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Original Article

Confirmatory factor analysis of the Child Feeding Questionnaire: a measure of parental attitudes, beliefs and practices about child feeding and obesity proneness

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The Child Feeding Questionnaire (CFQ) is a self-report measure to assess parental beliefs, attitudes, and practices regarding child feeding, with a focus on obesity proneness in children. Confirmatory factor analysis tested a 7-factor model, which included four factors measuring parental beliefs related to child's obesity proneness, and three factors measuring parental control practices and attitudes regarding child feeding. Using a sample of 394 mothers and fathers, three models were tested, and the third model confirmed an acceptable fit, including correlated factors. Internal consistencies for the seven factors were above 0·70. With minor changes, this same 7-factor model was also confirmed in a second sample of 148 mothers and fathers, and a third sample of 126 Hispanic mothers and fathers. As predicted, four of the seven factors were related to an independent measure of children's weight status, providing initial support for the validity of the instrument. The CFQ can be used to assess aspects of child-feeding perceptions, attitudes, and practices and their relationships to children's developing food acceptance patterns, the controls of food intake, and obesity. The CFQ is designed for use with parents of children ranging in age from about 2 to 11 years of age.

Introduction

Childhood obesity is increasingly pervasive, with prevalence rates roughly doubling during the past 2 decades (Troiano & Flegal, 1998). Today, nearly 25% of U.S. children are overweight. Genetic factors are implicated in obesity, but such dramatic secular increases in the prevalence of childhood obesity highlight the importance of environment and emphasize the pressing need for research that can delineate environmental factors implicated in the etiology of childhood obesity (Hill & Peters, 1998). The present research focuses on delineating one aspect of the family environment, parents' child-feeding practices, and evaluates a new instrument derived from a conceptual model that specifies how parenting practices can be linked to childhood obesity. This conceptual model provided the basis for the design of items to assess multiple aspects of parental control of child feeding, including parental perceptions, concerns, attitudes and practices.

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Parents play a central role in shaping a family eating environment, which provides a context for the child's early eating experience (Birch & Fisher, 1998). Parents' feeding attitudes and practices shape what foods the child is offered, exert control over the timing, size, and social context of meals and snacks, and set the emotional tone of eating occasions (Birch & Fisher, 1995). Early experimental research from our laboratory revealed that child-feeding practices had clear effects on the child's emerging food preferences (Birch *et al.*, 1980, 1984), intake patterns, and developing self-regulation of food intake (Birch *et al.*, 1987). More recent evidence links parents' child-feeding practices to their children's weight status (Birch & Fisher, 1998, 2000; Johnson & Birch, 1994). Taken together, these findings stress the potential importance of parents' child-feeding practices on their children's food acceptance patterns, and have led to hypotheses that child-feeding practices might be implicated as an environmental factor in childhood obesity (Birch & Fisher, 1998).

Conceptual framework

The Child Feeding Questionnaire (CFQ) was designed to assess parents' perceptions and concerns regarding child obesity, as well as child-feeding attitudes and practices. It is appropriate for use in research settings with parents of normally developing children, ranging in age from the preschool period through middle childhood. Costanzo and Woody's (1985) theory regarding the role of domain specific parenting in children's obesity proneness provided a basis for the development of the CFQ. In a departure from traditional perspectives on parenting (cf. Baumrind, 1966, 1980), Costanzo and Woody proposed that parents do not have a single, consistent parenting style. Rather, they suggested that parenting styles differed within parents, across domains of the child's development, and across children within the same family. Using the example of obesity proneness in children, Costanzo and Woody (1985) contended that parents are more likely to exert higher levels of external control over children's eating when the parent is concerned about the child's development and: (i) highly invested in health, fitness, or child weight issues; (ii) perceived the child to be at risk for developing eating and/or weight problems based on family history or other perceived risk factors; or (iii) did not believe that the child was capable of self control over eating. Costanzo and Woody hypothesized that high levels of parental control imposed in feeding may impede the development of children's self-control based on responsiveness to hunger and satiety cues.

