Research Article

Greek Validation of Emotional Eating Scale for Children and Adolescents

Despina S Kalogiratou[1], Flora Bacopoulou[2], Christina Kanaka-Gantenbein[1,2], Dimitrios Vlachakis[3], Orsalia Gerakini[1], George P Chrousos[1,2] and Christina Darviri[1]

[1]Postgraduate Course Stress Management and Health Promotion, Medical School, National and Kapodistrian University of Athens, 4 Soranou Ephessiou Str., 11527, Athens, Greece
[2]First Department of Pediatrics, Medical School, National and Kapodistrian University of Athens, Aghia Sophia Children's Hospital, National and Kapodistrian University of Athens, 1 Thivon Str., 11527, Athens, Greece
[3]Genetics and Computational Biology Group, Laboratory of Genetics, Department of Biotechnology, Agricultural University of Athens, 75 Iera Odos, 11855, Athens, Greece

Correspondence should be addressed to Christina Darviri; Tel: +30 2106597644 ; Fax: +30 2106597644, Email: cdarviri@yahoo.com

Abstract

Aim: In this study, we focused on the Greek validation of the Emotional Eating Scale for Children and Adolescents (EES-C). **Methods:** Our sample consisted of 150 students in primary and secondary school settings from two different areas of Greece. Child Depression Inventory (CDI) and State and Trait Anxiety in Children (STAIC) were also used for validation purposes.

Results: The principal component factor analysis for construct validity generated three subscales: eating in response to anger/anxiety, feeling unsettled and depression. The EES-C tool was found with high internal reliability (Cronbach's Alpha 0.917). **Conclusions:** EES-C is a valid and reliable instrument to detect the emotional eating in children and adolescents in Greece.

Introduction

Emotional state can affect food intake (Geliebter & Aversa 2003). Emotional eating is precipitated by negative emotions such as anger, depression, boredom, anxiety, loneliness and often bears an episodic relationship to stressful periods of life (Ganley 1989). In an attempt to decrease these negative emotions, overeating temporarily provides comfort and distraction (Spoor *et al.* 2007). Eating in response to negative emotions in children and adolescents is a topic of increasing concern amongst healthcare professionals. It has been associated with a strong preference for high energy dense foods (Nguyen-Michel *et al.* 2007), binge eating (Stice *et al.* 2002), negative feelings of physical incompetence and various other problematic behaviors (Braet & Van Strien 1997). Considering that emotional eating could lead to obesity and is related to psychopathology (Lindeman & Stark 2001), it is crucial to understand the establishment of disordered eating in children and adolescents.

In an attempt to examine in detail the relationship between negative mood states and disordered eating, Arnow *et al.* (1995) designed the Emotional Eating Scale (EES) in obese adults with binge eating disorder. The EES is a 25-item self-report measure in which respondents rate their desire to eat in response to emotions on a 5-point scale (no desire, small desire, moderate desire, strong urge, and overwhelming urge to eat). This tool generates three subscales based upon the average of items reflecting the urge to eat in response to anger/frustration, anxiety, and depression. In 2007, Tanofsky-Kraff *et al.* adapted the instrument to be used for children and adolescents (EES-C) to examine the effects of feelings on eating attitudes in children and adolescents aged 8-17 years old. In developing the EES-C, various modifications to the vocabulary were undertaken in order to facilitate understanding in children, as well as the addition of the word "happy" to the original list of emotions, and a column incorporated to determine the number of days per week correlating to the various emotional eating attitudes. In this study EES-C demonstrated good convergent validity and temporal stability. However, it generated three subscales (i.e. depression, anger/anxiety/frustration, and feeling unsettled) that differed from the original adult version. A plausible explanation could be that children lack the ability to distinguish between eating in response to negative

Table 1. Rotated factor loadings of the principal components analysis (N = 139).

