Received: 30 October 2017 | Revised: 19 December 2017 | Accepted: 15 January 2018

DOI: 10.1002/hsr2.28

RESEARCH ARTICLE

WILEY Health Science Reports Open Access

The factor structure of the Children's Eating Behaviour Questionnaire: A comparison of four models using confirmatory factor analysis

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Abstract

Aims: The Child Eating Behavior Questionnaire (CEBQ) consists of 8 subscales measuring different aspects of eating behavior and is a widely used instrument in pediatric settings, both in relation to eating disorders and overweight/obesity. However, despite its widespread usage, research results have, to this date, been inconsistent in regard to the factor structure of the CEBQ, with several factorial models suggested. The purpose of this study was to systematically compare the 4 factor structures commonly reported in the literature on the 35-item CEBQ, using confirmatory factor analysis in the same sample.

Methods and results: In total, parents of 560 children aged 5 to 12 years old completed the CEBQ; 70 questionnaires were incomplete, resulting in a final sample of 490. Confirmatory factor analyses tested the 4 competing models: a 6-factor model, 2 seven-factor models, and an 8-factor model. The 8-factor model provided an acceptable fit to the data and turned out to be the best fitting model. Correlation coefficients between the 8 factors never exceeded $r = .77$, supporting the construct uniqueness of the 8 subscales. Results also indicated that the CEBQ subscales have good factorial validity and internal reliability ($\alpha \geq .75$).

Conclusion: In summary, this study of Icelandic children supports the appropriateness of using the CEBQ as a measure of 8 distinct dimensions of eating behavior style in school-aged children.

KEYWORDS

CEBQ, children, confirmatory factor analysis, eating behavior, factor structure, validation

1 | INTRODUCTION

Eating behavior problems are highly prevalent in young children and have been linked to underweight and poor growth, as well as to overweight and obesity.[1-5] Although a wide range of prevalence rates have been reported because of variability in definition and heterogeneity in assessment methods, it is estimated that around 25% of normally developing children, and up to 80% of children with developmental delays, display some type of feeding problem.[4,6]

The construct of eating behavior has been divided into 6 areas: satiety responsiveness, responsiveness to food cues, emotional eating, general interest in eating, speed of eating, and food fussiness.[7] Eating behavior problems have been conceptualized as a spectrum, as they can range from the child being under- or overresponsive to cues, or eating too fast or too slow. Some of these behaviors are believed to be influenced by the caregiver, while others, such as suspiciousness of new foods, are conceptualized as having an evolutionary purpose.[3,4,7-9] The 6 areas are not mutually exclusive, as behavior in one area may affect behavior in another. For example, a child displaying picky eating might complete a meal at a slower pace than a child with diminished response to satiety, leading to differences in speed of eating based on problems in 2 different areas.

One of the most widely used assessment instruments for eating behaviors in children is the Child Eating Behavior Questionnaire (CEBQ), a 35-item parent-report questionnaire.[7] The CEBQ was based on the 6 eating behavior areas mentioned above, as well as on additional constructs derived from interviews with parents of young children: responsiveness to social factors, distractibility, and desire for drinks.[7] Despite its widespread use and translation into several languages, the factor structure of the CEBQ has been a matter of debate. Initially, Wardle et al[7] created a 57-item scale, which was subsequently reduced to 35 items. The 57-item version yielded 8 factors (food responsiveness [FR], enjoyment of food [EF], emotional overeating [EO], desire to drink [DD], satiety responsiveness [SR], slowness in eating [SE], emotional undereating [EU], and fussiness [FU]), while the 35-item yielded 7 factors, maintaining the original structure, except that items on the SR and SE loaded on a single factor.[7] However, SR and SE were retained as separate scales, as the correlation between the 2 was expected, as satiety response can be reflected in slower pace of eating over the course of a meal.[7] Subsequent studies of the CEBQ's factor structure have provided mixed results, ranging from 3 to 8 factor solutions (see Table 1).

