

Original

Validation of the dutch eating behavior questionnaire for children (DEBQ-C) for use with Spanish children

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Abstract

Introduction: The Dutch Eating Behaviour Questionnaire for children was developed by Van Strien and Oosterveld (2008) to measure three different eating behaviors (emotional eating, restrained eating and external eating); it is an adaptation of the DEBQ for adults.

Objective: The purpose of this study is to analyze the psychometric properties of the Dutch Eating Behavior Questionnaire for Children (DEBQ-C) with a Spanish sample.

Method: The DEBQ-C was administered to 473 children (240 boys and 233 girls), from 10 to 14 years old. The sample included a Clinical Overweight Group (COG; n = 81) comprising children who were receiving weight loss treatments, a Non Clinical Overweight Group (NCOG, n = 31) comprising children who were overweight but not in treatment, and a Normal Weight Group (NWG, n = 280).

Results: Results showed that the DEBQ-C had acceptable internal consistency ($\alpha = 0.70$). Temporal stability was good for "External Eating" and "Restrained Eating" scales. Confirmatory factor analysis showed that the three-factor solution had good fit indices. Furthermore, the clinical overweight participants scored significantly higher on "External Eating" and "Restrained Eating" compared to the normal weight children.

Conclusion: The DEBQ-C proved to be an effective instrument for researching children's eating behaviors.

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Key words: Obesity. Psychometrics. Eating disorders. Child behavior. Feeding behavior.

VALIDACIÓN DEL CUESTIONARIO HOLANDEÉS DE COMPORTAMIENTO ALIMENTARIO (DEBQ-C) PARA SU USO EN NIÑOS ESPAÑOLES

Resumen

Introducción: El cuestionario holandés de comportamiento alimentario para niños fue desarrollado por Van Strien y Oosterveld (2008) para medir tres conductas diferentes de ingesta (comer emocional, comer restrictivo, y comer externo). Este cuestionario es una adaptación del DEBQ para adultos.

Objetivo: El propósito de este estudio es analizar las propiedades psicométricas del Cuestionario Holandés de Comportamiento Alimentario Infantil (DEBQ-C) con una muestra española.

Método: El DEBQ-C se administró a un total de 473 niños (240 niños y niñas 233), de 10 a 14 años de edad. La muestra incluye un grupo clínico de niños con sobrepeso (COG, n = 81) que comprende los niños que estaban recibiendo tratamientos de pérdida de peso, un grupo de niños no clínico con sobrepeso (NCOG, n = 31) que comprende los niños que tenían sobrepeso pero que no estaban en tratamiento, y un grupo normopeso (NWG, n = 280).

Resultados: Los resultados indican que el DEBQ-C mostró una coherencia interna aceptable ($\alpha = 0,70$). La estabilidad temporal fue buena para las escalas "comer externo" y "comer restrictivo". El análisis factorial confirmatorio mostró que la solución de tres factores presenta buenos índices de ajuste. Además, los participantes con sobrepeso clínicos puntuaron significativamente más alto en "comer externo" y "comer restrictivo" en comparación con los niños de peso normal.

Conclusiones: Se demuestra que el DEBQ-C es un instrumento eficaz para la investigación del comportamiento alimentario en niños.

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Palabras clave: Obesidad. Psicometría. Trastornos de la conducta alimentaria. Conducta infantil. Conducta de ingesta.

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Introduction

Childhood overweight and obesity are the most common health disorders in western countries. It is necessary to study factors that influence these conditions in order to improve prevention and treatment strategies, particularly because the risk of being overweight in adulthood is significantly higher in overweight children than in normal weight children.^{1,2} The scientific literature has identified several variables that play an influential role in childhood overweight including medical, social and psychological factors. One of these variables is the presence of dysfunctional eating behaviors.

Three dietary dysfunctional eating patterns have been identified: emotional, external and restrained eating. "Emotional eating" has been addressed by the Psychosomatic Theory;³ it refers to eating in response to negative emotions in order to relieve stress while disregarding internal physiological signals of hunger and satiety. Several studies have shown that obese adults engage in more emotional eating than non-obese adults;^{4,5,6} emotional eating has even been explored as a risk factor for developing obesity;⁷ it has been also related with a gene expression of depressive feelings,⁸ and parental control and Dopamine D2 receptor gene.⁹ "External eating" refers to eating in response to external cues for food, such as sights or smells.¹⁰ As with emotional eating, external eating involves a decreased sensibility to internal signals of hunger and satiety.⁶ This eating behavior was addressed in Schachter's "Externality theory" of obesity.¹¹ Finally, "Restrained eating" was addressed by the restraint theory;¹² it refers to eating when an individual uses cognitive suppression of internal hunger signals in order to lose or maintain a particular weight.