Overview of CFQ development and preliminary studies

Three stages of development precede the research presented here. The first version of the CFQ (Johnson & Birch, 1994) consisted of 24 forced-choice items adapted from Costanzo and Woody's (1985) parent interview measuring parents' attitudes, beliefs, and tendency to use control in feeding and included items tapping parental concerns about child weight status, as well as items that assessed parental-feeding practices and the "balance of power" in the child-feeding relationship. In a sample of 77 families of preschool-aged children (46 girls, 31 boys), Johnson and Birch (1994) reported links between parental-control attitudes and practices and children's eating; parents who reported higher levels of control in child feeding had children who showed less adjustment of their intake in response to differences in the caloric density of foods. Consistent with Costanzo and Woody's ideas, they also noted that parents of heavier children reported using higher levels of control in the feeding context. In a second stage of development, items were revised and exploratory factor analysis was conducted on a larger sample of 275 parents of preschool-aged children. As in Johnson and Birch (1994), exploratory analyses revealed a factor measuring parental control in child feeding. Items relating to parents' perceptions, concerns, and inclination to use control in child feeding, however, loaded on three distinct factors: (i) parental concern about child weight; (ii) perceived child weight; and (iii) perceived parent weight.

In a third stage of development, items regarding parents' perceived responsibility for child-feeding tasks were added to facilitate an understanding of factors that might elicit parents' use of control in child feeding. With respect to the specifics of parental control in feeding, other research in our laboratory revealed that parents tended to use two distinct types of control, pressuring children to eat and restricting their access to snack foods, which were intended to address different problems with children's eating. First, experimental work indicated that pressuring children to consume "healthy" foods decreased children's preferences for those foods (Birch & Deysher, 1986; Birch *et al.*, 1984), although this practice was effective in increasing intake. Second, restricting children's access to snacks and "junk" foods increased intake of those foods when parental monitoring was removed (Birch *et al.*, 1980; Fisher & Birch, 1999a,b). As a result, items tapping parental use of restriction, and pressure to eat with their children were added to the CFQ. A third set of items, designed to tap parental monitoring, was also added.

The purpose of this research was to test the factor structure of the CFQ, using previous pilot testing and

exploratory analyses as a framework for the hypothesized structure. The current version of the CFQ contains items which measure seven different dimensions, including four factors tapping parental perceptions and concerns that may prompt use of controlling child-feeding practices: perceived parent weight, perceived child weight, parental concern about child weight, and parental responsibility. The other three factors assessed parental control attitudes and practices in child feeding, including the use of restriction, pressuring children to eat more, and monitoring. Specifically, this study: (i) tests the factor structure for the CFQ on an initial sample of 394 predominately non-Hispanic White parents living in Central Pennsylvania; (ii) confirms this solution on a second sample of 148 predominately non-Hispanic White parents living in the Denver, Colorado, metropolitan area; (iii) assesses the internal consistency and validity of the CFQ in both samples of predominately non-Hispanic White parents; and (iv) begins to assess the relevance of the CFQ to other ethnic groups by examining whether the structure of the CFQ confirmed in non-Hispanic White parents also fits the data from a sample of primarily Hispanic parents living in the Denver, CO, metropolitan area.

Methods

Participants

Sample 1

The participants in sample 1 included 394 parents recruited from central Pennsylvania for participation in a larger study on growth, nutrition, and development in 5 to 9-year-old girls. Eligibility criteria for family participation included the absence of severe food allergies or chronic medical problems affecting food intake in the child, the absence of dietary restrictions involving animal products, and both biological parents living with the child. On average, parents were in their mid-30s (mothers $35{\cdot}4 \pm 0{\cdot}3$ years; fathers $37{\cdot}4 \pm 0{\cdot}38$). Most fathers (97%) and almost two-thirds of mothers (63%) were currently employed, reporting an average of 45 h and 20 h per week, respectively. Twenty-nine percent of reported family incomes were below \$35 000, 35% between \$35 000–\$50 000, and 36% above \$50 000. Parents were well-educated, with mothers reporting 15 years (range = 12–20) of education and fathers reporting 15 years (range = 12–20). Parents were, on average, overweight as defined by body mass index (BMI; weight (kg)/height (m^2)) of >25 (World Health Organization, 1998), with mean BMI of 25·8 for mothers, and 28·0 for fathers.

