Systematic Development and Validation of a Theory-Based Questionnaire to Assess Toddler Feeding[1,2]

Kristen M. Hurley,[3,4]* M. Reese Pepper,[3,5] Margo Candelaria,[3] Yan Wang,[3] Laura E. Caulfield,[4] Laura Latta,[3] Erin R. Hager,[3] and Maureen M. Black[3]

[3]Department of Pediatrics, University of Maryland School of Medicine, Baltimore, MD; [4]Center for Human Nutrition, Department of International Health, The Johns Hopkins Bloomberg School of Public Health, Baltimore, MD; [5]Department of Pediatrics, MedStar Georgetown University Hospital, Washington, DC

Abstract

This paper describes the development and validation of a 27-item caregiver-reported questionnaire on toddler feeding. The development of the Toddler Feeding Behavior Questionnaire was based on a theory of interactive feeding that incorporates caregivers' responses to concerns about their children's dietary intake, appetite, size, and behaviors rather than relying exclusively on caregiver actions. Content validity included review by an expert panel ($n = 7$) and testing in a pilot sample ($n = 105$) of low-income mothers of toddlers. Construct validity and reliability were assessed among a second sample of low-income mothers of predominately African-American (70%) toddlers aged 12–32 mo ($n = 297$) participating in the baseline evaluation of a toddler overweight prevention study. Internal consistency (Cronbach's α: 0.64–0.87) and test-retest (0.57–0.88) reliability were acceptable for most constructs. Exploratory and confirmatory factor analyses revealed 5 theoretically derived constructs of feeding: responsive, forceful/pressuring, restrictive, indulgent, and uninvolved (root mean square error of approximation = 0.047, comparative fit index = 0.90, standardized root mean square residual = 0.06). Statistically significant ($P < 0.05$) convergent validity results further validated the scale, confirming established relations between feeding behaviors, toddler overweight status, perceived toddler fussiness, and maternal mental health. The Toddler Feeding Behavior Questionnaire adds to the field by providing a brief instrument that can be administered in 5 min to examine how caregiver-reported feeding behaviors relate to toddler health and behavior. J. Nutr. 143: 2044–2049, 2013.

Introduction

Childhood overweight/obesity is a major public health problem that can have long-term health consequences. In the past 30 y, childhood overweight/obesity has reached epidemic proportions, particularly among minority and/or low-income populations in high-income countries (1). During early childhood, eating behaviors are established that can influence overweight/obesity risks through adolescence and adulthood (2–4). Early life experiences around eating are influenced by parental feeding behaviors and attitudes, which may translate into differences in dietary intake and growth patterns, making the first few years of life an ideal period to help children establish healthy eating behaviors and avoid overweight/obesity (5–7).

Established patterns of parenting behavior are embedded within dimensions of responsivity and control (8,9) and have been used to describe parental feeding behaviors (10,11). Responsive feeding is characterized by caregiver guidance and an appropriate response to a child's cues of hunger and satiety. Nonresponsive feeding is characterized by a lack of developmentally appropriate or sensitive reciprocity between the caregiver and child, which includes excessive caregiver control (forcing/pressuring or restricting food intake), excessive parental passivity or child control (indulgence), or caregiver disregard (uninvolved) (11). Caregivers who force or restrict food intake may be more authoritarian overall in their parenting or may have specific concerns about their child's dietary intake, appetite, size, and propensity to overeat or refuse food, leading to more controlling feeding behaviors. Caregivers who exhibit indulgent feeding behaviors may be more permissive in their parenting; may rely on food rewards to manage their child's behavior; or may be responding to concerns about their child's intake, size, or food refusal (11).

Responsive parenting has benefits for the child that include better health outcomes and cognitive and psychosocial development (12,13). Similar to findings within the child development literature showing low rates of responsivity among mothers with depressive symptoms (14), maternal mental health symptomatology

is associated with reports of nonresponsive feeding behaviors (15,16). Support also exists for associations between nonresponsive feeding behaviors and perceptions of child fussiness (15–17) and poor child dietary intake as well as overweight/obesity (5–7,18).

