

Validation and Factor Structure of the Greek Version of the Emotional Eating Scale in a Sample of Patients with Binge Eating Disorder

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How to cite this paper: Karapatsia, M., Tzavara, Ch., Michopoulos, I., & Gonidakis, F. (2024). Validation and Factor Structure of the Greek Version of the Emotional Eating Scale in a Sample of Patients with Binge Eating Disorder. *Psychology*, 15, 1627-1639. <https://doi.org/10.4236/psych.2024.1510095>

Received: September 14, 2024

Accepted: October 28, 2024

Published: October 31, 2024

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Abstract

Background: Emotional eating has significant physical, psychological, and social consequences and it is highly associated with eating disorders. **Objectives:** The current study aimed to adapt and validate the Emotional Eating Scale (EES) in Greek and examine its factor structure and correlations with eating psychopathology and anthropometric measures. **Methods:** A sample of 160 participants (90% females) suffering from Binge Eating Disorder (BED), with a mean age of 40.7 years (SD = 11.5 years) and mean Body Mass Index of 37.5 kg/m² (SD = 14.8 kg/m²) completed the EES and the Eating Disorder Examination Questionnaire 6.0 (EDE-Q). A confirmatory factor analysis (CFA) was conducted to test how well the EES three-factor model fits the data. **Results:** The three-factor solution had an acceptable fit: anger/frustration, anxiety, and depression (Cronbach's alpha = 0.81, 0.83, 0.70, respectively). All EES subscales were significantly and positively correlated with eating concern, shape concern, and weight concern, as well as with the global scoring of EDE-Q. The correlation between EES and BMI was positively significant. Age was significantly and negatively associated only with depression subscale. **Conclusions:** The results showed that the Greek adaptation of the EES is a reliable measure of emotional eating in people suffering from BED.

Keywords

Emotional Eating Scale, Validation, Binge Eating Disorder, Eating Psychopathology

1. Introduction

Emotional eating is eating in reaction to an emotion. Emotional eating has drawn

particular interest because it frequently results in binge eating episodes and consumption of high-calorie, high-fat food (Oliver et al., 2000; APA, 2013). There is a link between these behaviors and a higher risk of obesity, as well as significant health issues such as eating disorders (EDs), diabetes, heart disease, and hypertension (van Strien et al., 2012; McCuen-Wurst et al., 2018). It is a well-known fact that emotions influence human behavior and decision-making (Peters et al., 2006). Several studies show that a person's emotional state can affect their food intake (Geliebter & Aversa, 2003) and that unpleasant feelings such as sadness, anxiety, loneliness, and anger frequently precede emotional eating (Bydlowski et al., 2005; Corstorphine et al., 2007; Svaldi et al., 2012). Studies show that negative mood is more linked to binge episodes than exposure to palatable food and calorie restriction (Cardi et al., 2015). According to research, obese individuals who binge eat report urges to eat when they are experiencing negative emotions (Chua et al., 2004).

It is argued that emotional eating is a learned behavior. Emotions can become addictive stimuli and trigger eating behaviors (Bongers & Jansen, 2017). Eating after a negative emotion seems to function to reduce emotional tension or as an attempt to detach, relieve, or change the emotion (Spoor et al., 2007; Safer et al., 2009; Gianini et al., 2013; Havermans et al., 2015). Emotion regulation seems to play an essential role in maintaining emotional eating and eating psychopathology in obese individuals who suffer from BED (Gianini et al., 2013; Fernandes et al., 2018).

Emotional eating scales have been developed to measure a person's urge to eat when they experience specific emotions (Masheb & Grilo, 2006; Garaulet et al., 2012; Cassioli et al., 2022). These scales have been used to assess therapeutic progress related to obesity and EDs (Safer & Jo, 2010; Garaulet et al., 2012). The self-administered questionnaire, Emotional Eating Scale (EES), is one of the tools used to measure emotional eating. EES, developed by Arnow et al. (1995), examines the relationship between negative emotions and disordered eating in people with obesity and binge eating. EES has been successfully translated into various languages and used in studies with adult populations with or without EDs (Duarte & Pinto-Gouveia, 2015; Rahme et al., 2021). It has also been adapted for use with children and adolescents (Tanofsky-Kraff et al., 2007). There are also adaptations of the EES focusing on a specific emotion (Koball et al., 2012) or adaptations of the scale adding positive emotions (Zhu et al., 2013).