Sample 2

The participants in sample 2 included 148 parents of 8 to 11-year-old children (53 boys, 67 girls) attending a private school in the Denver, CO, area. Families were primarily non-Hispanic White (85%), African American (9%), or Hispanic (4%). Eighty-eight percent of parents were living in a two-parent household. On average, parents were in their early 40s (mothers = $41{\cdot}6 \pm 0{\cdot}5$ years; fathers = $43{\cdot}5 \pm 0{\cdot}7$). Eligibility criteria for children's participation included the absence of severe food allergies or chronic medical problems affecting food intake, and the absence of dietary restrictions involving animal products. All fathers and almost two-thirds of mothers (68%) were currently employed. Mean education was 18·0 years for mothers and 18·4 years for fathers. Most parents were of normal weight (World Health Organization, 1998), with mean BMI = 24·0 for mothers and 25·7 for fathers.

Sample 3

The participants in sample 3 included 126 parents of 7 to 11-year-old boys and girls (63 boys, 63 girls) attending a public school in the Denver, CO, area. Families were recruited for participation in the study through the school and by letters sent to the parents. Eligibility criteria for children's participation included the absence of severe food allergies or chronic medical problems affecting food intake, and the absence of dietary restrictions involving animal products. Families were primarily Hispanic (90%) or non-Hispanic White (6%). Eighty-eight percent of parents were living in a two-parent household. On average, parents were in their early 30s (mothers = $33{\cdot}4 \pm 10{\cdot}6$ years; fathers = $35{\cdot}6 \pm 0{\cdot}7$). Nearly all fathers (94%) and two-thirds of mothers (66%) were currently employed. Mean education was $10{\cdot}4 \pm 0{\cdot}3$ years for mothers and $9{\cdot}7 \pm 0{\cdot}5$ years for fathers. On average, parents were overweight (World Health Organization, 1998) with a mean BMI = 29·0 for mothers, and 28·2 for fathers.

Measures

The child feeding questionnaire

The CFQ (see Appendix for girls' version) contains 31 items, loading on seven factors. Four hypothesized factors pertain to parental perception of child and parent weight, and concern about weight, which may elicit parental control in feeding: (i) *Perceived responsibility* (three items), assessing parents' perceptions of their responsibility for child feeding (e.g. "*When your child is at home, how often are you responsible for feeding*

her?"); (ii) *Parent perceived weight* (four items), assessing parents' perceptions of their own weight status history; (iii) *Perceived child weight* (three items), assessing parents' perceptions of their child's weight status history; and (iv) *Parents' concerns about child weight* (three items), assessing parents' concerns about the child's risk of being overweight (e.g. "*How concerned are you about your child becoming overweight*?"). Three additional hypothesized factors assess parents' attitudes and practices regarding their use of controlling child feeding strategies: (1) *Monitoring* (three items), assessing the extent to which parents oversee their child's eating (e.g., "How much do you keep track of the high fat foods that your child eats?"), (2) *Restriction* (eight items), assessing the extent to which parents restrict their child's access to foods (e.g., "I intentionally keep some foods out of my child's reach"), and (3) *Pressure to Eat* (four items), assessing parents' tendency to pressure their children to eat more food, typically at mealtimes (e.g., "My child should always eat all the food on her plate"). All items were measured using a 5-point Likert-type scale, with each point on the scale represented by a word anchor.

Children's weight status

Height and weight measurements were obtained by a trained staff member following those procedures described by Lohman *et al.* (1988). Children were dressed in light clothing and were measured without shoes. Height was measured in triplicate to the nearest 10th of a centimeter. Weight was measured in triplicate to the nearest 10th of a kilogram. Age and gender appropriate reference data were used to convert measurements to weight-for-height percentile scores (Hamill *et al.*, 1979).

Statistical analysis

To test whether the hypothesized 7-factor model provided a good fit to the data, structural equation modeling was used (LISREL, version 8·30) to estimate the model and assess its fit to the data in sample 1. The seven factors included perceived feeding responsibility, perceived parent weight, perceived child weight, concerns about child weight, restriction, pressure to eat, and monitoring. Once we examined the fit of the data to sample 1, samples 2 and 3 were used to determine whether the 7-factor structure of the CFQ could be confirmed in a second independent sample of primarily non-Hispanic White parents and in a third independent sample of primarily Hispanic parents. In each sample, a series of models were tested, and information about discrepancies in model fit available from residual values were used to make *post hoc* modifications to improve model fit. Therefore, the specifications of the final model tested in sample 1 provided the starting point for testing the fit of the 7-factor model in samples 2 and 3.