The *Dutch Eating Behavior Questionnaire* (DEBQ) was developed to measure these three eating behaviors in adults.¹³ It is composed by 33 questions with 5-choice answers (ranging from "never" to "very often"). This instrument has been extensively used, and has proven to be a useful and reliable tool.^{6,13,14}

In order to study eating behaviors in children, several adaptations of the DEBQ have been proposed. Braet and Van Strien¹⁵ used the adult version but found that most of the nine year old children did not completely understand the questions. Hill and Palin¹⁶ used a modified version of the dietary Restraint Scale of the DEBQ in eight-year-old children. This version included six of the ten original questions and the language was adapted to appropriate child reading levels. Furthermore, authors simplified the answers by including only three possible choices. The results of this study showed adequate construct validity, but the authors did not provide information on reliability. Halvarsson and Sjöden¹⁷ examined the psychometric properties of the DEBQ in a sample of nine-to ten-year-old children, and obtained adequate psychometric properties (Cronbach's α of 0.83 in total and a range of 0.77 and 0.86 for the DEBQ-C scales).

Braet et al.¹⁴ used also the DEBQ to compare the eating habits of overweight and normal-weight youngsters, including children and adolescents (from 10 to 14 years old) showing good psychometric properties. However, they found that the youngest children did not fully comprehend the items on the restrained eating scale.

More recently, Van Strien and Oosterveld¹⁸ adapted the instrument (DEBQ-C) for boys and girls from seven to twelve years old. To do so, the authors adapted the items, simplified the sentences and reduced response choices to three ("no", "sometimes" and "yes"). They administered this new version to 185 eight-year-old children and obtained a factorial structure of three factors (the same as in adults), which explained 35.8% variance. The final version of the instrument included 20 items (7 on emotional eating, 7 on restrained eating, and 6 on external eating). This further adapted version was administered to 769 seven-to twelve 12-year-old children, and a confirmatory factorial analysis was applied. Results supported the validity of the three-factor structure and showed that this structure was invariant of sex, body mass index (BMI) and age. Moreover, Cronbach's α ranging from 0.73 to 0.82 were obtained.

The aim of the present study is to evaluate the psychometric properties of the Spanish version of the DEBQ-C. Internal consistency, temporal stability (one month), age and gender differences, and factorial structure will be analyzed. Furthermore, three different weight groups (clinical overweight, non clinical overweight and non clinical normal weight participants) will be compared. Finally, relationships between DEBQ-C scales and eating attitudes (EAT-26) will be explored, and differences between eating disorder (ED) risky (EAT-26 > 20) and non risky (EAT-26 < 1) on eating behaviors will be investigated.

Method

Participants

A total of 473 children participated in the study (240 boys and 233 girls). They were drawn from both clinical and non-clinical populations. The non-clinical participants were recruited from four elementary schools, and were divided into two groups according to their weight: the normal weight group (NWG; n = 280) and the non-clinical overweight group (NCOG; n = 31). Participants were categorized as overweight when their weight exceeded the 85th percentile. The BMI percentiles for age and gender were based on normative data for the Spanish population.¹⁹ The clinical overweight group (COG; N = 81), was recruited from a Child and Adolescent Cardiovascular Risk Unit, from a Pediatric Service located in a public hospital specializing in childhood obesity treatments. All were receiving weight loss treatments based on nutritional and behavioral modification, and most of them were also receiv-

ing treatment for diseases associated with obesity including hypertension, type 1 diabetes, coronary heart diseases, and another syndromes such as insulin resistance. The BMI means of the different groups were 18.9 (SD = 2.45) for the NWG, 26.5 (SD = 2.2) for the NCOG, and 29.1 (SD = 3.8) for the COG. The sample was divided into COG and NCOG because, as Braet [20] indicated, it is more probable to find psychopathological features in clinical obese children seeking treatment than in the non-clinical obese population.

All participants were Caucasian. The mean age was 11.4 (SD = 1.2) years old for the entire sample, 11.8 (SD = 1.66) for the NCOG, 11.5 (SD = 1.1) for the NWG, and 12.1 (SD = 1.8) for the COG. There were significant differences among groups in age ($F(471, 2) = 6,064$; $p = 0.003$), with the COG being older than the other two groups (no differences were found between both non-clinical groups). Regarding gender, there were no differences between groups.

Instruments

The Dutch Eating Behavior Questionnaire for Children: (DEBQ-C; original Dutch version).¹⁸ A Spanish version provided by Van Strien was used, and was adapted slightly for the Spanish spoken in Spain. As mentioned, the DEBQ-C includes 20 questions with 3 possible answers (1 = “no”, 2 = “sometimes”, 3 = “yes”), grouped in 3 scales: “emotional eating”, which included 7 questions (numbered 2, 3, 9, 12, 15, 17, 19), “Restrained Eating”, which included 7 items (numbered 4, 6, 8, 11, 14, 16, 18), and “external eating”, including 6 items (numbered 1, 5, 7, 10, 13, 20).