Caregiver-reported questionnaires are available to assess feeding behaviors of young children, including measures used in predominately Caucasian [Child Feeding Questionnaire (CFQ)[6]] (19), African American and Latino [Caregiver's Feeding Styles Questionnaire (CFSQ)] (10), and Latino [Toddler Feeding Questionnaire (TFQ)] families (7). The CFQ assesses parental perceptions and behaviors around child feeding; the CFSQ assesses authoritative, authoritarian, indulgent, and uninvolved feeding styles (10); and the TFQ assesses environmental food influences and authoritative and indulgent feeding (7). The CFQ and CFSQ were developed to be administered to caregivers of children of varying ages [e.g., 2–11 y (CFQ) and 3–5 (CFSQ)], and the TFQ was developed specifically for use with Latino families of toddlers.

In a previous statewide sample of low-income mothers of infants receiving WIC (Special Supplemental Nutrition Program for Women, Infants, and Children), we developed and validated the Infant Feeding Questionnaire (15), which used established patterns of parenting behavior embedded within dimensions of responsivity and control (8,9) to assess 5 theorized feeding dimensions (responsive, pressuring/forceful, restrictive, indulgent, and uninvolved) (10,11). The current study extends this work by developing and validating a questionnaire that focuses specifically on the same 5 theorized feeding dimensions within a low-income sample of WIC toddlers 1–3 y of age, a time critical to the development of eating behaviors and prevention of feeding problems.

The two objectives of the current study are to: 1) develop a brief, caregiver-assessment tool (i.e., questionnaire) that examines the 5 dimensions of toddler feeding among caregivers with toddlers 1–3 y of age that can be easily incorporated into field studies across samples, and 2) evaluate the validity and reliability of the questionnaire among a low-income sample of caregivers of toddlers. We hypothesized that: 1) a self-report questionnaire can be used to identify the 5 dimensions of feeding, and 2) the 5 dimensions of feeding meet criteria for convergent validity through associations with maternal report of mental health symptomatology, maternal perceptions of toddler fussiness, and toddler overweight.

Participants and Methods

All data collection instruments and procedures were approved by the institutional review boards from the University of Maryland School of Medicine and the Maryland Department of Health and Mental Hygiene. Mothers provided written informed consent for their participation and the participation of their toddler.

Study design and sample
Two samples were recruited. The first was a pilot sample (n = 105) of low-income mothers of toddlers aged 12–36 mo recruited from an urban pediatric clinic. They were enrolled in a study that monitors the health and development of young children (20).

The second sample included baseline data from low-income mothers (n = 304) participating in the Toddler Overweight Prevention Study (TOPS), a randomized controlled intervention trial designed to prevent rapid weight gain and overweight/obesity among toddlers. The TOPS sample included biological mothers of toddlers aged 12–32 mo, born at term, with a birth weight >2500 g who were recruited from 2 sites: a suburban WIC clinic and an urban pediatric clinic serving predominantly low-income families. Of the 304 recruited mothers of toddlers, 2.5% of participants (n = 7) had incomplete data, resulting in a final analytic data set of 297. Descriptive data were analyzed and presented using means, SDs, ranges, and percentages.

Maternal and toddler measures
Mothers completed self-administered computer-based questionnaires, using voice-generating software. Mothers reported on their age; household income; marital status, mental health [symptoms of stress (4 items, 5-point scale)] (21); depression (22 items, 4-point scale) (22); anxiety (6 items, 4-point scale) (23,24); and toddler's age, sex, race/ethnicity, and temperament (6 items, 7-point scale) (25). In the current analysis toddler's race/ethnicity was categorized as African American, Caucasian, or other races or ethnicities.