To determine how well the 7-factor model fit the data from each sample, we focused on four fit indices, following the advice of Byrne (1998): the χ^2 test, the Non-Normed Fit Index (NNFI) (Bentler & Bonett, 1980; Tucker & Lewis, 1973), the Comparative Fit Index (CFI) (Bentler, 1990, 1992), and the root mean square error of approximation (RMSEA) (Steiger, 1990). The χ^2 test assesses the fit of the model by comparing the obtained sample correlation matrix with the correlation matrix estimated under the model. Small χ^2 values indicate a good fit, reflecting the small discrepancy between the structure of the observed data and the hypothesized model. Additional fit indices were considered because the χ^2 test is extremely sensitive to sample size. The NNFI and CFI indices compare the hypothesized model to a "null" or worst fitting model, taking into account model complexity, and NNFI and CFI values $> 0{\cdot}90$, indicate increasing good fit as they approach an upper bound of 1. The RMSEA reflects how close the model fit approximates a reasonably fitted model, and indicates good model fit with values $< 0{\cdot}05$. Using LISREL, these four types of fit statistics were generated separately for each model and were compared across competing models in order to make decisions regarding the best fitting models for each sample. The initial model was thus modified to yield a best fitting model for sample 1, and this model was fit to the data of sample 2 and sample 3.

Descriptive statistics were used to describe mean item scores of sample 1. Because each scale was designed to be internally consistent, Cronbach's alphas were evaluated for items on each of the seven factors of the final model for sample 1. Pearson correlations were used to evaluate relationships between mean item scores on each of the seven CFQ factors and children's weight status (weight-for-height percentiles; Hamill *et al.*, 1979) for samples 1 and 2.

Results

Results of the confirmatory factor analysis assessing the fit of the 7-factor model to the sample 1 data are presented, followed by a description of modifications made to improve model fit. Next, we attempted to confirm the fit of the final model obtained from the analyses of sample 1 using the data from sample 2, and sample 3.

Fit statistics for the 7-factor model, sample 1

Fit statistics for model 1, the hypothesized 7-factor model, are given in Table 1. Model 1 specifications

Table I. Goodness of fit indices for the child feeding questionnaire 7-factor model in sample 1

	$\chi^2(df)$	$\Delta\chi^2(\Delta df)$	RMSEA	CFI	NNFI
Model 1: 7-factor model	637* (252)	—	0·06	0·89	0·88
Model 2: 7-factor model, correlated factors	464* (231)	173* (21)	0·05	0·93	0·92
Model 3: 7-factor model, correlated factors, 2 error covariances[a]	419* (229)	45* (2)	0·04	0·95	0·94

[a]Correlated errors between (PPW1 and PPW2) and (PCW1 and PCW2).
CFI, Comparative Fit Index; RMSEA, root mean square error of approximation; NNFI, Non-normed Fit Index.
*$p < 0·05$.

Table 2. Estimated factor–factor correlations for the final 7-factor model in sample 1

	1	2	3	4	5	6	7
Perceived responsibility	—						
Perceived parent weight	0·06	—					
Perceived child weight	0·04	0·10	—				
Concern about child weight	0·07	0·17[a]	0·25[a]	—			
Restriction	0·05	0·01	0·18[a]	0·29[a]	—		
Pressure to eat	−0·15[a]	−0·07	−0·31[a]	0·00	0·34[a]	—	
Monitoring	0·28[a]	−0·03	0·02	0·13	0·31[a]	0·05	—

[a]Statistically different from zero.

included uncorrelated factors, uncorrelated errors, and the variance of one item on each factor fixed to 1. Based on the fit indicators, model 1 showed marginal fit, as indicated by the RMSEA, CFI and NNFI values. Although χ^2 values for this model were significant, with larger sample sizes, relatively small discrepancies between the observed data matrix and the predicted matrix can result in significant χ^2 values. Information from the residual values indicated that fit could be improved by estimating the correlations between factors. Model 2 included these factor–factor correlations (see Table 1), and showed improved model fit, as indicated by the reduction in χ^2 value in comparison to Model 1, and relative to the change in degrees of freedom. The RMSEA, CFI and NNFI for the correlated factor model indicated acceptable fit.