Eating Attitudes Test (EAT-26).²¹ This is a 26-item questionnaire that measures frequency of the individual's behavior or attitudes about eating disorders (ED). It has been employed as a screening tool for ED in both clinical and non-clinical samples. Furthermore, it has been utilized extensively as a research tool for identifying abnormal eating attitudes and behaviors and analyzing how these relate to ED. It is composed by 3 scales: “diet” (13 items), “bulimia and food preoccupation” (6 items) and “oral control” (7 items). The item scoring ranges from 0 (never) to 5 (always). The EAT-26 has shown an accuracy of at least 90% when used to identify people who have been diagnosed with an ED based on the DSM-IV criteria.²² Respondents with a score of 20 or higher are usually considered at risk for an ED.²³ It has been validated in a sample of Spanish children from ranging from 10 to 19 years old by Jorquera et al. (2006), showing good internal consistency ($\alpha = 0.87$).

Procedure

Informed consent was obtained from parents, who were informed about the study's objective. The COG

participants were recruited by pediatricians; parents' authorization was solicited when their children came to the Pediatric Unit for a periodic check-up. The height and weight of the COG participants were measured in the Paediatric Unit by hospital staff. The NWG and the NCOG were recruited from four elementary schools. Questionnaires were administered during regular school hours. Height and weight measurements were taken in the school by the research team. In order to study the temporal stability, the DEBQ-C was administered one month after ($N = 107$), but only to the NWG participants, due to the availability of the sample.

Results

Descriptive statistics for the 20 items and scales are given in table I. The average scores were 1.22 (SD = 0.34) for “Emotional eating”, 1.80 (SD = 0.52) for “Restrained eating” and 1.83 (SD = 0.46) for “External eating”. The highest score was obtained for question 20 (“External eating”), which measures “Desire to eat when somebody is cooking”; the lowest score was for question 17 (“Emotional eating”) that inquires about “desire to eat when I feel scared”.

In order to analyze differences in DEBQ-C scales according to gender and age, Regarding age, participants were divided into two groups (10-12 and 13-14 years old). ANOVA analyses were conducted. Results did not show significant differences between gender for any scale (“Emotional Eating”, [$F(1,470) = 0.200$; $p = 0.655$]; “Restrained Eating”, [$F(1,470) = 0.000$; $p = 1.00$]; “External Eating”, [$F(1,470) = 0.047$; $p = 0.828$]). Results indicated no significant differences between the age groups (“Emotional Eating”, [$F(1,470) = 0.161$; $p = 0.689$]; “Restrained Eating”, [$F(1,470) = 2.22$; $p = 0.137$]; “External Eating”, [$F(1,470) = 0.203$; $p = 0.653$]). In addition, the percentages of times which participants answer “no” for each factor was also analyzed. The rate of “no” in “emotional eating” ranges from 90.5% for item 17 (“desire to eat when afraid”), to 75.4% for item 15 (“Desire to eat when feeling restless”). In “restrained eating” the percentages of “no” ranges from 11.4 for item 4 (“Watch what you eat”), to 60.4% for item 16 (“Trying not to eat after evening meal”). In “external eating” this percentage ranges from 15.3% for item 1 (“Desire to eat when seeing or smelling food”), to 52.3% for item 13 (“Tempted by snack bar/fast food restaurant”).

Differences among clinical and non-clinical groups

In order to compare the eating behaviors of the three groups, ANOVAs analyses were conducted. Data are shown in table II. Results showed significant differences among groups in “Emotional eating” and a post-hoc comparison (Tuckey) analysis revealed significant

Table I
Descriptive data and saturations of each scale of the DEBQ-C

	Mean (SD)	Emotional eating	Restrained Eating	External Eating
1. Desire to eat when seeing or smelling food	2 (0.61)			0.529
2. Desire to eat when depressed	1.27 (0.56)	0.540		
3. Desire to eat when lonely	1.27 (0.56)	0.531		
4. Desire to eat when walking past a candy store	1.90 (0.73)			0.533
5. Eat slimming foods	1.68 (0.75)		0.639	
6. Desire to eat when watching others eat	1.64 (0.68)			0.673
7. Eating less after eating too much	1.78 (0.83)		0.565	
8. Desire to eat when worrying	1.20 (0.49)	0.689		
9. Tempted by delicious food	1.72 (0.77)			0.347
10. Eat less to avoid weight gain	1.66 (0.76)		0.729	
11. Desire to eat when things go wrong	1.18 (0.47)	0.631		
12. Tempted by snack bar/fast food restaurant	1.60 (0.70)			0.540
13. Trying not to eat between meals	1.72 (0.86)		0.694	
14. Desire to eat when feeling restless	1.30 (0.58)	0.544		
15. Trying not to eat after evening meal	1.66 (0.87)		0.645	
16. Desire to eat when afraid	1.10 (0.37)	0.569		
17. Eating while allowing for weight	1.65 (0.71)		0.489	
18. Desire to eat when feeling sorry	1.25 (0.53)	0.658		
19. Tempted when food is being prepared	2.03 (0.76)			0.551
Emotional eating	1.22 (0.34)			
Restrained eating	1.80 (0.51)			
External eating	1.83 (0.43)			