The 7-factor solution has been supported most frequently, but only in studies using exploratory factor analysis (principal component analysis, PCA).[10-13] In these 7-factor solutions, the EO and FR subscales have been combined into one, in both the Dutch version[12] and the Swedish version,[13] while the study on the Chilean version[11] reported a combined SR and SE factor, in congruence with the original study by Wardle et al.[7] Cao et al[10] on the other hand reported a 7-factor solution of the Chinese version, in which FR was split into 2 factors, and the SR and EF were not found. The Chinese version, therefore, appears to be substantially different from the other versions, additionally because their sample consisted of 12- to 18-month-old children, while the other studies had not only a wider age range in their sample (see Table 1) but also cultural differences in feeding practices, as explained by Cao et al.[10] In the Portuguese version, and also using exploratory factor analysis, a 6-factor solution was reported, with both EO/FR and SR/SE combined.[14] Thus, except for the Chinese version, it appears that exploratory factor analyses have supported a 7-factor solution, with either SR and SE or EO and FR combined, or a 6-factor solution, with EO/FR and SR/SE combined.

More recent studies have reported somewhat different results using confirmatory factor analysis (CFA), which provides more accurate examination of the structure of the data and variable correlations than PCA.[15] Sparks and Radnitz[5] tested the 7-factor model on 229 children in the United States and reported a poor fit. They subsequently performed an exploratory factor analysis, resulting in a proposal of a new 15-item version with a 3-factor solution. Mallan et al[16] tested the 8-factor model on 663 children in Australia and reported a good fit in an ethnically diverse sample. SR and SE were reported to be strongly correlated, which is in concordance with previous literature. Finally, in a study of 1002 preschool-aged children in the United States, Domoff et al[17] reported a reasonable fit for the 8-factor model, with moderately strong correlations between SR and SE, as well as between EO and FR. The originally proposed 8-factor structure[7] has, thus, been supported in 2 different studies using confirmatory factor analyses, on children aged 5 years old or younger. Whether these results also apply to older children, however, is not clear. Although an 8-factor solution was reported in a recent study of children aged 6 to 11 in Thailand,[18] the results were based on exploratory factor analyses, as were the other previous studies including children in this age group.[11,14]

The factor structure of the CEBQ, therefore, remains an unresolved issue. Ascertaining the number of discrete constructs a scale measures is of fundamental importance in both applied and scientific work. Combining possibly discrete subscales into one decreases the sensitivity of the CEBQ and, consequently, its usefulness in detecting problematic eating behaviors and measuring treatment gains. Moreover, this issue can impede interpretation of research results, as evidenced in a recent study by Mallan et al[19] where the alleged multicollinearity issue between factors of the CEBQ rendered interpretation of results, difficult. The main purpose of this study was to test the 6-, 7-, and 8-factor models of the CEBQ in a sample of 5- to 12-year-old children. Confirmatory factor analysis has not been used previously to test the CEBQ in this age group, nor has any previous study reported on comparing the fit of multiple models in the same sample. We aim to resolve the mixed previous literature on the number of factors in this study.

TABLE 1 Factor analyses of the CEBQ (summary of previous studies)

Study	Country	Method	n	Age	Factors	Factors combined?
Wardle et al[7]	United Kingdom	PCA	308	1-9	7	SR and SE
Sleddens et al[12]	Netherlands	PCA	135	6-7	7	EO and FR
Viana et al[14]	Portugal	PCA	240	3-13	6	EF and FR/SR and SE
Svensson et al[13]	Sweden	PCA	174	1-6	7	EO and FR
Santos et al[11] (2011)	Chile	PCA	294	6-12	7	SR and SE
Cao et al[10]	China	PCA	219	1-1,5	7	FR split; SR/EF not found
Sparks and Radnitz[5]	United States	PCA and CFA	229	2-5	3[a]	Multiple
Mallan et al[16]	Australia	CFA	663	1-5	8	N/A
Domoff et al[17]	United States	CFA	1002	3-4	8	N/A
Sirirassamee et al[18]	Thailand	PCA	680	6-11	8	N/A

[a]The 3-factor solution was based on a 15-item version of the CEBQ.

Abbreviations: CEBQ, Child Eating Behavior Questionnaire; CFA, confirmatory factor analysis; EO, emotional overeating; EF, enjoyment of food; FR, food responsiveness; PCA, principal component analysis; SE, slowness in eating; SR, satiety responsiveness.