Maternal stress. The 4-item Perceived Stress Scale measures perception of stress associated with daily life, with established reliability and validity (21). The scale's scores are obtained by reverse coding positive items and then summing across all 4 items on a continuous scale. Higher scores reflect higher degrees of perceived daily stress. The internal consistency reliability within the current sample was 0.63.

Maternal depression. The Beck Depression Inventory is a 21-item scale that is in compliance with the *Diagnostic and Statistical Manual of Mental Disorders–IV* criteria for depression, has excellent psychometric properties, and has been used widely to characterize depressive symptoms (cognitive, behavioral, affective, and somatic symptoms) in adults (22). For each item, mothers select among 4 responses ranging from 0 (symptom not present) to 3 (most severe). Scores on this inventory range from 0 to 63. The internal consistency reliability within the current sample was 0.89.

Maternal anxiety. The 6-item short-form of the state scale of the Spielberger State-Trait Anxiety Inventory measures current feelings of apprehension, tension, nervousness, and worry, with established reliability and validity (23,24). A continuous scale was used in our study, with higher scores reflecting higher levels of anxiety. The internal consistency reliability within the current sample was 0.80.

Toddler temperament. At the baseline assessment, maternal perception of toddler temperament was measured by 6 items from the fussy difficult factor of the Infant Characteristics Questionnaire (IchQ) (25). Items were selected that represented fussiness or irritability, such as time spent crying or soothing difficulty. The 7-point response scale used in the IchQ ranged from 1 (very easy) to 7 (very difficult). Items from the IchQ were summed to form a total score, with higher scores reflecting higher levels of toddler fussiness or irritability. Validity and reliability evidence for the IchQ include adequate factor structure, internal consistency, and test-retest reliabilities (25).

Toddler anthropometry. Trained data collectors collected toddler anthropometric data (weight and recumbent length) using a standardized protocol (26). Sex-specific z scores were calculated according to the World Health Organization growth standards (27) and then converted to percentiles. Weight status was defined based on weight-for-length percentile. Toddler overweight was defined as being at or above the 85th percentile.

Development of the toddler feeding behavior questionnaire
The initial Toddler Feeding Behavior Questionnaire (TFBQ), consisting of 72 items scored with a 5-point Likert scale, was developed based on theories of parenting (9) and feeding (10) and by adapting items from existing questionnaires (15,19,28). The range of the 5-point Likert scale

---

was as follows: 0 (never), 1 (seldom), 2 (half of the time), 3 (most of the time), and 4 (always). The 72 questions, reflecting either feeding behaviors or attitudes, were created to measure the 5 dimensions of parenting with respect to feeding: responsive (18 items), forceful/pressuring (20 items), restrictive (13 items), indulgent (14 items), and uninvolved (7 items). Responsive, forceful/pressuring, indulgent, and uninvolved feeding items were assessed with questions pertaining to behaviors (e.g., How often do you talk to your toddler during meals?). To reduce the tendency of caregivers to respond to questions in a socially desirable way, we framed restrictive feeding questions as attitudes rather than behaviors, following the practice of other feeding questionnaires (e.g., How often are you concerned that your toddler is eating too much?).

Validity and reliability of the TFBQ

Scale validity was assessed by: *1*) content validity per expert panel review, *2*) construct validity per factorial validity [exploratory and/or confirmatory factor analyses (CFAs) within pilot and study samples], and *3*) convergent validity. Scale reliability was assessed by internal consistency reliability and test-retest reliability.

Assessment of content validity. Content validity refers to the extent to which a specific set of items reflects a specific domain (29). To maximize the content validity of the scale, we asked an expert panel of 7 colleagues (an interdisciplinary group of researchers with expertise in child feeding) to review and comment on the item pool. Items deemed to be lacking relevance or clarity were removed or revised. Suggestions regarding the inclusion of new items were considered.