Table II
Differences among COG, NCOG and NWG

	NWG (n = 280)	NCOG (n = 31)	COG (n = 81)	F	μ^2	1- β
	Mean (SD)	Mean (SD)	Mean (SD)			
Emotional eating	1.20 (0.29)	1.12 (0.25)	1.28 (0.43)	3.327*	0.017	0.623
Restrained eating	1.67 (0.48)	2.12 (0.48)	2.21 (0.42)	45.269**	0.191	1
External eating	1.86 (0.45)	1.69 (0.32)	1.67 (0.44)	7.059**	0.035	0.928

COG = Clinical Overweight Group; NCOG = Non-Clinical Overweight Group; NWG = Normal Weight Group.
* = $p < 0.05$; ** = $p < 0.01$.

differences only between the COG and the NCOG ($p = 0.04$), with the COG scoring higher. No differences involving the NWG were found. Regarding "Restrained eating", results also revealed significant differences among groups, and the post-hoc (Tuckey) analyses showed differences between the NWG and the COG ($p < 0.001$), and between the NWG and the NCOG ($p < 0.001$), with the NWG scoring lower than the other overweight groups. There were no differences between the COG and the NCOG in this eating behavior. Finally, regarding "External eating", results showed significant differences, and the post hoc (Tuckey) analysis revealed differences only between the NWG and the COG ($p = 0.02$), with the NWG scoring higher. Additional analyses used gender and age as covari-

ables, but results were similar, and gender and age were not significant for any scale.

Reliability Analysis: Internal consistency and temporal stability

In order to analyze internal consistency, Cronbach's alpha coefficients for the DEBQ-C and the three scales were calculated. The alpha values for the scales were 0.69 for "Restrained eating", 0.78 for "Emotional eating", and 0.69 for "External eating". Due to the low score in "Restrained eating", the analysis was repeated in order to observe the effects of each item over Cronbach's alpha coefficient. Excluding item 4, the alpha

Table III
Bivariate correlations and partial correlations for DEBQ-C controlling for BMI and age (in brackets), for clinical groups

	Emotional eating			Restrained eating			External eating		
	COG	NCOG	NWG	COG	NCOG	NWG	COG	NCOG	NWG
Emotional				-0.10 (-0.12)	-0.03 (-0.09)	0.01 (0.05)	0.52** (0.53**)	0.33 (0.44**)	0.25** (0.25**)
Restrained							-0.35** (-0.29**)	0.11 (0.17)	-0.5 (-0.01)
BMI	0.00	0.46**	-0.06	-0.05	0.22	0.35**	0.07	-0.08	-0.08
Age	0.16	0.00	0.06	-0.07	0.01	-0.12	0.08	0.18	0.07

COG = Clinical Overweight Group; NCOG = Non-Clinical Overweight Group; NWG = Normal Weight Group.
* = p < 0.05; ** = p < 0.01.

value for this scale increased slightly: 0.76. Regarding gender, the alpha values for the scales were 0.79 (boys) and 0.73 (girls) for “Restrained eating”, 0.82 (boys) and 0.73 (girls) for “Emotional eating”, and 0.71 (boys) and 0.68 (girls) for “External eating”. For weight groups, the alpha values for the scales were 0.72 (NWG), 0.88 (COG) and 0.77 (NCOG) for “Emotional eating”, 0.74 (NWG), 0.66 (COG) and 0.72 (NCOG) for “Restrained eating” and 0.65 (NWG), 0.73 (COG) and 0.38 (NCOG) for “External eating”. Regarding age, the alpha values for the scales were 0.75 (10-11) and 0.78 (12-14) for “Restrained eating”, 0.75 (10-11) and 0.81 (12-14) for “Emotional eating” and 0.70 (10-11) and 0.69 (12-14) for “External eating”.

In order to analyze test-retest reliability over time (one month after), intraclass correlations (ICC) were applied to part of the original sample (n = 107), this sample was composed mainly by non overweight children, due to the availability of the sample. The ICC for the “Emotional eating” scale was 0.39 (0.22-0.54), the “Restrained eating” scale was 0.71 (0.61-0.79) and the “External eating” scale was 0.64 (0.52-0.74).

Correlational Analysis

The interrelationships of the DEBQ-C scale scores were examined using Pearson’s correlational analyses, and partial correlational analysis (controlling for BMI and age) separated by groups (table III). “External eating” correlated positively with “Emotional eating” in the three groups, with COG showing the highest values. This correlation was maintained after controlling for BMI and age. “Restrained eating” correlated negatively with “External eating”, but only in the COG, even when controlling for BMI and age.

BMI correlated positively with “Emotional eating” only in the NCOG. BMI also correlated positively with “Restrained eating” only in the NWG. There was no relation between “External eating” and BMI. Age did not correlate with any of the scales of the DEBQ-C.