2 | METHODS

2.1 | Participants

Participants were parents of 560 children aged 5 to 12 years old, recruited from 4 elementary schools in the capital region of Iceland, both from the inner city and the suburbs. The questionnaires were sent home with 1331 children, and 560 (42%) were returned. No information was gathered on the children whose parents chose not to participate. Of the 560 children, 265 were girls (47.3%) and 260 were boys (46.4%); information on gender was missing for 35 (6.3%) children. A single parent per child completed the questionnaire. Of the 560 participating parents, 449 (80.2%) were mothers and 74 (13.2%) were fathers. Information on respondent's gender was missing for 37 parents (6.6%). Mean age of children was 8.53 years (SD 1.99) and parents was 38.33 years (SD 5.67; range 22-59 y). As the Icelandic population is very homogeneous, with 92% of the population of Norse-Celtic descent,[20] questions about exogenous factors such as race and ethnicity were not included in the study. Information on other demographic variables was not collected.

2.2 | Measures

The Children's Eating Behaviour Questionnaire (CEBQ) is a 35-item parent-report measure designed to assess 8 factors: food responsiveness, enjoyment of food, emotional overeating, desire to drink, satiety responsiveness, slowness in eating, emotional undereating, and fussiness.[7] The CEBQ was translated into Icelandic by 2 experts in clinical psychology and 1 expert in anthropology. All 3 were native Icelandic speakers and fluent in English, had lived in the United States, and had extensive knowledge of both cultural environments. Translators were chosen based on Geisinger's[21] guidelines, and the translation process was based on the guidelines set forth by the International Test Commission[22] and Hambleton.[23] The translators first made 3 individual translations of the CEBQ, and then met and discussed each item on the questionnaire to finally create a single version everyone agreed upon.

2.3 | Procedure

First, IRB approval was obtained from the Icelandic Data Protection Authority. Participants were then recruited by sending the CEBQ home with children in grades 1 to 7 from participating schools, along with a letter explaining the study and asking parents/legal guardians to fill out the questionnaire and send it back to the school. The letter also explained that the action of returning the questionnaire was considered as consent to participate. The study was completely anonymous; apart from the CEBQ questions, participants were only asked about gender and age of both the respondent and their child.

2.4 | Statistical analysis

In all, 70 respondents did not answer all of the items in the analysis and were, therefore, excluded from the analysis. Thus, the total number of answers analyzed was 490. Confirmatory factor analysis was used to evaluate the adequacy of the 4 different factor structures of the CEBQ scale that have been reported in the literature, using Mplus 7. The ordinal nature of the indicators was addressed by defining all of the indicators as categorical in Mplus. This uses the robust weighted least squares (WLSMV) estimator. The WLSMV estimator handles ordinal data well for moderately large samples.[24] Three common fit indices were adopted to evaluate fit of the overall model: comparative fit index (CFI), Tucker-Lewis index (TLI), and root mean square error of approximation (RMSEA). Although it is difficult to give precise cutoff values for these fit indices, the following general rules of thumb were used in the present study[25]: TLI/CFI > .95 (good fit), .90 to .95 (borderline fit), and < .90 (poor fit); RMSEA < .06 (good fit), .06 to .08 (fair fit), .08 to .10 (borderline fit), and >.10 (poor fit).