Arnow et al. (1995) proposed a three-factor solution: anger/frustration, anxiety, and depression. Different studies reported different factors. In the Lebanese validation study of EES in a sample of adults, four factors were identified: sadness and irritability, exhaustion, excitement, and distress. Also, body dissatisfaction was positively correlated with emotional eating and self-esteem (Rahme et al., 2021). The Portuguese study of EES in a sample of female college students and women from the general population presented a three-factor structure: depression, anxiety, and anger (Duarte & Pinto-Gouveia, 2015). Four factors were identified in the

Goldbacher et al. (2012) study, which looked at the factor structure of the EES and its correlations with anthropometric characteristics in individuals who were overweight or obese: somatic arousal, depression, anger, and anxiety.

The emotional Eating Scale has not been validated in Greek and its psychometric properties have not been assessed in the BED population.

The purpose of the present study was to assess the validity of the Greek version of the EES (**Appendix**) and test its factor structure and correlations with eating psychopathology and anthropometric measures, specifically BMI and age, in a sample of adults suffering from BED.

2. Method

2.1. Participants

The study included 160 adult individuals diagnosed with BED. All participants sought treatment at the EDs Unit of the 1st Psychiatric Clinic, National and Kapodistrian University of Athens (NKUA), Eginition Hospital, and at the daycare Center for EDs “ANASA.” The majority of individuals who seek treatment for EDs are women. Exclusion criteria from the study were a Body Mass Index (BMI) below 18.5, active suicidal thoughts or psychosis, current substance or alcohol abuse, and lack of adequate knowledge of the Greek language (read and write).

2.2. Measures

2.2.1. The Emotional Eating Scale

The Emotional Eating Scale (EES) (Arnow et al., 1995) consists of 25 negative emotions, and individuals rate the urge to eat on a 5-point Likert scale after experiencing a particular emotion: 1 = no urge to 5 = very intense urge. A higher score indicates a significant reliance on food to regulate emotions. Arnow et al. (1995) in their original version of the EES in a sample of obese women undergoing treatment for binge eating identified three factors: anger/frustration, anxiety, and depression. The scale presented good psychometric properties, and all three subscales were related to measures of binge eating (Arnow et al., 1995).

2.2.2. The Eating Disorder Examination Questionnaire

The Eating Disorder Examination Questionnaire 6.0 (EDE-Q) (Fairburn & Beglin, 1994). EDE-Q was utilized to evaluate general psychopathology related to eating disorders. This questionnaire comprises 28 questions concerning eating behaviors over the past 28 days. Twenty-two questions focus on eating psychopathology and six questions focus on the frequency of maladaptive eating behaviors. These questions are categorized into four subscales: restrained eating, eating concern, shape concern, and weight concern. EDE-Q was employed to examine the correlation between EES and eating psychopathology. EDE-Q has been validated and used in Greek (Pliatskidou et al., 2015).

2.2.3. A Demographic Questionnaire

Furthermore, a demographic questionnaire was employed to gather data, encompassing

assing information such as age, gender, socioeconomic background, family situation, educational level, onset of binge eating behavior, health conditions, medication use, and any history of suicidal thoughts or attempts. The BMI was calculated using the individual's weight and height measurements.

2.3. Procedure

Professor Arnou granted permission to translate EES into Greek and test its validity and factor structure. Two proficient translators, fluent in Greek and English, independently translated the EES questionnaire into Greek using a sequence involving forward-backward-forward procedures, following the guidelines set by the World Health Organization for translating and adapting instruments (WHO, 2020). The initial phase involved administering the questionnaire as a pilot study to 10 participants to identify and correct any misunderstandings or difficulties that arose.

Participants received written and oral explanations that detailed the study objectives, anonymity, data protection measures, and the right to withdraw from the study at any point, under the principles of the Helsinki Declaration. Participants were given written and verbal explanations outlining study objectives, anonymity and data protection measures, and the right to withdraw from the study at any time following the principles of the Helsinki Declaration.

3. Ethical Approval

Ethical approval for the research was granted by the Bioethics Committee of the Medical School, National and Kapodistrian University of Athens (NKUA), Greece (approval number 5993/5.62018). The study was conducted under the Declaration of Helsinki.