Correlations between DEBQ-C scales and EAT-26 scales were also examined using Pearson’s correlational analyses, and using partial correlational analyses (controlling for BMI and age) (table IV). “Emotional

Table IV
Bivariate correlations and partial correlations between DEBQ-C and EAT-26 controlling for BMI and age (in brackets)

	Emotional eating	Restrained eating	External eating
Diet	0.01 (0.02)	0.62** (0.54**)	-0.09 (-0.01)
Bulimia and food preoccupation	0.12* (0.11)	0.25** (27**)	-0.08 (-0.08)
Oral control	0.02 (0.03)	-0.01 (0.12*)	-0.01 (-0.10)

* = p < 0.05; ** = p < 0.01.

eating” showed a positive correlation with “bulimia and food preoccupation”. “Restrained eating” correlated positively with “diet” and “bulimia and food preoccupation”; it also showed a relationship with “oral control”, though only when age and BMI were controlled. Finally, “External eating” did not show relationship with any EAT-26 scales.

Differences among ED risk groups

In order to compare dysfunctional eating behaviors of children at risk and not at risk for EDs, participants with EAT-26 scores higher than 20 (n = 40), and lower than 1 (n = 58) were selected, and ANOVAs analyses were applied for the three DEBQ-C scales (table V). Results revealed significant differences only in “Restrained eating” (F (2,82) = 39.50; p < 0.001; η^2 = 0.42), showing that children at risk for EDs displayed restrained behaviors more often than children not at risk.

Table V
Differences in emotional eating between high and low scores in the EAT-26 (risk of eating disorder)

	Low EAT-26	High EAT-26	F	η^2
Emotional	1.81 (0.40)	1.77 (0.43)	0.00	0.00
Restrained	1.46 (0.43)	2.26 (0.51)	39.50**	0.42
External	1.16 (0.24)	1.19 (0.37)	0.05	0.00

*p < 0.05; **p < 0.01.

Confirmatory factor analysis

Several Confirmatory Factor Analyses (CFAs) were applied to explore the goodness of fit indices for the factorial model of the Spanish DEBQ-C. EQS software for Windows version 6.1²⁴ was performed to conduct the analyses. Maximum likelihood with robust correction was used to avoid distributional problems in the data set. A range of indices was employed to assess the degree to which observed data were accounted for by the proposed models: CFI (Comparative Fit Indices), GFI (Goodness of Fit Index), RMSEA (Root Mean Square Error of Approximation), and χ^2 . According to Hu and Bentler²⁵ the following criteria were used to indicate the fit of the CFA models to the data: CFI and GFI > 0.90 and RMSEA < 0.08. Values for CFI and GFI ranged from 0 to 1. These fit statistics and the chi-square were selected because previous research has demonstrated their performance and stability.^{25,26}

Three models were considered in analyzing the structure of the DEBQ-C: the monofactorial including all the items, the three factor model including all the items¹⁸ and the three factors excluding item four from “Restrained eating”. The latter structure was tested because item four showed very low factorial saturation in a previous CFA (0.167). The monofactorial structure produced; $\chi^2 = 1,655.672$ ($p < 0.001$) (CFI = 0.450, GFI = 0.708, SRMR = 0.080, RMSEA = 0.119), the three factor structure including item four produced; $\chi^2 = 290.2126$, ($p < 0.001$), (CFI = 0.910, GFI = 0.931, SRMR = 0.057, RMSEA = 0.048 [0.041-0.055]), and the three factor structure excluding item four produced; $\chi^2 = 239.6112$ ($p < 0.001$), CFI = 0.935, GFI = 0.939, SRMR = 0.053, RMSEA = 0.045 [0.027-0.044]).

Discussion

The aim of this study was to explore the psychometric properties of the DEBQ-C in a Spanish sample. This study is the first validation of the children’s version of the DEBQ in a language other than the original (Dutch).

Regarding reliability, internal consistency values are good, although a bit lower than those reported by Van Strien & Oosterveld¹⁸ (alphas between 0.73 to 0.82). There are slightly differences when gender, age and weight are taking into consideration, the most significant result is the low reliability obtained by the NCOG (0.38) in the “External eating”, however in the rest of the groups the reliability is good. Alpha values in “Restrained eating” are higher when item 4 is excluded. This result can be explained by a subtlety in the Spanish translation. As mentioned, we used the translation given by Van Strien in which item 4, “Watch what you eat”, was translated as “Fijarse exactamente”. While this Spanish verb is related to *observe* or *pay attention*, it significantly does not have the conno-

tation of *awareness* that the verb *watch* has in English. Hence, we recommend translating this item as “Estoy pendiente de lo que como”, which conveys the idea that the children should be aware of the health implications of what they eat.

It is notable that temporal stability was only measured in the NWG. For this group, external eating and restrained eating proved quite stable over time, unlike emotional eating, for which scores varied throughout the month. This might be because young children’s emotions are difficult to identify. In fact, this eating style has been less frequent in children. There are no previous data with which to compare these results. The only data about emotional eating stability is that which was obtained using the emotional eating scale for children (EES-C) adapted by Tanofsky-Kraff et al.²⁷ These authors found acceptable stability for this construct, but their sample was older than in the current study. Further research is needed to clarify the stability of the concept and measurement of emotional eating in children.