Four CFI models were tested. In the first model (model 1), the following 8 factors, reported in the original article from Wardle et al,[7] were specified: *food responsiveness* (5 items, eg, my child's always asking for food), *fussiness* (6 items, eg, my child enjoys tasting new foods), *enjoyment of food* (4 items, eg, my child enjoys eating), *desire to drink* (3 items, eg, if given the chance, my child would always be having a drink), *emotional undereating* (4 items, eg, my child eats less when s/he is upset), *emotional overeating* (4 items, eg, my child eats more when anxious), *satiety responsiveness* (5 items, eg, my child has a big appetite), and *slowness in eating* (4 items, eg, my child finishes his/her meal quickly). The first model hypothesized *a priori* that 1) the responses to all items could be explained by the 8 factors, 2) each factor measure had a nonzero loading on the factor, and 3) the error terms of each of the measures were not correlated. The correlations between factors were freely estimated. In the second model (model 2), the 7-factor model from Wardle et al[7] and Santos et al[11] was specified. The model tested assumed that the items originally measuring *satiety responsiveness* (SR) and *slowness in eating* (SE) had nonzero loadings on 1 factor (SR/SE). As before, the error terms of each of the items were not correlated and the correlations between factors were freely estimated. The third model (model 3) specified the 7 factors reported in the articles from Svensson et al[13] and Sleddens et al.[12] This model assumed that the items measuring the factors *emotional overeating* (EO) and *food responsiveness* (FR) loaded on 1 factor (EO/FR). Other specifications were identical to the specifications in the first model. In the fourth and final model (model 4), the 6 factors from Viana et al[14] were hypothesized *a priori*. In this model, the items measuring the factors *enjoyment of food* (EF) and *food responsiveness* (FR) had nonzero loadings on 1 factor (EF/FR), and the items that measured the factors *satiety responsiveness* (SR) and *slowness in eating* (SE) had nonzero loadings on 1 factor (SR/SE). The error terms of each of the items were not allowed to correlate, and the correlations between factors were freely estimated.

Since the 7- and 6-factor solutions are nested within the original 8-factor solution,[7] it is possible to test if the simpler solutions fit the data significantly worse. The Satorra-Bentler chi-square difference test was used to compare the fit of the nested models.[26] However, since the chi-square difference test is sensitive to sample size, the CFI was also used to test if the respecification of model 1 resulted in a significantly worse fit. To determine if an 8-factor model should be rejected, a cutoff value of .01 was selected for the CFI difference test.[27] Thus, a decrease in CFI higher than .01 suggests that the 8-factor solution fits the data better than the 7- or the 6-factor models. Value of .01 or lower, on the other hand, suggests that the simpler solution fits the data equally well as the 8-factor model.

TABLE 2 Goodness-of-fit indices of the confirmatory factor analysis

Model	CFI	TLI	RMSEA	CI for RMSEA	ΔCFI	SB χ^2	df	$\Delta\chi^2$	Δdf	Model Selected
8 factors[a]	.92	.91	.076	(.073;.080)		2054.9	532			
7 factors[b] (SR and SE)	.89	.88	.086	(.083-.090)	.03	2498.3	539	209.5	7	8 factors
7-factors[c] (EO and FR)	.90	.90	.083	(.080-.087)	.02	2367.1	539	171.0	7	8 factors
6-factors[d] (EF and FR) (SR and SE)	.79	.77	.12	(.117-.124)	.13	4423.7	545	855.5	13	8 factors

Abbreviations: $\Delta\chi^2$, delta chi-square; ΔCFI, delta comparative fit index; Δdf, delta degrees of freedom; CFI, comparative fit index; CI, confidence interval; df, degrees of freedom; EO, emotional overeating; EF, enjoyment of food; FR, food responsiveness; RMSEA, root mean square error of approximation; SB χ^2, Satorra-Bentler chi-square; SE, slowness in eating; SR, satiety responsiveness; TLI, Tucker-Lewis Index.

[a]Wardle et al[7]; Mallan et al[16]

[b]Wardle et al[7]; Santos et al[11].

[c]Svensson et al[13]; Sleddens et al[12]

[d]Viana et al[14]

3 | RESULTS

Table 2 shows the fit indices for each model and the results for the nested model comparisons. The original 8 factor model was first fitted. The CFI and TLI indices suggested that the fit was borderline acceptable and the RMSEA suggested that the fit was fair.

Next, a 7-factor model was fitted, where the original factors SR and the SE factors were merged into 1 factor. Both the CFI and TLI fit indices suggested a poor fit of this model and the RMSEA suggested that the fit was borderline. The Satorra-Bentler chi-square (SB χ^2) difference test showed that the 7-factor model fitted the data significantly worse than the 8-factor model ($P < .001$). Moreover, the value of the CFI difference test for the 8- and the 7-factor solutions was above the .01 cutoff value. The findings, therefore, supported the original 8-factor solution over the 7-factor model obtained by Wardle et al[7] and Santos et al.[11]

When a model was fitted in which the EO and FR factors were merged into 1 factor, all the fit indices suggested that the fit of this 7-factor model was borderline. The SB χ^2 difference test showed that the fit of the 7-factor (EO and FR) model fitted significantly worse than the original 8-factor model, and the CFI difference value was above the cutoff value of .01. Again, the model comparison findings were in favor of the original 8-factor model.