Items	Depression	Feeling Unsettled	Anger/ Anxiety
Resentful			0.507
Discouraged		0.512	
Shaky		0.632	
Worn Out		0.550	
Not doing enough		0.486	
Excited		0.784	
Disobedient		0.602	
Down	0.503		
Stressed out	0.558		
Sad	0.697		
Uneasy	0.561		
Irritated			0.623
Jealous		0.456	
Worried	0.644		
Frustrated	0.563		
Lonely	0.546		
Furious			0.578
On edge			0.367
Confused		0.560	
Nervous			0.627
Angry			0.741
Guilty	0.581		
Bored			0.602
Helpless	0.587		
Upset	0.649		
Happy		0.759	
Explained variance (%)	33.1	8.3	6.1
Eigenvalues	8.614	2.180	1.602

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

emotions and without. EES-C has been validated in a Spanish sample of children aged 9 to 16 years by Perpina *et al.* (2011). In this validation study the analysis of confirmatory factors revealed five scales: eating in response to anger, anxiety, restlessness, helplessness, and depression. EES-C has also been found to be reliable and valid in the Turkish pediatric population aged 10 to 18 years old (Bektas *et al.* 2016).

In comparison to the studies mentioned above, there are other tools that do not differentiate between various types of emotional eating. Dutch Eating Behavior Questionnaire (DEBQ) measures the restrained, emotional, and external eating behavior with high internal consistency and factorial validity in adults (Strien *et al.* 1986). The child adaptation of DEBQ includes 20 items with 3 possible answers (1 = "no", 2 = "sometimes", 3 = "yes"). Emotional eating subscale includes 7 items, restrained eating subscale includes 7 items and external eating subscale includes 6 items. This tool was found to be a useful measure for young children's emerging dietary restraint and overeating tendencies from age 7 (van Strien & Oosterveld 2008). Children's Eating Behaviour Questionnaire (CEBQ) is another parent-rated 35-item instrument, which assesses eight aspects of eating style in children with a good internal consistency and reasonable reliability. It includes responsiveness to food, enjoyment of food, satiety responsiveness, slowness in eating, fussiness, emotional overeating, emotional undereating and desire for drinks (Wardle *et al.* 2001). In conclusion DEBQ and CEBQ do not allow us to differentiate between various types of emotions, unlike the EES-C.

Pertinent studies in Greece are scarce (Bacopoulou *et al.* 2018, Costarelli *et al.* 2011, Yannakoulia *et al.* 2004) and a questionnaire that can measure eating in response to emotions in children has not yet been developed in the population. Such an instrument, would allow pooling of data and comparing with other relevant studies, and most importantly, would facilitate the prevention and management of emotional eating and its repercussions in the Greek population. Hence, the aim of this study was to validate EES-C in Greece.

Materials and Methods

Study Design
This is a validation study exploring the psychometric properties of the EES-C in a sample of Greek students. The study protocol was designed by the Postgraduate Course Stress Management and Health Promotion, School of Medicine, University of Athens. Permission was obtained via email from Tanofsky-Kraff et al., who developed the EES-C in 2007 (Tanofsky-Kraff *et al.* 2007).

Participants
We selected five primary/secondary schools in Attica Province and the island of Kefalonia. The study was carried out between January and April 2018. Students should be 8-15 years old, able to read. Written consent forms were obtained from their parents before inclusion in the study. The purpose of the study was explained to the students and their parents and the questionnaires were anonymous. In total, a sample of 150 students aged from 9 to 14 years old participated

Table 2. Descriptive characteristics of the three subscales of EES-C.

	Mean	Median	SD	Min	Max
Depression	21	20	8.47	10	50
Feeling Unsettled	21	21	7.93	9	45
Anger/ Anxiety	15.9	15	6.41	7	35

EES-C: Emotional Eating Scale for Children and Adolescents
SD: Standard Deviation

in our study.

Procedure

The original English version of EES-C was translated in Greek and then re-translated back into English by two experienced bilingual translators. Next, the final questionnaire was discussed with a third, independent translator in order to evaluate the accuracy of the translation. The questionnaire was then administered to a pilot sample of 10 children, to determine clarity and difficulties in completion. The measurements took place during their normal school day. The average completion time was 25 minutes.

Measure

Demographic data: Gender and age were recorded. Body weight was also measured to the nearest 0.1 kg with the use of a calibrated digital scale and with participants standing, without shoes, in the minimum clothing possible. Height was measured using a stadiometer to the nearest 1 cm with participants standing without shoes, maintaining a relaxed posture. Body Mass Index (BMI) was estimated by dividing weight in kilograms by the height in meters squared (Nuttall 2015).