Present data also indicate that the DEBQ-C measurement is not influenced by individual characteristics such as sex and age. There are no differences in scores when sex and age are taken into account; furthermore, age does not correlate with any of the three eating behaviors. These results are different to those obtained by Snoek, Van Strien, Janssens & Engels²⁸ with DEBQ, where girls (between 11 and 14) scored higher in “Emotional eating” and “Restrained eating”, and boys in “External eating”. However, our results are in accordance with those obtained by Braet et al.¹⁴ These authors found that the prevalence of emotional and external eating was age-related and gender-specific; however, sex differences were found only in adolescents older than 13. Hence, the lack of differences in our study might be due to the participants’ age (from 10 to 14 years old). Perhaps gender differences appear later in adolescence. Nevertheless, it has been noted that Braet et al.’s study used a version of the DEBQ adapted for adults, whereas we used the DEBQ-C.

As for factorial validity, the CFA results support the factorial structure reported by Van Strien and Oosterveld,¹⁸ with three factors. Thus, the Spanish translation of the DEBQ-C appears to measure the same three constructs (external eating, restrained eating and emotional eating) as the original version. This three-factor structure has been consistently found in all studies using the DEBQ, in both adults and children. The CFA data suggest that results are better when item 4 is excluded, as this item achieved low factorial saturation. As mentioned, this might be due to the Spanish translation of this item.

The correlations obtained between the three scales are also consistent with previous studies,^{17,28} indicating a relationship between “emotional eating” and “external eating”. This result was found in all three groups, even when BMI and age were controlled; it is consistent with Van Strien and Oosterveld¹⁸ as well as with

results from the adult version of the DEBQ. This finding suggests that although emotional and external overeating are independent constructs, they often occur; this is in accordance with the theory that emotionality and food cues can operate together to elicit specific eating behaviors.¹⁸ Thus, data indicate that children who have an eating reaction to emotional stressors are also likely to have an eating reaction to external food cues. Finally, “Restrained eating” was not related to the other two eating behaviors; this suggests adequate discriminative validity since the questionnaire is designed to measure various aspects of eating behavior. The only correlation involving “Restrained eating” was negative, with “External eating” and only in the clinical group. This result is similar to that obtained by Braet et al.,¹⁴ and might indicate that clinical overweight children do not counteract their externality tendency to overeat by imposing cognitive restraint on their food intake.

Results about “Emotional eating” showed that this kind of eating is more frequent in clinical overweight children than non-clinical ones. This result is consistent with those obtained in obese adults by Geliebter and Aversa⁴ and Van Strien et al.⁶ Furthermore, it also indicates that there are no differences with normal weight children, who had even higher (though non-significant) scores than non-clinical overweight participants. Nguyen-Rodriguez, Chou, Unger, and Spruijt-Metz³⁰ found a higher proportion of emotional eaters in normal weight than overweight adolescents. A similar finding was obtained by Braet et al.¹⁴ It is interesting that this pattern is different for children and adults, as well as for clinical and non-clinical overweight groups of children. In addition, present data also showed that emotional eating is only related to BMI in the non-clinical overweight group. These findings might indicate that the relationship between emotional eating and weight gain in children is more complex than initially believed. It is possible that both variables are not directly related; however, there are other mediating variables, and weight status is relevant in this relationship. Future studies should explore the potential mediating factors of the relationship between BMI and emotional eating.

As for the relationship between emotional eating and ED risk, emotional eating behaviour correlated significantly with the “bulimia and food preoccupation” scale. However, this correlation, though significant, was low and disappeared when BMI and age were controlled for. Furthermore, there were no differences in “emotional eating” scores between participants at risk for ED and those not at risk. Emotional eating has been linked to eating disorders in adults,³¹ mainly to bulimia and binge eating. According to our results, this relationship does not hold for children. As previously mentioned, there might be meditational variables between emotional eating and eating pathologies. For example, Van Strien and Oosterveld¹⁸ suggested that emotional eating might be more prominent in people who have experienced negative life events. Emotional eating has

not been as stable as the other two eating behaviors, and has shown great temporal variability. As previously mentioned, this might indicate that the measurement is not stable or that this eating behavior is not stable in children. The DEBQ notably only provides a unique score for emotional eating by exploring eating responses to frustration, sadness, or anxiety; it does not inquire into behavioral responses to positive emotions. Significantly, Tanofsky-Kraff, et al.²⁷ found that eating in response to feeling “happy” was the most common emotion chosen by children and adolescents and that’s the one reason why eating in response to positive emotions differs from eating in response to negative emotions (which is quite rare in children). These findings indicate that the relationship between emotional eating and weight in children are more complex than previously believed.³⁰ Clearly, more research is needed to draw firm conclusions about this eating behavior in children.