Finally, the 6-factor model presented in Viana et al[14] was estimated. In this model, the factors EF and FR, on the one hand, and SR and SE, on the other, were merged. All the fit indices indicated an unacceptable fit, and both the SB χ^2 ($P < .001$) and CFI difference tests suggested that the 6-factor model fitted the data significantly worse than the 8-factor model. Thus, the final model selected was the original 8-factor model.[7]

The factor loadings of the completely standardized solution for the selected 8-factor model are summarized in Table 3. All the items loaded significantly ($P < .001$) on their respective factors and in the expected direction. The lowest correlation ($r = .50$) was between the item "*My child eats less when s/he is tired*" (item 11) and the EU factor, and the highest (.96) was between the item "*If given the chance, my child would drink continuously throughout the day*" (item 29) and the DD factor.

The reliability of measurements obtained with different subscales was evaluated using Cronbach's alpha coefficient (Table 3). Cronbach's alpha ranged from .75 for the SR scale to .9 for the FF scale, suggesting acceptable reliability in all cases.

The correlation between the 8 latent factors and composite reliability for each scale is presented in Table 4. As expected, the relationships between SR and EF ($r = .77$), on the one hand, and FR and EO ($r = .74$), on the other, were quite strong, but not strong enough to suggest that construct redundancy is a problem for CEBQ. This conclusion is further supported by the fact that these factors are differently related with other factors measured with CEBQ. For instance, the correlation between SR and SE is $r = .59$, whereas the correlation between EF and SE is .32. Similarly, the correlation between FR and SR is $r = .44$, but the correlation between EO and SR is $r = .19$. Taken together, these findings support the conceptual uniqueness of the 8 factors measured with CEBQ.

4 | DISCUSSION

Targeting eating behaviors in children is important to prevent health-related problems, such as poor growth and obesity,[1,2,4] and a valid instrument to measure eating behaviors that are potentially health related is a prerequisite for detection and monitoring of children at risk. The 35-item Children's Eating Behavior Questionnaire (CEBQ), one of the most widely used measures of eating behaviors in children, is founded on an 8-factor conceptualization of eating styles.[7] However, factor-analytic studies of the 35-item CEBQ have caused controversy over the underlying factor structure and have raised concerns regarding the validity of the scale.

In the present study, 4 different CFA models of the CEBQ were examined based on previous research: 1) the original 8-factor model,[7] 2) a 7-factor model where the items originally measuring *satiety responsiveness* and *slowness in eating* were presumed to measure one factor,[7,11] 3) a 7-factor model where the items measuring *emotional overeating* and *food responsiveness* were hypothesized to measure 1 factor,[12,13] and finally 4) a 6-factor model where the factors *enjoyment of food* and *food responsiveness*, on the one hand, and *satiety responsiveness* and *slowness in eating*, on the other, were merged into 2 factors.[14] The models were tested on a sample of primary caregivers who rated the eating behaviors of their children aged 5 to 12.

The 8-factor model fitted the data reasonably well, and so did the 7-factor model where *satiety responsiveness* and *slowness in eating* were merged into 1 factor. The 8-factor model, however, fitted the data better. These findings are not congruent with the findings of

TABLE 3 Factor loadings and Cronbach's alpha reliability estimates of CEBQ subscales

CEBQ Item	Emotional Overeating (EO)	Enjoyment of Food (EF)	Satiety Responsiveness (SR)	Slowness in Eating (SE)	Food Responsiveness (FR)	Desire to Drink (DD)	Food Fussiness (FF)	Emotional Undereating (EU)
2	.83							
13	.82							
15	.84							
27	.84							
1		.86						
5		.75						
20		.77						
22		.88						
3			.89					
17			−.79					
21			−.58					
26			−.55					
30			−.51					
4				.83				
8				−.85				
18				−.67				
35				−.60				
12					.70			
14					.84			
19					.88			
28					.60			
34					.87			
6						.63		
29						.96		
31						.95		
7							.79	
10							−.87	
16							−.78	
24							.77	
32							−.91	
33							.83	
9								.84
11								.50
23								.70
25								.88
Cronbach's alpha	.80	.84	.75	.77	.82	.84	.90	.79

Abbreviation: CEBQ, Child Eating Behavior Questionnaire.