4. Statistical Analysis

Quantitative variables were expressed as mean values (Standard Deviation) and median (Interquartile Range), while qualitative variables were expressed as absolute and relative frequencies. Confirmatory factor analysis (CFA), with a maximum likelihood estimation method, was conducted to test how well the EES three-factor model fits the data. We used the chi-square by degrees of freedom ratio (χ^2/df), the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR) as goodness-of-fit indices (Mueller, 1996), and these parameters were considered adequate when $CFI \geq 0.90$, $TLI \geq 0.90$, $RMSEA \leq 0.05$ and $SRMR < 0.08$ (Bentler, 1992; Nunnally & Bernstein, 1994; Greenspoon & Saklofske, 1998; Hu & Bentler, 1999). Internal consistency reliability was determined by the calculation of Cronbach's alpha and McDonald's omega coefficients (Malkewitz et al., 2022). Scales with reliabilities equal to or greater than 0.70 were considered acceptable. We tested the extent to which the EES scale was correlated with the EDE-Q scale via Pearson's correlation coefficient. All reported p values

are two-tailed. Statistical significance was set at $p < 0.05$, and analyses were conducted using SPSS statistical software (version 26.0).

5. Results

5.1. Participants Characteristics

The sample consisted of 160 adult participants, with 90% being females, as the majority of individuals seeking therapy at the ED units were women. The mean age of 40.7 years (SD = 11.5 years) and the mean BMI of 37.5 kg/m² (SD = 14.8 kg/m²). Their characteristics are presented in **Table 1**.

Table 1. Sample characteristics.

	N (%)
Gender	
Females	144 (90.0)
Males	16 (10.0)
Age, mean (SD)	40.7 (11.5)
Occupation	
Full time employed	99 (61.9)
Part-time employed	13 (8.1)
Unemployed	28 (17.5)
Student	13 (8.1)
Other	7 (4.4)
Family status	
Unmarried	83 (51.9)
Married	48 (30.0)
Divorced/Widowed	15 (9.4)
Living with partner	14 (8.8)
Educational status	
Middle school graduate	2 (1.3)
High school graduate	46 (28.8)
University alumni	39 (24.4)
Technical university alumni	18 (11.3)
Post-graduate degree	38 (23.8)
Other	17 (10.6)
Ever visited a specialist for mental issues	131 (81.9)
Age of eating disorder onset, mean (SD)	19.7 (11.5)
Greater weight ever, mean (SD)	112.9 (29)
Lowest weight ever, mean (SD)	66 (14.8)
Current BMI, mean (SD)	37.5 (9.2)

Continued

Current BMI	
Normal	11 (6.9)
Overweight	21 (13.1)
Obese	128 (80.0)
Have you ever been hospitalized for serious adverse events of your eating disorder	5 (3.1)
Under treatment (now or in the past)	104 (65)
Ever had an attempt of suicide	20 (12.5)
Suicidal thoughts	11 (6.9)
Substance/Alcohol abuse	6 (3.8)
Sexual abuse	5 (3.1)
Physical abuse	10 (6.3)
Restraint (EDE-Q), mean (SD)	2.15 (1.54)
Eating concern (EDE-Q), mean (SD)	3.1 (1.44)
Shape concern (EDE-Q), mean (SD)	4.38 (1.18)
Weight concern (EDE-Q), mean (SD)	4.09 (1.24)
Global scoring (EDE-Q), mean (SD)	3.43 (1)

5.2. Construct Validity and Internal Consistency Reliability of the Greek EES

Confirmatory factor analysis (CFA) was conducted to check the three-factor solution of the original EES scale, and it was found that this solution had an acceptable model fit (RMSEA = 0.04; CFI = 0.96; TLI = 0.92 and SRMR = 0.067). The reliability of each factor is presented in **Table 2**. Cronbach's alpha for the Anger/frustration factor was 0.81, for Anxiety 0.83, and for the Depression factor was 0.70, indicating acceptable reliability. Also, McDonald's omega coefficients were estimated and were equal to 0.80 for the Anger/frustration factor, 0.84 for Anxiety and 0.71 for the Depression factor. All factors were significantly correlated with each other. Moreover, when an item of a factor was removed, a trivial change was made in its alpha; thus, no item needed to be removed.