Regarding “Restrained eating”, data indicate that this behavior is very relevant to overweight and ED in children. Firstly, results show that this behavior is more frequent in both overweight groups than in the normal weight group, which is in accordance with previous research.^{6,14} Perhaps paradoxically, restrained eating is usually found to be a risk factor for overeating. As Van Strien and Oosterveld¹⁸ noted, when self control is lacking, restrained eaters are likely to overeat. However, although restraining is a more frequent behavior in overweight children, it is only related to BMI in the normal weight group. This finding might indicate that restrained eating is a risk factor for obesity in children, and is a typical behavior of overweight children. Furthermore, data have shown differences in this scale between groups at risk for ED and those not at risk (according to EAT-26 scores). This eating pattern was also related to the “diet” and “bulimia and food preoccupation” scales from the EAT-26. All of these data indicate that this eating behavior in children is related to episodes of uninhibited food intake, and contributes to the evidence about the significance of the relationship between restrained eating and the risk of developing ED and overweight.

Finally, “External eating” was the most prevalent type of eating behavior in all children. As Van Strien et al.⁶ point out, external eating can be an evolutionarily normal response (related to the thrifty genotype), and can be found in all weight categories. Furthermore, normal weight participants obtained higher scores on this scale than the clinical overweight group. These results are in accordance with those obtained by Van Strien and Oosterveld¹⁸ and Braet et al.,¹⁴ and are not expected according to the hypothesis of the role of external food cues in developing overweight.³² Our data show significant differences only between the clinical overweight and normal weight children. Non-clinical overweight participants’ scores are not statistically different from both the clinical overweight and normal weight participants; in fact, their scores fall in

between the other two groups. Hence, perhaps clinical overweight children, who are receiving treatment, control their external eating styles to some extent. Therefore it is possible that these children, who show a more restrained attitude, use their restraint-intentions indicated by the intervention, to decrease or regulate external eating.

As with emotional eating, external eating behaviors have no relationship with any EAT-26 scales, and do not discriminate between ED risk groups, indicating that this eating behavior is more related to obesity and overweight than with other ED problems in children. This disassociation might be due to the age of the participants. Perhaps eating behaviors are related to eating pathology in adolescents but not in younger children, in whom EDs are less prevalent.

This study has several limitations. Firstly, as self-report data, results may have been influenced by acquiescence and social desirability. Furthermore, children might not be fully aware of their behavior, such as whether they eat in response to external food cues, engage in emotional eating, or suppress feelings of hunger cognitively. Secondly, the data are cross-sectional and therefore no firm conclusions about the direction of the obtained associations can be drawn. Furthermore, certain relevant variables have not been taken into account, such as parental feeding practices, the drive for thinness, impulsivity, and the presence of eating disorder psychopathology.

In conclusion, the primary objective of this study was to explore the psychometric properties of the Spanish translation of the DEB-C. The DEBQ-C has indeed proven to be a reliable instrument for measuring eating behaviors in children, as well as the behaviors' effects on overweight and obesity. It also has revealed different eating behaviors among clinical overweight, non-clinical overweight and normal weight participants. Further research is needed to analyze the specific roles of these different behaviors in development, and their influence on the establishment and management of obesity and ED in children.