Based on examination of the residuals for model 2, model 3 included estimation of two additional correlated error terms. Two error covariances were estimated: between perceived parent weight items PPW1 and PPW2 (see Appendix for description of items) and between perceived child weight items PCW1 and PCW2. Because both of these pairs of items request retrospective reports of weight status, correlated errors between them seem plausible. Comparison of model 2 to model 3 revealed that model 3 represented an improvement in model fit, as indicated by the change in χ^2. RMSEA, CFI and NNFI indices showed a modest improvement when estimating two error covariances. Therefore, model 3 was designated the final model.

Description of the final 7-factor model, sample 1

Factor correlations between factors for the final model are presented in Table 2. There was significant variability in factor scores; all factor variances were statistically different than zero. As shown in Table 2, the highest correlations between factors were between restriction and pressure to eat scales and restriction and monitoring scales. Higher levels of restriction were associated with greater monitoring, and greater pressure to eat. In addition, the pressure to eat scale was significantly negatively associated with perceived child weight, indicating that parents who perceived their child as being thinner reported using higher levels of pressure to eat with the child.

Table 3 shows item variances, factor loadings, and direct factor-item correlations. All items were meaningful indicators of the factors, as indicated by item loadings. Factor loadings ranged from 0·37 to 0·95, with 21 of 24 direct factor-item correlations greater than 0·50. Descriptive statistics for mean factor scores and the internal consistency (Cronbach's alpha) of items on each factor were generated for the final model (Table 4). As shown in Table 4, all internal consistencies were within acceptable levels.

Confirmation of the 7-factor model, sample 2

The final model from the analyses of sample 1, model 3 (see Table 1), was fit to the data from sample 2. As described above, and shown in Table 1, model 3 included correlated factors and correlated errors. The fit statistics for Model 3 for the sample 2 data appear in Table 5, and reveal that Model 3 showed marginal fit, as indicated by the RMSEA, CFI, and NNFI values. Residual indices indicated that fit of the model could be improved by estimating the cross loading of restriction item, RST3A,B, on the pressure to eat sub-scale. This modification resulted in an improvement in all indices of model fit (Table 5, model 4). A second modification was made by estimating an additional error covariance

Table 3. Estimated factor-item loadings, item variances, and factor variances for the final 7-factor model in sample 1

Item	Perceived responsibility	Perceived parent weight	Perceived child weight	Concern	Restriction	Pressure to eat	Monitor	Item variance
RSP1	0·83							0·70
RSP2	0·79							0·62
RSP3	0·85							0·73
PPW1		0·39						0·15
PPW2		0·60						0·36
PPW3		0·78						0·62
PPW4		0·57						0·32
PCW1			0·52					0·27
PCW2			0·73					0·53
PCW3			0·90					0·81
CN1				0·59				0·35
CN2				0·78				0·61
CN3				0·78				0·60
RST1A,B,C[a]					0·57			0·33
RST2					0·37			0·14
RST3A,B[a]					0·44			0·19
RST4A,B[a]					0·71			0·50
PEl						0·44		0·19
PE2						0·71		0·51
PE3						0·55		0·30
PE4						0·72		0·52
MN1							0·87	0·76
MN2							0·95	0·90
MN3							0·68	0·47
Factor variance	0·97	0·10	0·19	1·50	0·78	0·92	0·75	

[a]Items combined (see Appendix) prior to model fitting using principal component analysis.

Table 4. Descriptive statistics and internal consistency estimates for the final 7-factor model in sample 1

Factor	Mean ± *SD*	Range	Internal consistency
Perceived responsibility	3·4 ± 0·95	1–5	0·88
Perceived parent weight	3·1 ± 0·78	1–5	0·71
Perceived child weight	2·9 ± 0·50	1–5	0·83
Concern about child weight	2·3 ± 1·15	1–5	0·75
Pressure to eat	2·5 ± 0·95	1–5	0·70
Restriction	4·0 ± 0·78	1–5	0·73
Monitoring	3·6 ± 0·91	1–5	0·92

between items perceived parent weight items PPWl and PPW3 (Table 5, model 5). This modification resulted in a further improvement of fit, and the RMSEA, CFI, and NNFI values for this model are above acceptable levels. The 7-factor model was confirmed using the data from sample 2, with minor modifications, providing additional support for the 7-factor structure of the CFQ.

