test- retest reliability, thirty obese subjects were asked to complete the BES again 9 to 20 days later. The normal-weight participants answered the BES and demographic questionnaire. The study procedure was approved by ethics committee of TLGS, and all the subjects signed a written consent form. Each of the participants received a gift (such as book or table clock).

Data Analysis
Sensitivity and specificity were calculated in order to evaluate concurrent validity of the Persian version of BES. The Receiver Operator Characteristic curve (ROC curve) was used to illustrate the performance of BES. To measure internal consistency and test–retest reliability of the Persian version of BES, Cronbach's alpha coefficient and correlation coefficient were used respectively. Discriminant validity of BES was determined using one way ANOVA.

Results
Concurrent validity
Clinical interview diagnosed 21.7% (n=13) of the obese participants as having binge eating disorder. In comparison, the Persian version of BES identified 33.3% of the obese sample as binge eaters. Using the semi-structured clinical interview as a gold standard,

Table 1. demographic characteristics of obese and normal weight groups

	Obese group (n=60)		Normal weight group (n=60)		Total (n=120)	
	n	%	n	%	n	%
Marital status						
Married	50	83.3	44	73.3	94	78.3
single	10	16.7	16	26.7	26	21.7
Level of education						
High school	16	26.7	12	20	28	23.3
Diploma	29	48.3	23	38.3	52	43.3
Bachelor or above	15	25	25	41.7	40	33.3
Work status						
Housewife	31	51.7	22	36.7	53	44.2
Employed	19	31.7	24	40	43	35.8
Self employed	10	16.7	14	23.3	24	20

Figure1. ROC curve, accuracy of BES as screening tool for binge eating disorder

Table 2. Sensitivity and Specificity of BES(n=60)

Interview diagnosis	BES scores		Total
	>17	≤17	
BED	11 Sensitivity= %84.6	2	13
Non-BED	9	38 specificity=%80.8	47
Total	20	40	60

BED= Binge Eating Disorder; BES= Binge Eating Scale

Table 3. Binge Eating Scale scores of obese and normal weight subjects

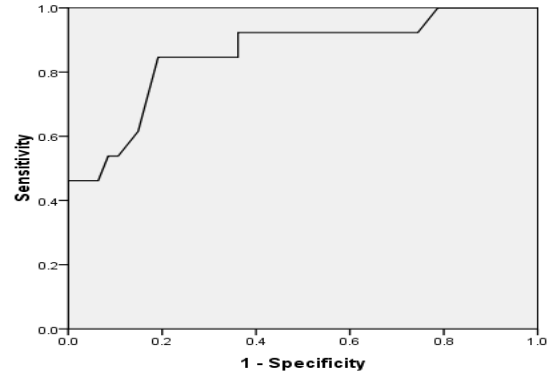|	Obese group(n=60)		Normal weight group(n=60)		ANOVA	
	Mean	SD	Mean	SD	F	P
BES Score	13.88	8.78	4.90	4.19	29.65	0.0001

BES= Binge Eating Scale

the BES showed sensitivity value of 84.6% and specificity value of 80.8% in identifying individuals with binge eating disorder (cutoff value>17) (Table 2). ROC curve demonstrates an association between sensitivity and specificity. The area under the curve is 0.85 (Figure 1). Discriminant validity Table 3 shows means and standard deviation of the obese and normal weight groups on the BES. One way ANOVA showed that the obese group obtained significantly higher scores than the normal weight control subjects in BES.

Reliability
Cronbach's alpha coefficient of BES was 0.85. Thirty subjects participated in test- retest reliability study. The correlation between the two administrations of BES was 0.71.

Discussion
This is the first study which evaluates validity and reliability of the Persian version of BES in the Iranian obese population. The BES showed acceptable reliability and considerable sensitivity (84.8%) and specificity (80.8%). BES, also, effectively distinguished the obese participants from the normal weight subjects. These results suggest that the Persian version of BES is a sensitive instrument for screening binge eating among the non treatment-seeking obese population.

Our findings are consistent, to some degree, with results of the previous studies. Ricca et al, (2000) reported a sensitivity of 84.8% and a specificity of 74.6% for BES in Italian obese patients. Freitas, et al (2006) and celio, et al (2004) reported approximately similar sensitivity (85% and 97.8%), but significantly lower rate of specificity (20% and 47.7%) for BES in comparison to the present study and the research carried out by Ricca et al. (2000). These discrepancies may be due to using different samples (treatment seeking obese patients versus non treatment seeking obese persons). In addition, the cutoff value used by Celio et al (2004) was more conservative (BES≥27).
Internal consistency of the Persian version of BES was equivalent to the original scale (6) and very similar to its Portuguese version (12). Test-retest reliability of the Persian version of BES also indicated acceptable temporal stability in 9 to 20 days interval.
These findings should be interpreted as strengths and limitations of the study. One of the strengths of this study was recruiting male participants. Therefore, the findings can be generalized to Iranian non-treatment seeking obese men. Another strength of the study was matching normal weight and obese participants by age and sex. However, since our participants were recruited from the non-treatment seeking obese population, these results may not be generalized to treatment seeking obese patients. Since most of the subjects had at least 12 years of education, the generalizability of the

findings to less-educated non-treatment seeking obese individuals may be limited.

With respect to sensitivity and specificity of BES, findings of our study was similar to those conducted on obese population with different cultural background. This could imply that there may be a series of similar patterns and symptoms presented by samples of all the cited studies. This in turn necessitates developing a similar therapeutic approach for the treatment of binge eating disorder among the obese population with different cultures.

Acknowledgment

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