Santos et al[11] who examined the factor structure of CEBQ in a Chilean sample of the same age group. The fit of the other 7 factor model, where *emotional overeating* (EO) and *food responsiveness* (FR) were merged into 1 factor, was also acceptable, but again, worse than the 8 factor model. These results differ from those of Sleddens et al[12] and Svensson et al,[13] who factor analyzed the CEBQ items in samples of children from the Netherlands and Sweden. In both of those studies, the findings suggested that the items measuring EO and FR should load on one and the same factor.

When the 6-factor model was fitted to the data, the results showed a poor fit and a considerably worse fit than the 8-factor model, contrary to the findings of Viana et al.[14] They inspected the factor structure of the CEBQ in a sample of Portuguese children and their findings suggested that the factors *enjoyment of food* and *food responsiveness* should be merged into 1 factor, and the same applied to the factors *satiety responsiveness* and *slowness in eating*. There are probably many reasons for why the findings of the present study diverge from the above-mentioned ones. With the exception of Santos et al,[11] these studies focused on age groups that differed from the one in this study. Moreover, all of these studies used exploratory factor analysis (PCA), whereas CFA was used in the present study. Finally, the sample size in most of these studies was quite small for the analysis conducted, increasing the risk of obtaining unstable factor structures. This reason for why our findings diverge from those of these prior studies is supported by the fact that our findings concur with previous studies that have used larger samples using either CFA or PCA, and samples of

TABLE 4 Correlations between CEBQ latent factors

CEBQ Scale	EO	EF	SR	SE	FR	DD	FF	EU
Emotional overeating (EO)	…							
Enjoyment of food (EF)	0.25***	…						
Satiety responsiveness (SR)	0.190***	0.767***	…					
Slowness in eating (SE)	0.111*	0.321***	0.589***	…				
Food responsiveness (FR)	0.740***	0.465***	0.439***	0.244***	…			
Desire to drink (DD)	0.424***	0.028	−0.020	−0.052	0.543***	…		
Food fussiness (FF)	0.111	−0.615***	−0.476***	−0.159**	0.056	0.110*	…	
Emotional undereating (EU)	0.614***	−0.053	−0.267***	−0.177***	0.294***	0.292***	0.220***	…

Abbreviation: CEBQ, Child Eating Behavior Questionnaire.

*$P < .05$.

**$P < .01$.

***$P < .001$.

different age groups.[16-18] Taken together, these results support Wardle et al's[7] original theorization of eating styles and the conceptual uniqueness of the 8 factors measured with CEBQ.

The validity of the 8 factor structure was further corroborated with the fact that the correlation coefficients between the 8 factors never exceeded .77 (for *enjoyment of food* and *satiety responsiveness*). These findings do not support the claim that construct redundancy is a problem for the CEBQ but rather support a theoretical link between constructs. The link between finding food reinforcing and consuming larger portions is well documented, both in children and adults.[28,29] Reinforcing value of food has been defined as behavior indicating preference for food over nonfood alternatives,[28] and items on the *enjoyment of food* subscale (eg, looks forward to mealtime, loves food, and enjoys eating) seem to reflect such preferences. Items on the *satiety responsiveness*, on the other hand, mostly reflect the amount of food consumed (eg, leaving food on plate, becoming full easily), and as there is a correlation between finding food reinforcing and the amount of food consumed, a correlation between *enjoyment of food* and *satiety responsiveness* would be expected. The conclusion that these concepts are unique is further supported by the fact that *enjoyment of food* and *satiety responsiveness* are differently related to other factors measured by the CEBQ. For instance, the correlation between *satiety responsiveness* and *slowness in eating* is $r = .59$, whereas the correlation between *enjoyment of food* and *slowness in eating* is .32. Both satiety response and slowness in eating can be categorized as traits related to appetite control and, as discussed earlier, are expected to correlate, as satiety response can be reflected in a slower pace of eating over the course of a meal. Enjoyment of food, on the other hand, captures the subjective experience from eating and does not necessarily affect the pace.[7,30] Thus, different correlations between these variables are to be expected.