Assessment of construct validity. Construct validity (e.g., factorial and convergent validity) refers to the extent to which a construct measures what the theory suggests (29). Factorial validity enables the investigator to explore and confirm patterns of latent variables or factors underlying an item set (e.g., responsive feeding factor, forceful feeding factor). Convergent validity provides evidence of similarity between measures of theoretically related constructs. Construct validity was evaluated in 3 phases: *1*) exploratory factor analysis (EFA), which was used first because the feeding questionnaire and its hypothesized factor structure originated from parenting theory and literature (9); *2*) CFA; and *3*) convergent validity.

In phase 1, the revised item set (following content validity) was administered to the pilot sample and subsequently to the TOPS sample. EFA used eigen values >1. Single-item deletions were based on a predefined, systematic procedure defined by factor loadings (<0.40), homogeneity, low variance, and theory. To test our hypotheses that a caregiver-reported questionnaire could be used to identify the 5 dimensions of feeding, a 5-factor solution was examined.

In phase 2, the TOPS sample was used to confirm the EFA results and create the most accurate model possible. CFA was conducted on items remaining after the EFA, using the structural equation modeling software M-PLUS 6.0 (30). The indicators used to evaluate the model fit were the root mean square error of approximation (≤0.08) (31), comparative fit index (≤0.90) (32), and standardized root mean square residual (≤0.08) (33). Beyond fit indices, we also examined modification fit indices, item loadings, and residual variance when considering misspecifications in the models. These statistics guided our decisions about final item removal and factor solutions as well as when to correlate and cross load items or factors.

In phase 3, within the TOPS sample we evaluated convergent validity by examining the associations among the 5 feeding dimensions and constructs that had been associated with the feeding dimensions (i.e., maternal-reported mental health symptomatology, maternal perceptions of toddler fussiness, and toddler overweight) (5–7,15–17,34). Mean and sample-specific weighted (produced via CFAs) feeding factor scores were calculated. To account for interval scales and skewed feeding data, we examined associations between maternal mental health and perceptions of toddler fussiness with mean feeding factor scores using Spearman rank correlation coefficients (r_s). Associations between toddler overweight status and mean feeding factors were examined using logistic regression. The associations between maternal and toddler age variables and mean feeding factor scores were also examined using Spearman rank corre-

lation coefficients to determine whether they should be included as potential confounding factors. An α level of 0.05 was considered statistically significant, and an α level of <0.10 was considered marginally significant.

Assessment of reliability. Test-retest reliability measures the stability of an instrument at 2 time points (29). An intraclass correlation coefficient of 0.75 is considered adequate (35). A subsample of 33 (11%) mothers participating in TOPS completed the questionnaire twice within a 2-wk period. Both assessments were conducted in the homes of the mothers with a computerized data collection system. Test-retest reliability was assessed via intraclass correlation coefficients.

Internal consistency reliability tests the homogeneity of the items within a scale that is intended to measure a single phenomenon (e.g., forceful feeding). Internal consistency reliability was assessed with Cronbach's α (29). Internal consistency reliability was tested overall or stratified by race/ethnicity (African American + other vs. Caucasian) and median infant age (20 mo) to examine the suitability of the scale across a diverse group of toddlers. Values in the text are mean ± SD unless indicated otherwise.

Results

TOPS sample characteristics

Mothers (27 ± 6.2 y of age; range: 18–46 y) were mostly low-income (with 93.1% reporting participation in WIC) and single (73.2%). About half (55%) of the toddlers were male (20.3 ± 5.6 mo of age; range: 12–32 mo). A majority of toddlers were African American (70.3), 21.3% were Caucasian, and 8.4% were classified as "other" (including 2% Hispanic or Latino, 0.7% American Indian or Native American, 0.3% Asian, and 5.4% mixed race/ethnicity). Nearly one-third (29%) of toddlers were overweight (≥85th percentile of weight for length).