Emotional Eating Scale Adapted for Use in Children and Adolescents (EES-C): EES-C is a 26-item self-report measure used to assess the urge to cope with negative affect by eating. As mentioned above it generates three subscales: depression, anger/anxiety/frustration, and feeling unsettled. Respondents rate their desire to eat in response to each emotion on a 5-point scale (no desire, small desire, moderate desire, strong urge, and overwhelming urge to eat). Higher scores indicate a greater reported desire to eat in response to negative mood states. It yields very good internal consistency (Cronbach's Alphas: from 0.83 to 0.95) and demonstrates good convergent and discriminant validity in children and adolescents aged 8-17 years old (Tanofsky-Kraff *et al.* 2007).

Child Depression Inventory (CDI): CDI is a 27-item measure used to evaluate depressive symptoms in children. In each item the child has three possible answers: 0 indicating an absence of symptoms, 1

indicating mild symptoms, and 2 definite symptoms. The total score can range from 0 to 54 (Kovacs 1985). CDI has been validated in Greek (Giannakopoulos *et al.* 2009).

Stait - Trait Anxiety in Children (STAIC): STAIC is a 40-item self-report measure of state and trait anxiety developed for use within the primary school setting. It consists of two forms of 20 items. One form asking children how they feel at a particular moment in time responding to the state anxiety scale (STAIC-state anxiety) and the other form asking children how they feel generally (usually) responding to the trait anxiety scale (STAIC-trait anxiety). Each question is answered using a 3-point Likert-type scale (Spielberger & Edwards 1973). In our study, we used the STAIC-trait anxiety scale. STAIC has been validated in Greek (Psychountaki *et al.* 2003).

Statistical Analysis

Descriptive measures included means, standard deviations, and absolute and relative frequencies. Principal component analysis (PCA) was used to identify the factors from the EES-C. Bartlett's test was used to assess whether the correlation between items was adequate. The Kaiser-Meyer-Olkin (KMO) statistic was used to assess sample adequacy. The appropriate number of derived factors were identified using the scree-plot (looking for inflexion points), since the study sample was not large enough to support the Kaiser criterion. Loadings of each item on derived factors were maximized using the orthogonal varimax rotation. Criterion- related validity was assessed by Pearson's rho correlations with CDI and STAIC-trait anxiety. Cronbach's alpha values were calculated to assess internal consistency of the identified factors. After, EES-C total score was assessed for meaningful associations with the other measurements of the study. The level of significance p was 0.05. Statistical analyses were performed using the SPSS statistical software version 22.0 for Windows (SPSS Inc., Chicago, IL).

Results

In total, 150 questionnaires were collected (100% completion rate). 139 of them served us for further analysis. Out of the final sample, 106 were students of primary school (46% 4th graders; 14.4% 5th graders; 15.8% 6th graders) and 33 were students of middle school (23.7% 1st graders). Students were aged 9-13 years old (mean age 10.83) and they were normal weight (mean BMI z-score 0.4). Out of the 139 (54% were female), 85 (61.2%) lived in a rural area and 54 (38.8%) in an urban area. No difference between the rural and urban area for EES-C total score was found (data not showed).

The results of the PCA are presented in Table 1. The KMO measure was 0.869 which is well above the acceptable limit of 0.5 and verified the sampling

Table 3. Construct validity of the Emotional Eating Scale for Children and Adolescents (EES-C).

Correlations		Depression	Feeling Unsettled	Angry/Anxiety	Total EES-C
Depression	Pearson Correlation	1			
	Sig. (2-tailed)				
	N	142			
Feeling Unsettled	Pearson Correlation	0.569	1		
	Sig. (2-tailed)	0,000			
	N	140	142	141	
Anger/Anxiety	Pearson Correlation	0.621	0.623	1	
	Sig. (2-tailed)	0.000	0.000		
	N	141	141	144	
Total EES-C	Pearson Correlation	0.868	0.854	0.850	1
	Sig. (2-tailed)	0.000	0.000	0.000	
	N	139	139	139	139

adequacy for the analysis. Bartlett's test of sphericity was significant ($F_{(325)} = 1537.5$, $p < 0.001$), indicating that correlations between items were sufficiently large enough to perform PCA. Scree plot (not presented) indicated that three factors should be retained. The first factor had loadings from 10 items (0.503 - 0.649), accounting for 33.1% of the variance and represented eating in response to depression. The second factor had loadings from 9 items (0.456 - 0.784), accounting for 8.3% of the variance and represented eating in response to feeling unsettled. The third factor had loadings from 7 items (0.367 - 0.741), accounting for 6.1% of the variance and represented eating in response to anger/anxiety. The total explained variance rate was 47.67%.