To further explore the psychometric properties of the Icelandic version of the CEBQ, reliability estimates and factorial validity were examined. The reliability coefficients for all 8 subscales were high and comparable with previous studies,[7,12,13,16-18] and all of the items loaded highly on their respective factor in the 8-factor model, demonstrating good factorial validity.

Two main limitations of this study should be noted. First, the lack of random sampling is a limitation, as participants were recruited using a convenience sampling technique. Furthermore, even though the sample was moderately large, research on the relationship between sample size and number of parameter estimates, number of indicator variables per factor, and communalities suggest that the sample in the current study may have potentially been too small.[31,32] Secondly, external variables measuring concepts theoretically related to eating response styles were not included in the study. Previous research has, for instance, examined the relationship between various factors of the CEBQ and child weight status,[3,5,10,13,14,17] but only Domoff et al[17] and McCarthy et al[33] have used all 8 subscales. It is, therefore, of interest to examine the relationship between all 8 dimensions of eating response styles and weight-related variables in future research, to further explore the validity of CEBQ. It is also important to note that even though the 8-factor model fitted the data better than the other 3 models, the difference in fit measures for the 8-factor model and the two 7-factor models was small. Nevertheless, the 8-factor model did fit the data significantly better than the other two, and the correlational analysis also supported the conceptual uniqueness of all 8 factors. This does not exclude the possibility of another true population model, which would likely allow cross-loadings. However, according to the principle of parsimony the simplest possible model should be chosen, which, based on the current data, is the 8-factor model.

Despite these limitations, the present study is the first to compare and test systematically different factor structures of CEBQ that have been obtained in previous studies and to provide rigorous evidence supporting the validity of the original 8-factor structure of the CEBQ.

5 | CONCLUSION

This study supports the original 8-factor structure of the CEBQ in a sample of school-aged children. Based on these results, we advise against combining any of the 8 subscales, as our findings suggest that all the subscales measure discrete constructs. It also suggests that the instrument functions adequately in this population and seems to have similar psychometric properties as the original UK version. The results, therefore, support the use of the instrument as a measure of 8 distinct eating style dimensions in the population of children 5 to 12 years old.

ACKNOWLEDGEMENTS

The authors would like to thank the parents who participated in the study and the staff of the participating schools for their help during data collection.

CONFLICT OF INTEREST

None declared.

AUTHOR CONTRIBUTIONS

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How to cite this article: Njardvik U, Klar EK, Thorsdottir F. The factor structure of the Children's Eating Behaviour Questionnaire: A comparison of four models using confirmatory factor analysis. *Health Sci Rep*. 2018;1:e28. https://doi.org/10.1002/hsr2.28

APPENDIX A

Number	Item content (my child ...)
1	Loves food
2	Eats more when worried
3	Has a big appetite
4	Finishes his/her meal quickly
5	Is interested in food
6	Is always asking for a drink
7	Refuses new foods at first
8	Eats slowly
9	Eats less when angry
10	Enjoys tasting new foods
11	Eats less when she/he is tired
12	Is always asking for food
13	Eats more when annoyed
14	If allowed to, would eat too much
15	Eats more when anxious
16	Enjoys a wide variety of foods
17	Leaves food on his/her plate at the end of a meal
18	Takes more than 30 min to finish a meal
19	Given the choice, would eat most of the time
20	Looks forward to mealtimes
21	Gets full before his/her meal is finished
22	Enjoys eating
23	Eats more when she/he is happy
24	Is difficult to please with meals
25	Eats less when upset
26	Gets full easily
27	Eats more when she/he has nothing else to do
28	Even if full she/he finds room to eat his/her favorite food
29	If given the chance, would drink continuously throughout the day
30	Cannot eat a meal if she/he has had a snack just before
31	If given the chance, would always be having a drink
32	Is interested in tasting food she/he hasn't tasted before
33	Decides that she/he doesn't like a food, even without tasting it
34	If given the chance, would always have food in his/her mouth
35	Eats more and more slowly during the course of a meal