Seventeen percent of mothers indicated symptoms of stress at least "sometimes" during the past month (1.4 ± 0.79; range: 0–4); 5% reported depressive symptoms during the past 2 weeks (0.37 ± 0.35; range: 0–3); and one-fourth reported feeling at least "somewhat" anxious at the time of the interview (1.7 ± 0.62; range: 1–4). The perceived toddler fussiness score was 3.3 ± 0.7 on a scale of 1–7.

Content validity

The 72-item questionnaire was reviewed by experts in the field to assess content validity. Twenty items were eliminated, and 1 item was added based on their suggestions and interpretation of individual items. Common reasons for item deletion included: *1*) varying expert interpretations of underlying meaning of an item (e.g., some interpreted as responsive feeding, others as forceful feeding), and *2*) lack of relevance (e.g., concern that item was not measuring responsive feeding). On the basis of expert suggestions, we added the question "If your toddler wants something for a meal that you think is inappropriate, how often do you give it to him or her?" to represent indulgent feeding behavior. After assessment of content validity, the questionnaire contained 53 items.

Construct validity

EFA conducted on the pilot sample confirmed the presence of 5 feeding dimensions: responsive, pressuring/forceful, restrictive, indulgent, and uninvolved. Model fits were adequate, based on factor loading and a scree plot, with internal consistencies of >0.70 for all 5 factors. All 53 items were retained for evaluation within the TOPS sample.

EFA was used on the 53-item responses from the TOPS sample using eigen values >1 and a 5-factor solution. Single-item deletions (*n* = 26) were based on a predefined, systematic

procedure, with items removed because of single or multiple issues: weak factor loading (n = 6), multiple loadings (n = 13), single-item factor loading (n = 6), homogeneity (n = 12), low variance (n = 4), and theory (n = 6). The item added during content validity was removed because it did not load with any other items onto a factor.

A 27-item, 7-factor feeding behavior solution was produced. Individual items within each factor represented the following feeding dimensions: factor 1 (responsive, 6 items), factor 2 (uninvolved, 4 items), factor 3 (restrictive, 5 items), factor 4 (rewards, 3 items), factor 5 (forceful, 4 items), factor 6 (provides low mealtime routine), and factor 7 (responsive verbal praise during feeding, 2 items).

Using the 27 items, a (forced) 5-factor solution resulted in the following constructs: factor 1 (responsive, 8 items; factors 1 and 7 above collapsed to form a single factor), factor 2 (uninvolved, 4 items), factor 3 (indulgent, 6 items; factors 4 and 6 above collapsed to form a single factor), factor 4 (5 items), and factor 5 (forceful, 4 items). The 5-factor solution produced loadings that ranged primarily from 0.49 to 0.87 and included only 1 double loading (**Table 1**). The question "How often are you concerned that your toddler eats too many sweets or high-fat food?" loaded on the indulgent (factor 3, loading = 0.35) and restrictive (factor 4, loading = 0.61) factors. The question was retained in the restrictive scale because the loading was higher than in the indulgent scale.

Using the 27 items, CFA was performed in MPLUS (30). The 7 and 5 factors initially produced by the EFA were confirmed with CFA. In the 7-factor solution, the overall goodness of fit was improved by correlating the residual variance of 2 items within the uninvolved factor (root mean square error of approximation = 0.042; comparative fit index = 0.93; standardized root mean square residual = 0.056). In the 5-factor solution, the overall goodness of fit was improved by correlating the residual variance of 2 items within the responsive factor, within the indulgent factor, and within the uninvolved factor (root mean square error of approximation = 0.047; comparative fit index = 0.90; standardized root mean square residual = 0.062) (Table 1).

Reliability (27-item, 5-factor questionnaire). The test re-test reliability (n = 33) of the 27-item scale was based on intraclass correlation coefficients, which ranged from 0.79 to 0.88 for responsive, indulgent, and restrictive feeding factors; the coefficients were 0.62 and 0.57 for the forceful and uninvolved feeding factors, respectively.