Table 2 presents the mean scores of each subscale along with the theoretical and observed values of the range. It is evident that there was a good dispersion of calculated scores in our sample relative to the possible range of scores. In order to further examine the construct validity of the EES-C we estimated the intercorrelation of the EES-C subscales and the EES-C total score. The analysis shown in Table 3 proves that the three subscales have a positive correlation between them as well as with the total score of the scale ($r = 0.569 - 0.868$, $p < 0.001$), attesting good convergent validity. In order to examine the reliability of the questionnaire we used the Cronbach's alpha index. This analysis showed satisfactory reliability of the EES-C, Cronbach's alpha was 0.917. Cronbach's alphas for depression subscale was 0.851, for feeling unsettled was 0.836, for anger/anxiety subscale was 0.805. In Table 4 the item analysis results are shown, according to which there is no need for item deletion, as the index does not

increase in any case.

To assess criterion validity of the questionnaire, we correlated EES-C subscales with two other scales: CDI and STAIC-trait anxiety. Based on the results shown on Table 5, it seems that depression subscale is positively correlated to STAIC-trait anxiety ($r = +0.217$, $p = 0.014$) and feeling unsettled subscale is positively correlated to CDI ($r = +0.191$, $p = 0.029$).

Regarding EES-C total score across demographic variables, there was a significant negative correlation between age and EES-C ($r = -0.230$, $p = 0.006$) and positive correlation between BMI z-score and EES-C ($r = 0.173$, $p = 0.042$). The latter is indicative of the good predictive validity of the Greek version of EES-C. Finally, the results showed that gender did not affect emotional eating (data not showed).

Discussion

The Greek Version of EES-C seems to have satisfactory psychometric properties. Our adaptation was based on data collected from 139 children/ adolescents using common component analysis. A factor analysis generated three subscales: eating in response to depression, to feeling unsettled and to anger/anxiety. This three factor structure has been supported previously by the original validation study of Tanofsky-Kraff et al. (2007) and the validation of the Turkish version (Bektas *et al.* 2016). However, in these studies the three factors generated were: anxiety/ anger/frustration, feeling unsettled and depression. In the Spanish version of EES-C the results showed five subscales such as anxiety, anger, depression, restlessness, and helplessness. This five factors

Table 4. Emotional Eating Scale for Children and Adolescents (EES-C) item analysis.

	Cronbach's Alpha if Item Deleted
Resentful	0.915
Discouraged	0.914
Shaky	0.914
Worn Out	0.916
Not doing enough	0.914
Excited	0.914
Disobedient	0.914
Down	0.916
Stressed out	0.913
Sad	0.914
Uneasy	0.915
Irritated	0.913
Jealous	0.914
Worried	0.914
Frustrated	0.913
Lonely	0.913
Furious	0.913
On edge	0.913
Confused	0.913
Nervous	0.914
Angry	0.912
Guilty	0.914
Bored	0.915
Helpless	0.914
Upset	0.913
Happy	0.914

structure was a refined version of the structure obtained in the original validation study (Perpiñá *et al.* 2011).

In our study, the subscale of depression is positively correlated with the trait of anxiety and the subscale of feeling unsettled is positively correlated with symptoms of depression. The subscale of depression is positively correlated with symptoms of depression, but surprisingly without a statistically important value ($p < 0.585$). The subscale of anger/anxiety did not correlate with trait anxiety indicating that this subscale captures a construct distinct from general anxiety or misconduct related to anger. On the contrary, in the Spanish version (Perpiñá *et al.* 2011)

Table 5. Emotional Eating Scale for Children and Adolescents (EES-C) subscales correlation to Child Depression Inventory (CDI) and State - Trait Anxiety In Children (STAIC).