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References

1. Dietz WH. Childhood obesity: Prevalence and effects. In *Eating Disorders and obesity: A comprehensive handbook*. Edited by Brownell KD, Fairburn CG. New York: Guildford Press; 1995: 438-440.
2. Guo SS, Wu W, Chumlea WC, Roche AF. Predicting overweight and obesity in adulthood from body mass index values in childhood and adolescence. *Am J Clin Nutr* 2002; 76: 653-658.
3. Kaplan HI, Kaplan HS. The psychosomatic concept of obesity. *Journal of Nervous and Mental Disorders* 1957; 125: 181-201.
4. Geliebter A, Aversa A. Emotional eating in overweight, normal weight, and underweight individuals. *Eat Behav* 2003; 2: 341-347.
5. Ricca V, Castellini G, Lo Sauro C, Ravaldi C, Lapi F, Mannucci E, Rotella CM, Faravelli C. Correlations between binge eating and emotional eating in a sample of overweight subjects. *Appetite* 2009; 53: 418-421.
6. Van Strien T, Herman CP, Verheijden MW. Eating style, overeating, and overweight in a representative Dutch sample. Does external eating play a role? *Appetite* 2009; 52: 380-7.
7. Striegel-Moore RH, Morrison JA, Schreiber G, Schumann BC, Crawford PB, Obarzanek E. Emotion-induced eating and sucrose intake in children: the NHLBI Growth and Health Study. *Int J Eat Disord* 1999; 25 (4): 389-98.
8. Van Strien T, Van der Zwaluw CS, Engels RCME. Emotional eating in adolescents: A gene (SLC6A4/5-HTT) - a depressive feelings interaction analysis. *J Psychiatr Res* 2010; 44: 1035-42.
9. Van Strien T, Snoek HM, Van der Zwaluw CS, Engels RCME. Parental control and the dopamine D2 receptor gene (DRD2) interaction on emotional eating in adolescence. *Appetite* 2010; 54: 255-61.
10. Schachter S, Goldman R, Gordon A. Effects of fear, food deprivation and obesity on eating. *J Pers Soc Psychol* 1968; 10: 91-7.
11. Schachter S, Rodin J. Obese humans and rats. Erlbaum/Halsted, Washington, DC; 1974.
12. Herman CP, Mack D. Restrained and unrestrained eating. *J Pers* 1975; 43: 647-660.
13. Van Strien T, Frijters JER, Bergers GPA, Defares PB. The Dutch Eating Behavior Questionnaire (DEBQ) for assessment of restrained, emotional and External Eating behavior. *Int J EAT Disord* 1986; 5: 295-315.
14. Braet C, Claus L, Goosens L, Moens E, Van Vlierberghe L, Soetens B. Differences in eating style between overweight and normal-weight youngsters. *J Health Psychol* 2008; 13: 733-42.
15. Braet C, Van Strien T. Assessment of emotional, externally induced and restrained eating behavior in nine to twelve year-old obese and non-obese children. *Behav Res Ther* 1997; 35: 863-73.
16. Hill AJ, Palin V. Dieting awareness and low self Worth: Related issues in 8-year-old girls. *Int J Eat Disord* 1998; 24: 405-413.
17. Halvarsson K, Sjøden P. Psychometric properties of the Dutch Eating Behavior Questionnaire (DEBQ) among 9-10 year old Swedish girls. *Eur Eat Disord Rev* 1998; 6: 115-125.
18. Van Strien T, Oosterveld P. The Children's DEBQ for Assessment of Restrained, Emotional, and External Eating in 7-to 12-Year-Old Children. *Int J Eat Disord* 2007; 41: 72-81.
19. Sobradillo B, Aguirre A, Aresti U, Bilbao A, Fernandez-Ramos C, Lizárraga A, Loranzo, H, Madariaga L, Rica I, Ruiz I, Sánchez E, Santamaría C, Serrano JM, Zabala A, Zurimendi B, Hernandez M. Curvas y tablas de crecimiento (Estudios longitudinal y transversal). Fundación Faustino Orbeagoza Eizaguirre; 1988.
20. Braet C, Mervielde I, VADEREYCKEN W. Psychological Aspects of Childhood Obesity: A controlled Study in a Clinical Sample. *J Pediatr Psychol* 1997; 22: 59-71.
21. Garner DM, Olmsted MP, Bohr Y, Garfinkel PE. The Eating Attitudes Test: psychometric features and clinical correlates. *Psychol Med* 1982; 12: 871-878.
22. Mintz LB, O'Halloran S. The Eating Attitudes Test: Validation with DSM-IV Eating Disorder Criteria. *J Pers Assess* 2000; 74: 489-503.
23. Jorquera M, Botella-Garneria C, Guillen V, Marco H, Baños RM, Botella C, Perpiñá C. El "Test de Actitudes hacia la Comida-26": Validación en una muestra española. *Interpsiquis* [http://www.psiquiatria.com/articulos/tr_Personalidad_y_habitos/alimentacion_trastornos_de/24936] 2006.
24. Bentler PM. EQS structural equations program manual. Multivariate Software, Encino, CA; 1995.

25. Hu LT, Bentler PM. Cut-off criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Structural Equation Modelling* 1999; 6: 1-55.
26. Bentler PM, Bonett DG. Significance tests and goodness of fit in the analysis of covariance structures. *Psychol Bull* 1980; 47: 541-70.
27. Tanofsky-Kraff M, Theim KR, Yanovski SZ, Bassett AM, Burns NP, Ranzenhofer LM, Glasofer DR, Yanovski JA. Validation of the Emotional Eating Scale Adapted for Use in Children and Adolescents (EES-C). *Int J Eat Disord* 2007; 40: 232-40.
28. Snoek HM, Van Strien T, Janssens JMA, Engels RCME. Emotional eating, external, restrained eating and overweight in Dutch Adolescents. *Scand J Psychol* 2007; 48: 23-32.
29. Van Strie T, Schippers GM, Cox WM. On the relationship between emotional and external eating behavior. *Addict Behav* 1995; 20: 585-94.
30. Nguyen-Rodríguez ST, Chou C, Unger JB, Spruijt-Metz D. BMI as a moderator of perceived stress and emotional eating in adolescents. *Eat Behav* 2008; 9: 238-246.
31. McNamara C, Chur-Hansen A, Hay P. Emotional responses to food in adults with an eating disorder: a qualitative exploration. *Eur Eat Disord Rev* 2008; 16: 115-123.
32. Burton P, Smit HJ, Lightowler HJ. The influence of external eating behavior on overeating: mediation by food cravings. *Appetite* 2007; 49: 191-7.