TABLE 1 Psychometric test results (EFA, CFA, Cronbach's α, and ICC) of a 27-item, 5-factor Toddler Feeding Behavior Questionnaire[1]

Feeding subscale	Items	EFA factor loadings	Cronbach's α	Test-retest reliability (ICC)
	n			
Responsive	8	0.49–0.77	0.79	0.79
Forceful	4	0.45–0.73	0.64	0.62
Restrictive	5	0.61–0.77	0.76	0.83
Indulgent	6	0.53–0.74	0.74	0.88
Uninvolved	4	0.81–0.87	0.87	0.57

[1] CFA assessed the overall goodness of fit of the 5-factor solution (root mean square error of approximation = 0.047; comparative fit index = 0.90; standardized root mean square residual = 0.062); Cronbach's α assessed the internal consistency reliability of the feeding subscales; EFA assessed individual factor loadings; ICC assessed the test-retest reliability of the feeding subscales among a subsample (n = 33) of the 297 participants. CFA, confirmatory factor analysis; EFA, exploratory factor analysis; ICC, intraclass correlation coefficient.

The internal consistency reliability for the 27-item, 5-factor feeding scale was moderate, with the Cronbach's α for all factors >0.70, except for forceful feeding (α = 0.64). When stratifying the sample by toddler age ($\leq$20 mo vs. >20 mo), Cronbach's α ranged from 0.68 to 0.89 and 0.59 to 0.83, respectively. When stratifying by toddler race/ethnicity (African American + "other" vs. Caucasian), Cronbach's α ranged from 0.63 to 0.86 and 0.67 to 0.90, respectively.

Convergent validity (27-item, 5-factor questionnaire). Based on mean summary scores produced from the final 27-item, 5-factor solution TFBQ (**Table 2**), the 3 constructs comprising unresponsive feeding were intercorrelated: the indulgent feeding construct was positively associated with the forceful (r_s = 0.25, P < 0.001) and restrictive (r_s = 0.18, P = 0.003) feeding constructs, and forceful and restrictive feeding constructs were positively correlated (r_s = 0.12; P = 0.04). The responsive feeding construct was negatively correlated with the uninvolved (r_s = −0.15, P = 0.01) and restrictive (r_s = −0.11, P = 0.06) feeding constructs.

TABLE 2 Description of the 27-item Toddler Feeding Behavior Questionnaire (TFBQ)[1]

Responsive Feeding Behaviors (8 items, 2 subscales)

1. How often do you talk to toddler during meals?
2. How often do you say something positive about toddler's eating?
3. How often do you arrange food to make it more interesting for toddler?
4. How often do you talk to toddler about the food he or she is eating?
5. How often can you tell when toddler is full?
6. How often do you eat with toddler?
(Responsive verbal praise during feeding behaviors)
7. How often do you praise toddler for eating?
8. How often do you encourage toddler to try a new food?
Forceful Feeding Behaviors (4-items)
9. How often do you yell or threaten toddler to get him/her to eat enough?
10. If toddler is not hungry, how often do you get him/her to eat anyway?
11. How often do you try hard to get toddler to eat a new food within one meal?
12. How often do you physically struggle with toddler to eat?
Restrictive Feeding Attitudes (5-items)
13. How often are you concerned that toddler is eating too much?
14. How often are you concerned that toddler will become overweight?
15. How often are you concerned that toddler eats too many high fat foods?
16. How often are you concerned that toddler would eat too much if you did not limit?
17. How often are you concerned that toddler will have to diet?
Indulgent Feeding Behaviors (6-items, 2 subscales)
(Reward based indulgent behaviors)
18. How often do you promise a non-food reward if toddler eats?
19. How often do you offer sweets if toddler behaves well?
20. How often do you offer toddler sweets as reward for eating?
(Low mealtime routine based indulgent behaviors)
21. How often do you let toddler eat while watching TV or playing?
22. How often do you let toddler eat whatever he or she wants?
23. How often do you immediately make something else if toddler doesn't like what is being served?
Uninvolved Feeding Behaviors (4-items, reversed coded)
24. How often are you responsible for the amount of food toddler is served?
25. How often are you responsible for the kinds of foods toddler is served?
26. How often do you know what toddler eats throughout the day?
27. How often do you know when toddler is eating?