Table 5. Goodness of fit indices confirming the 7-factor model in Sample 2

	χ^2 (*df*)	$\Delta\chi^2$ (Δdf)	RMSEA	CFI	NNFI
Model 3: 7-factor solution[a]	391 (229)	—	0·07	0·87	0·84
Model 4: 7-factor solution, item cross loading[b]	330 (228)	61* (1)	0·06	0·91	0·89
Model 5: 7-factor solution, item cross loading, 1 error covariance[c]	309 (227)	21* (1)	0·05	0·92	0·91

[a]Model 3, Table 1.
[b]Restriction item # RST3A,B crossloading on pressure to eat subscale.
[c]Correlated error between items # PPW1 and # PPW3.
CFI, Comparative Fit Index; RMSEA, root mean square error of approximation; NNFI, Non-normed Fit Index.
*$p < 0·05$.

Relationships between CFQ sub-scales scores and child weight status, samples I and 2

Because the CFQ was designed to address parents' child-feeding beliefs, concerns, and practices as they are

Table 6. Associations between parents' CFQ scores and child weight status in samples 1 and 2

CFQ sub-scale	Children's weight-for-height status (%) *r*	
	Sample 1	Sample 2
Responsibility	0·04^{ns}	0·20*
Perceived parent weight	0·30**	0·40**
Perceived child weight	0·43**	0·50**
Concerns about child weight	0·46**	0·35**
Pressure to eat	−0·26**	−0·14^{ns}
Restriction	0·13*	0.11^{ns}
Monitoring	0·04^{ns}	0·15^{ns}

*$p = 0{\cdot}06$; **$p < 0{\cdot}001$; ns, not significant.

related to the child's obesity proneness, we predicted that parent's scores on six of the seven factors (excluding perceived responsibility—see Appendix for a listing of items loading on each factor) should be correlated with the child's weight status. The correlations between parents' factor scores and the child's weight status for each of the seven factors appear in Table 6, and reveal that parents' factor scores were related to their child's weight status in predicted directions. Associations between child weight status and CFQ sub-scale scores were of the same direction and similar magnitude across samples. Consistent with predictions, significant correlations were obtained between child's weight status (weight/height percentiles), and parents' scores on four of the factors. Perceived parent weight, perceived child weight, and concerns about child weight were positively related to the child's weight status, and pressure to eat was negatively related to child's weight status (statistically significant only in sample 1). In addition, Restriction was marginally positively related to the child's weight status; monitoring was not related to the child's weight status.

Fit statistics for the 7 factor model, sample 3

The final model from the analyses of sample 1, model 3 (see Table 1), was fit to the data from sample 3. The fit statistics for that model appear in Table 7. The χ^2 value for sample 3 was significant, indicating that the hypothesized model differed from the observed correlation matrix. The RMSEA, CFI, and NNFI values were also below acceptable levels. Review of the item loading estimates revealed that the loadings for Pressure to Eat items PEl and PE2 as well as Restriction items RST3A and RST3B were not significantly different from zero. These items were dropped and the model fit was re-estimated. These modifications resulted in an acceptable fit with improvement in all fit indices (Table 7, model 2).

Table 7. Goodness of fit indices confirming the 7-factor model in sample 3

	χ^2 (*df*)	$\Delta\chi^2$ (*df*)	RMSEA	CFI	NNFI
Model 1: 7-factor solution[a]	352 (229)	—	0·056	0·85	0·82
Model 2: 7-factor solution, three items removed[b]	232 (166)	120 (63)	0·05	0·91	0·89

[a]Final model from sample 1: correlated factors and correlated errors between (PPW1 and PPW2) and (PCW1 and PCW2).
[b]Two items from the pressure to eat sub-scale PEl and PE2 and 1 composite item from the restriction sub-scale RST3A,B.

Discussion

The CFQ was designed based on Costanzo and Woody's (1985) model, and includes seven factors; four factors measuring aspects of parents' perception and concerns regarding child risk for obesity, and three factors assessing parents' use of controlling feeding practices. Following initial scale development, confirmatory factor analysis revealed that the 7-factor model fit the data well, for two separate non-Hispanic white samples, and with minor modification, also fit the data from an Hispanic sample.