		CDI	**STAIC-Trait Anxiety**
Depression	Pearson Correlation	0.048	0.213
	Sig. (2-tailed)	0.585	0.015
	N	129	130
Feeling Unsettled	Pearson Correlation	0.191	0.016
	Sig. (2-tailed)	0.029	0.852
	N	130	131
Anger/ Anxiety	Pearson Correlation	0.006	0.130
	Sig. (2-tailed)	0.943	0.138
	N	130	132

of EES-C all the subscales (except that of restlessness) presented small to medium positive correlations with externalization and internalization symptoms, and with both anxiety (as trait) and symptoms of depression. Regarding total explained variance rate, in our sample it was 47.67%, higher than the variance calculated in the Turkish version (Bektas *et al.* 2016), whereas it was lower than the variance calculated in the original validation study of Tanofsky-Kraff et al. (2007) and in the validation study of the Spanish version (Perpiñá *et al.* 2011). The factor loads of the items in three subscales were higher than 0.30, as in other validation studies (Bektas *et al.* 2016, Perpiñá *et al.* 2011, Tanofsky-Kraff *et al.* 2007).

As far as the age is concerned, we found that it is negatively correlated with emotional eating, meaning that eating in response to emotional cues decreases as the child gets older. A plausible explanation could be that older children could control their desire to eat in response to their feelings better than the younger. Concerning body mass index, our analysis revealed that emotional eating was positively correlated with BMI z-score based on World Health Organization (WHO) growth charts (de Onis *et al.* 2006). This result is in contrast with other studies (Caccialanza *et al.* 2004, Sleddens *et al.* 2008, Tanofsky-Kraff *et al.* 2007) that found no relationship between emotional eating and body size. However, we consider our finding as a proof of evidence of the good predictive validity of the Greek version of EES-C.

The Greek Version of EES-C is highly reliable in our sample with a Cronbach's alpha coefficient of 0.917. Cronbach's alphas for depression subscale was 0.851, for feeling unsettled was 0.836, for anger/anxiety subscale was 0.805. Results of the present study were lower than the results of the original validation of the scale whereas they were similar to the

results of the Turkish version and higher than the results of the Spanish version (Bektas *et al.* 2016, Perpiñá *et al.* 2011).

It is acknowledged that our study has several limitations, such as the small number of participants, the self-reported measures, the lack of test retest method and the lack of eating psychopathology measures. One of the strengths of the present study is that our sample was recruited from different areas of Greece, both rural and urban, which most likely permits the widespread use of the tool in the country. In conclusion, the Greek version of EES-C can be used by physicians, nurses, dietitians and other healthcare professionals in order to detect the effects of emotions on eating behaviors of children and adolescents in Greece.

Acknowledgments

Conflict of Interest

The authors declare that there is no conflict of interest to disclose.

Authors' contributions

Despina S. Kalogiratou designed the work, performed the statistical analysis, drafted the manuscript. Flora Bacopoulou, Christina Kanaka-Gantenbein and Dimitrios Vlachakis supervised the project. Orsalia Gerakini carried out the data collection. George P. Chrousos and Christina Darviri conceived of the original idea and supervised the project. All authors read and reviewed the final manuscript.

References

Bacopoulou F, Foskolos E, Stefanaki C, Tsitsami E & Vousoura E 2018 Disordered eating attitudes and emotional/behavioral adjustment in Greek adolescents. *Eating and Weight Disorders: EWD* **23** 621–628

Bektas M, Bektas I, Selekoğlu Y, Kudubes AA, Altan SS & Ayar D 2016 Psychometric properties of the Turkish version of the Emotional Eating Scale for children and adolescents. *Eating Behaviors* **22** 217-221

Braet C & Van Strien T 1997 Assessment of emotional, externally induced and restrained eating behaviour in nine to twelve-year-old obese and non-obese children. *Behav Res Ther* **35** 863-873

Arnow B, Kenardy J & Agras WS 1995 The Emotional Eating Scale: the development of a measure to assess coping with negative affect by eating. *Int J Eat Disord* **18** 79-90

Caccialanza R, Nicholls D, Cena H, Maccarini L,

Rezzani C, Antonioli L, Dieli S & Roggi C 2004 Validation of the Dutch Eating Behaviour Questionnaire parent version (DEBQ-P) in the Italian population: a screening tool to detect differences in eating behaviour among obese, overweight and normal-weight preadolescents. *Eur J Clin Nutr* **58** 1217-1222