[1] A 27-item, 5-point Likert scale [never (0), seldom (1), half of the time (2), most of the time (3), and always (4)] was employed to evaluate each feeding behavior construct; with higher scores indicating a more positive feeding behaviors. Items within the uninvolved feeding behavior construct were reversed coded.

Younger mothers had higher responsive feeding scores than older mothers ($r = -0.15$, $P = 0.01$), and mothers of younger toddlers had lower indulgent feeding scores than mothers of older toddlers ($r = 0.15$, $P = 0.01$). Neither maternal nor toddler age was significantly related to maternal mental health symptoms or maternal perceptions of infant temperament or risk of toddler overweight ($P > 0.05$); therefore, age was not included as a confounding variable in the following analyses.

Mothers with higher restrictive feeding scores were more likely to have overweight toddlers (OR: 1.58, CI: 1.1, 2.4; $P < 0.05$), perceive their child as fussy ($r_s = 0.13$, $P < 0.05$), and report symptoms of anxiety ($r_s = 0.12$, $P < 0.05$) and depression ($r_s = 0.15$, $P < 0.01$, compared with mothers with lower restrictive feeding scores (**Table 3**). Mothers with higher indulgent or uninvolved feeding scores perceived their child as being fussy (indulgent: $r_s = 0.22$, $P < 0.001$; uninvolved: $r_s = 0.12$, $P < 0.05$) and reported symptoms of anxiety (indulgent: $r_s = 0.12$, $P < 0.05$; uninvolved: $r_s = 0.16$, $P < 0.01$), depression (indulgent: $r_s = 0.15$, $P < 0.01$; uninvolved: $r_s = 0.10$, $P = 0.10$), and stress (indulgent: $r_s = 0.16$, $P < 0.01$; uninvolved: $r_s = 0.22$, $P < 0.001$). Conversely, mothers with higher responsive feeding scores were marginally less likely to have overweight toddlers (OR: 0.68; CI: 0.44, 1.06; $P = 0.09$), perceived their child as being less fussy ($r_s = -0.13$, $P < 0.03$), and reported fewer symptoms of anxiety ($r_s = -0.17$; $P < 0.004$) and depression ($r_s = -0.25$; $P < 0.001$) compared with mothers with lower scores in responsive feeding (Table 3). The patterns between these relations remained when examining the association using sample-specific weighted feeding factor scores.

Discussion

This study developed a valid and reliable 27-item instrument (that can be caregiver administered in ~5 min) to assess 5 theoretically derived feeding dimensions among a low-income sample of toddlers 12–32 mo of age. The dimensions are based on a theory of interactive feeding that incorporates caregivers' responses to concerns about their children's dietary intake, appetite, size, and behavior (11) rather than relying exclusively on caregiver behaviors. The validation of the questionnaire suggests that an interactive perspective that acknowledges the concerns that caregivers have about their children's feeding behavior may be useful in formulating caregiver feeding recommendations.

The intercorrelations found among the feeding constructs suggest that they are not categorical traits, but rather that caregivers simultaneously report using different feeding behaviors that likely vary by child characteristics and/or the emotional context of mother–child feeding interactions during the meal. For example, when mothers are concerned about their children's intake, appetite, or size, they often vacillate between increasing their control (forceful or restrictive) or relaxing their control (indulgence) to be sure that the child eats something. Similar intercorrelations between feeding constructs have been reported among a low-income racially and ethnically diverse sample of caregivers of infants (15).