Costanzo and Woody (1985) proposed that the extent to which parents impose control in feeding is prompted by perceptions and concerns regarding the child's risk for obesity, especially by a currently overweight phenotype. The use of parental control in child feeding is hypothesized to have adverse effects on the child's subsequent eating and weight status by impeding the child's opportunities for the development of self control in the eating domain. Turkheimer and Waldron (2000) have argued that such differences among siblings' phenotypes can promote differential treatment of children and result in nonshared environmental effects within families. Parents' feeding practices that are shaped by the child's weight status provide an example of these non-shared environmental effects, and there is some evidence that these feeding practices can promote disregulation of intake, problems of energy balance, and possibly, increasing childhood weight status. This view of children's "obesity proneness" was used to guide the development of the CFQ, a self report instrument for use with parents that assesses parents' beliefs and attitudes relevant to the parental investment in the child's weight status, the child's risk for obesity or eating problems,

and parental control, attitudes, and practices regarding child feeding.

This model of domain specific parenting also indicates that while parenting is a response to the child's phenotype for weight, parenting is also causally implicated in promoting the development of problems in the controls of food intake and childhood obesity. Relationships between child-feeding practices and children's eating and weight have been established in experimental work, which has shown that the imposition of external controls on children's eating results in problems in regulating energy intake, in particular, a reduced responsiveness to the energy density of foods as a control of food intake (Birch & Deysher, 1986; Birch *et al*., 1980, 1989). Research has substantiated that young children are capable of regulating energy intake (Birch & Deysher 1986; Birch *et al*., 1989, 1991, 1993). However, responsiveness to internal cues is readily disrupted by the imposition of child-feeding practices that refocus the child from internal hunger and satiety cues to aspects of the eating environment, such as the amount of food remaining on the plate, as is often the case with pressure to eat (Birch *et al*., 1987). Reduced responsiveness to internal hunger and satiety cues has been associated with greater childhood weight (Birch & Fisher, 2000; Fisher & Birch, 1999a; Johnson & Birch, 1994). Collectively, these findings are especially important due to the dramatic increases in childhood obesity and obesity among U.S. children in recent decades which underscores the need to measure aspects of the environment that may foster childhood obesity. To adequately assess the role of parents' child-feeding practices within the family context on the etiology of childhood obesity, a measure of parenting practices was needed to assess parents' child feeding practices and beliefs outside the laboratory; the CFQ was designed to fulfill that need.

The 7-factor child-feeding questionnaire focused on two broad categories of factors: (i) parental perceptions and concerns regarding their child's obesity proneness; and (ii) parental use of child-feeding practices, especially restriction and pressure to eat, that can impede the development of adequate self control of eating in the child. Results indicate that a 7-factor model provided an acceptable fit to the data in two separate samples of families. Acceptable model fit was observed in both samples, despite differences between samples in geographic location, the socioeconomic status and weight status of the parents, and the age and gender composition of the children in the two samples. The 7-factor solution provided, with minor modification, acceptable fit in a small sample of lower socioeconomic Hispanic parents of elementary school-aged boys and girls. This provides further evidence that the CFQ can be appropriate for use with families with children from preschool age to the end of middle childhood, and with minor modification fit data from a Hispanic sample as well, suggesting that broader application may be appropriate.

The fact that the Hispanic responses to the pressure to eat and restriction items were not identical to the responses of the non-Hispanic white sample is consistent with previous reports of child feeding practices of Mexican American mothers. Olvera-Ezzell and colleagues reported that Mexican American mothers were unlikely to use forced compliance, reward, threat, or bribe in their attempts to influence the amounts their children consume (Olvera-Ezzell *et al*., 1990). While Mexican American mothers are often more permissive in parenting and frequently offer their children food, they may not use coercive strategies to force their children to consume more food. One of the limitations of the instrument is that data have not been obtained from African American samples to test the model fit among this group. Because rates of childhood obesity are especially high among African Americans (Lacar *et al*., 2000), additional research investigating the validity of the CFQ for use with this population is especially pressing.