Costarelli V, Antonopoulou K & Mavrovounioti C 2011 Psychosocial Characteristics in Relation to Disordered Eating Attitudes in Greek Adolescents. *Eur Eat Disord Rev* **19** 322-330

de Onis M, Onyango AW, Borghi E, Garza C Yang H & WHO Multicentre Growth Reference Study Group. Comparison of the World Health Organization (WHO) 2006 Child Growth Standards and the National Center for Health Statistics/WHO international growth reference: implications for child health programmes. *Public Health Nutr* **9** 942-947

Ganley RM 1989 Emotion and eating in obesity: A review of the literature. *Int J Eat Dis* **8** 343-361

Geliebter A & Aversa A 2003 Emotional eating in overweight, normal weight, and underweight individuals. *Eat Behav* **3** 341-347

Giannakopoulos G, Kazantzi M, Dimitrakaki C, Tsiantis J, Kolaitis G & Tountas Y 2009 Screening for children's depression symptoms in Greece: the use of the Children's Depression Inventory in a nation-wide school-based sample. *Eur Child Adolesc Psychiatry* **18** 485-492

Kovacs M 1985 The Children's Depression, Inventory (CDI). *Psychopharmacol Bullet* **21** 995-998

Lindeman M & Stark K 2001 Emotional eating and eating disorder psychopathology. *Eat Dis* **9** 251-259

Nguyen-Michel ST, Unger JB & Spruijt-Metz D 2007 Dietary correlates of emotional eating in adolescence. *Appetite* **49** 494-499

Nuttall FQ 2015 Body Mass Index: Obesity, BMI, and Health A Critical Review. *Nutr Today* **50** 117

Perpiñá C, Cebolla A, Botella C, Lurbe E & Torró MI 2011 Emotional Eating Scale for Children and Adolescents: Psychometric Characteristics in a Spanish Sample. *J Clin Child Adolesc Psychol* **40** 424-433

Psychountaki M, Zervas Y, Karteroliotis K & Spielberger C 2003 Reliability and Validity of the Greek Version of the STAIC. *Eur J Psychol Assess* **19** 124–130

Sleddens EF, Kremers SP & Thijs C 2008 The Children's Eating Behaviour Questionnaire: factorial validity and association with Body Mass Index in Dutch children aged 6–7. *Int J Behav Nutr Phys Act* **5** 49

Spielberger CD & Edwards CD 1973 STAIC preliminary manual for the State-Trait Anxiety Inventory for Children ("How I Feel Questionnaire"). Palo Alto, Calif.: Consulting Psychologists Press

Spoor STP, Bekker MHJ, Van Strien T & van Heck GL 2007 Relations between negative affect, coping, and emotional eating. *Appetite* **48** 368-376

Stice E, Presnell K & Spangler D 2002 Risk factors for

binge eating onset in adolescent girls: A 2-year prospective investigation. *Health Psychol* **21** 131-138

Strien TV, Frijters JER, Bergers GPA & Defares PB 1986 The Dutch Eating Behavior Questionnaire (DEBQ) for assessment of restrained, emotional, and external eating behavior. *Int J Eat Dis* **5** 295-315

Tanofsky-Kraff M, Theim KR, Yanovski SZ, Bassett AM, Burns NP, Ranzenhofer LM, Glasofer DR & Yanovski JA 2007 Validation of the emotional eating scale adapted for use in children and adolescents (EES-C). *Int J Eat Disord* **40** 232-240

van Strien T & Oosterveld P 2008 The children's DEBQ for assessment of restrained, emotional, and external eating in 7- to 12-year-old children. *Int J Eat Dis* **41** 72–81

Wardle J, Guthrie CA, Sanderson S & Rapoport L 2001 Development of the Children's Eating Behaviour Questionnaire. *J Child Psychol Psychiatry* **42** 963-970

Yannakoulia M., Matalas AL, Yiannakouris N, Papoutsakis C, Passos M. & Klimis-Zacas D 2004 Disordered eating attitudes: An emerging health problem among Mediterranean adolescents. *Eat Weight Disord* **9** 126-133