Table 2. Item-total correlations and Cronbach's α of EES items.

Factor	Item	Corrected Item Total Correlation	Cronbach's Alpha If Item Deleted	Cronbach's Alpha
Anger frustration	Resentful	0.45	0.79	0.81
	Discouraged	0.55	0.78	
	Inadequate	0.54	0.78	
	Rebellious	0.28	0.81	
	Irritated	0.51	0.78	
	Jealous	0.42	0.79	

Continued

	Frustrated	0.46	0.79	
	Furious	0.51	0.78	
Anger frustration	Angry	0.54	0.78	0.81
	Guilty	0.50	0.79	
	Helpless	0.35	0.80	
	Shaky	0.31	0.84	
	Excited	0.18	0.85	
	Jittery	0.53	0.81	
	Uneasy	0.65	0.80	
Anxiety	Worried	0.69	0.79	0.83
	On edge	0.67	0.79	
	Confused	0.45	0.82	
	Nervous	0.67	0.80	
	Upset	0.66	0.80	
	Worn out	0.32	0.70	
	Blue	0.58	0.59	
Depression	Sad	0.45	0.64	0.70
	Lonely	0.52	0.61	
	Bored	0.41	0.66	

Descriptions of each factor and the correlation coefficients between them are presented in **Table 3**. All factors were significantly correlated with each other. More significant anger/frustration was associated with more significant anxiety and depression. Moreover, greater anxiety was associated with more significant depression.

Table 3. Descriptive statistics for EES factors and their intercorrelations.

		Pearson's r Coefficients					
		Minimum	Maximum	Mean (SD)	1	2	3
1	Anger frustration (EES)	5.00	44.00	26.64 (8.51)	1.00	0.63***	0.62***
2	Anxiety (EES)	1.00	36.00	19.21 (7.71)		1.00	0.53***
3	Depression (EES)	0.00	20.00	13.92 (4.11)			1.00

EES Emotional Eating Scale, * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

5.3. Correlation between EES and EDE-Q

All EES subscales were significantly and positively correlated with eating concern, shape concern, weight concern, and the global scoring of EDE-Q. No significant correlation was found between EES and the EDE-Q Greek version of the Restraint

subscale. Pearson's coefficients between EES and EDE-Q factors are presented in **Table 4**.

Table 4. Pearson's coefficients between EES and EDE-Q factors.

		Anger Frustration (EES)	Anxiety (EES)	Depression (EES)
Restraint (EDE-Q)	r	-0.09	-0.01	-0.07
	P	0.254	0.921	0.355
Eating Concern (EDE-Q)	r	0.32	0.20	0.21
	P	<0.001	0.013	0.007
Shape Concern (EDE-Q)	r	0.38	0.29	0.41
	P	<0.001	<0.001	<0.001
Weight Concern (EDE-Q)	r	0.36	0.28	0.39
	P	<0.001	<0.001	<0.001
Global Scoring (EDE-Q)	r	0.30	0.24	0.29
	P	<0.001	0.002	<0.001

EES Emotional Eating Scale, EDE-Q Eating Disorder Examination.

5.4. Correlation between EES and Anthropometric Measures

BMI was significantly and positively associated with Anger-frustration ($r = 0.25$; $p = 0.001$), Anxiety ($r = 0.23$; $p = 0.003$), and depression scores ($r = 0.26$; $p = 0.001$). Thus, greater BMI was significantly associated with greater Anger-frustration, Anxiety, and depression scores. It was also found that age was significantly and negatively associated only with depression score ($r = -0.23$; $p = 0.003$), indicating that older age was associated with lower depression score, while no significant association was found with Anger-frustration ($r = -0.15$; $p = 0.066$) and Anxiety scores ($r = -0.10$; $p = 0.195$).

6. Discussion

This study is the first to validate the Greek version of the EES scale and test its factor structure in a sample of adults seeking therapy for BED. Emotional eating is associated with binge eating episodes and increases the intake of high-fat food, which can result in weight gain and health problems (Ricca et al., 2009; Koenders & van Strien, 2011; Péneau et al., 2013). Among our 160 participants seeking therapy for BED, 80% were obese, and 13.1% were overweight. In our sample, 4.5% had been hospitalized for severe adverse events related to their eating disorder. Most of the sample (80.2%) had visited a specialist for mental health issues in the past, 12.6% had attempted suicide, and 6.3% had suicidal thoughts in the past but had never attempted suicide. In their study, Grilo et al. (2009) found that 73.8% of treatment-seeking patients with BED had at least one psychiatric disorder in the past, and 43.1% had at least one psychiatric disorder at the time of seeking therapy.