Further work with the instrument is needed to establish its reliability and validity. Limited evidence for validity of the CFQ is provided by the observed relationships between CFQ factors and independent measures of children's weight status. As expected, factors designed to measure parental concerns and beliefs regarding the child's risk for obesity (perceived parent weight, perceived child weight, and concerns about child weight) were significantly positively related to the child's weight status. Parents' reports of their use of control in child feeding (pressure to eat, restriction) were also related to the child's weight status in expected directions; parents of heavier children reported using less pressure to eat, and greater use of restriction of the child's access to foods. Because the data presented here are cross-sectional, they cannot speak to the causal direction of these relationships, and longitudinal data are needed to definitively determine whether the extent to which parental control practices are causally implicated in childhood obesity. For example, research conducted with longitudinal data linking parenting practices tapped by the CFQ to children's subsequent eating and weight status is needed to determine whether CFQ subscales, in addition to reflecting parental reaction to the child's weight status, predict and are causally involved in increases in child weight status.

The CFQ provides a tool for assessing one aspect of the family environment: parents' perceptions, beliefs, attitudes, and practices regarding child feeding relevant to the development of obesity proneness in children. With important clinical outcomes linked to obesity and

research increasingly pointing to the role of the environment in the etiology of childhood overweight and obesity, the CFQ should be useful in research, but additional measurement work is needed to determine the extent to which this instrument is appropriate for use with diverse populations and to determine its clinical utility.

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Appendix

Table AI. Child Feeding Questionnaire factors, items, and response options. To create a factor score for each of the seven factors, calculate the mean score for the items loading on that factor

Factor	Variable name	Order (#)	Question	Response options
Perceived responsibility	PR1	1	When your child is at home, how often are you responsible for feeding her?	1 = never; 2 = seldom; 3 = half of the time; 4 = most of the time; 5 = always
	PR2	2	How often are you responsible for deciding what your child's portion sizes are?	
	PR3	3	How often are you responsible for deciding if your child has eaten the right kind of foods?	
Perceived parent weight	PPWl	4	Your Childhood (5 to 10 years old)	1 = markedly underweight; 2 = underweight; 3 = normal; 4 = overweight; 5 = markedly overweight
	PPW2	5	Your adolescence	
	PPW3	6	Your 20s	
	PPW4	7	At present	
Perceived child weight	PCW1	8	Your child during the first year of life	1 = markedly underweight; 2 = underweight; 3 = normal; 4 = overweight; 5 = markedly overweight
	PCW2	9	Your child as a toddler	
	PCW3	10	Your child as a pre-schooler	
	Not used in analysis due to sample age	11	Your child kindergarten through 2nd grade	
		12	Your from child 3rd through 5th grade	
		13	Your child from 6th through 8th grade	
Concern about child weight	CNI	14	How concerned are you about your child eating too much when you are not around her?	1 = unconcerned; 2 = a little concerned; 3 = concerned; 4 = fairly concerned; 5 = very concerned
	CN2	15	How concerned are you about your child having to diet to maintain a desirable weight?	
	CN3	16	How concerned are you about your child becoming over weight?	
Restriction	RST1A	17	I have to be sure that my child does not eat too many sweets (candy, icecream, cake or pastries)	1 = disagree; 2 = slightly disagree; 3 = neutral; 4 = slightly agree; 5 = agree
	RST1B	18	I have to be sure that my child does not eat too many high-fat foods	
	RST1C	19	I have to be sure that my child does not eat too much of her favorite foods	
	RST2	20	I intentionally keep some foods out of my child's reach	
	RST3A	21	I offer sweets (candy, ice cream, cake, pastries) to my child as a reward for good behavior	
	RST3B	22	I offer my child her favorite foods in exchange for good behavior	
	RST4A	23	If I did not guide or regulate my child's eating, she would eat too many junk foods	
	RST4B	24	If I did not guide or regulate my child's eating, she would eat too much of her favorite foods	
Pressure to eat	PE1	25	My child should always eat all of the food on her plate	1 = disagree; 2 = slightly disagree; 3 = neutral; 4 = slightly agree; 5 = agree
	PE2	26	I have to be especially careful to make sure my child eats enough	
	PE3	27	If my child says "I'm not hungry", I try to get her to eat anyway	
	PE4	28	If I did not guide or regulate my child's eating, she would eat much less than she should	
Monitoring	MN	29	How much do you keep track of the sweets (candy, ice cream cake, pies, pastries) that your child eats?	1 = never; 2 = rarely; 3 = sometimes; 4 = mostly; 5 = always
	MN	30	How much do you keep track of the snack food (potato chips, Doritos, cheese puffs) that your child eats?	
	MN	31	How much do you keep track of the high-fat foods that your child eats?	