The purpose of our study was first to assess the validity of the Greek version of the EES in a sample of adults suffering from BED. The three-factor solution proposed by [Arnou et al. \(1995\)](#) was found to have an acceptable model fit: anger/frustration, anxiety, and depression. There were no significant correlations between EES scores and anthropometric measures. Different studies of EES' s factor structure reported different factors ([Goldbacher et al., 2012](#); [Duarte & Pinto-Gouveia, 2015](#); [Rahme et al., 2021](#)). Given that culture impacts how people perceive and use their emotions, we might speculate that the study variations can be attributed to cultural and linguistic differences. Additionally, different populations and recruitment techniques were employed in the studies. Therefore, it is important to validate tools like EES in the language of the target group to develop effective therapies for EDs.

The study's second aim was to examine the correlation between EES and eating psychopathology. All three EES subscales were significantly and positively correlated with eating concern, shape concern, weight concern, and the global EDE-Q scoring. There was no significant correlation between the EES and Restraint subscale. Emotion regulation difficulties are an important factor in eating psychopathology. It is important to teach individuals emotion regulation skills to decrease disordered eating behaviors, such as binge eating ([Safer et al., 2009](#)).

The study's third objective was to analyze the relationship between EES and anthropometric characteristics, specifically age and BMI. It was found that age was significantly and negatively associated only with depression subscale. Unlike the findings of [Goldbacher et al. \(2012\)](#), who reported no significant connections between the EES scores and BMI, our research also found that BMI showed a significant and positive correlation with all EES subscales.

7. Limitations

The study's limitations were the lack of test-retest reliability assessment and the low percentage of male participants. The study sample mostly consisted of women (90%), because the majority of individuals seeking treatment for BED in Greek EDs units are women. Thus, the findings can mainly be applied to adult females diagnosed with BED. Also, using a self-administered questionnaire may lead to information bias.

Nonetheless, this study presents data showing that the Greek version of the EES can be a reliable tool used in clinical practice and research with Greek-speaking individuals who suffer from BED. Future studies should be conducted on different populations to validate the broader applicability of the Greek EES.

8. Conclusion

The current study presents data indicating that the Greek version of the EES can be a reliable tool for assessing emotional eating in Greek-speaking individuals with BED in clinical practice and research. Also, the study's results add to the existing literature on the link between emotional eating and eating disorders, as well as the association between emotional eating and BMI.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendix

Ελληνική Εκδοχή της Κλίμακας Συναισθηματικού Φαγητού

Καραπατσία, Μ., Τζαβάρα, Χ., Μιχόπουλος, Γ., Γονιδάκης, Φρ., 2024

Όλοι αντιδρούμε στα διάφορα συναισθήματα με διαφορετικό τρόπο. Κάποια είδη συναισθημάτων προκαλούν στους ανθρώπους μια έντονη ορμή να φάνε. Παρακαλώ σημειώστε σε ποιο βαθμό η καθεμία από τις παρακάτω συναισθηματικές καταστάσεις σας προκαλούν μια έντονη ορμή να φάτε τσεκάροντας το αντίστοιχο κουτάκι.

	Καμία ορμή να φάω	Μικρή ορμή να φάω	Μέτρια ορμή να φάω	Έντονη ορμή να φάω	Πολύ έντονη ορμή να φάω
Πικρία					
Αποθάρρυνση					
Αδυναμία					
Εξάντληση					
Ανεπάρκεια					
Ενθουσιασμός					
Επαναστατικότητα					
Κατήφεια					
Νευρικότητα					
Θλίψη					
Ταραχή					
Ευερεθιστότητα					
Ζήλια					
Ανησυχία					
Απογοήτευση					
Μοναξιά					
Οργή					
Αγωνία					
Σάστισμα					
Αναταραχή					
Θυμός					
Ενοχή					
Βαρεμάρα					
Αβοηθητικότητα					
Αναστάτωση					