Although factorial validity initially endorsed the presence of the 5 underlying dimensions of feeding within the TBFQ, the test of convergent validity further validated it by confirming established relations between feeding and maternal mental health, perceived toddler fussiness, and toddler overweight status (5–7,15–18,34). These relations remained when examining the associations using weighted (sample-specific) or non-weighted mean feeding factor scores, suggesting that the tool can be applied to other diverse samples of low-income mothers of toddlers.

The study has several strengths and limitations. First, the TBFQ was validated among a low-income, predominately African-American sample of caregivers of toddlers and cannot necessarily be generalized to other race or ethnic groups. Second, the robust methodology and systematic analyses used to validate the TBFQ was cross-sectional. Little is known about how variability in caregiver, child, and environmental contexts or changes over time relate to feeding. Third, the brief 27-item questionnaire increases the ease and feasibility in which feeding can be examined. However, the few studies that have compared caregiver report with direct feeding observation have reported little concordance (28,36).The findings suggest that the TBFQ can be used to examine how parental feeding behaviors relate to toddler health and behavior, supporting the need for further longitudinal and observational studies. Five types of research needed include: 1) validity and reliability studies of the TBFQ among additional race and ethnic groups (e.g., Hispanic, American Indian), 2) longitudinal studies to better understand the direction of causality (e.g., Do restrictive feeding attitudes predict child overweight status? or Does child overweight status predict restrictive feeding attitudes) and the stability of toddler feeding behaviors over time, 3) methodological studies that examine the concordance between the caregiver-reported toddler feeding questionnaire and toddler feeding observations (e.g., video-taped interactions) along with context specificity (e.g., differences

TABLE 3 Convergent validity of the 27-item Toddler Feeding Behavior Questionnaire[1]

	Responsive		Forceful		Restrictive		Indulgent		Uninvolved	
	Value	P	Value	P	Value	P	Value	P	Value	P
Maternal anxiety[2]	−0.17	0.004	0.07	0.24	0.12	0.04	0.12	0.04	0.16	0.007
Maternal depression[3]	−0.25	< 0.001	0.02	0.69	0.15	0.01	0.15	0.009	0.10	0.10
Maternal stress[4]	−0.10	0.09	0.02	0.73	0.10	0.09	0.16	0.006	0.22	< 0.001
Toddler fussiness[5]	−0.13	0.03	0.03	0.54	0.13	0.03	0.22	< 0.001	0.12	0.04
Toddler overweight[6]	0.68 (0.44, 1.06)	0.09	0.73 (0.50, 1.1)	0.11	1.58 (1.1, 2.4)	0.03	0.76 (0.50, 1.1)	0.19	0.96 (0.73, 1.3)	0.77

[1] Based on feeding factor summary scores (not weighted). Values are r_s for maternal anxiety, maternal depression, maternal stress, and toddler fussiness but ORs (95% CIs) for toddler overweight.
[2] Assessed using Spielberger State Anxiety Scale (23,24).
[3] Assessed using Beck Depression Inventory (22).
[4] Assessed using Perceived Stress Scale (21).
[5] Assessed using Infant Characteristics Questionnaire (fussiness factor) (25).
[6] Sex-specific z scores calculated according to World Health Organization growth standards (27) and then converted to weight-for-length percentiles. Overweight was defined as ≥85th percentile.

by food security status, eating episode), *4*) mechanisms (e.g., diet and self-regulation) linking nonresponsive feeding to toddler weight status, and *5*) randomized controlled trials testing the efficacy of responsive feeding interventions to treat and prevent nonresponsive toddler feeding behaviors, toddler feeding and behavior problems, maternal mental distress around feeding, and toddler growth problems.

Literature Cited

1. Ogden CL, Carroll MD, Kit BK. **Flegal** KM. Prevalence of obesity and trends in body mass index among US children and adolecents, 1999–2010. JAMA. 2012;307:483–90.

2. Fox MK, Pac S, Devaney B, Jankowski L. Feeding infants and toddlers study: What foods are infants and toddlers eating? J Am Diet Assoc. 2004; **104**(1, Suppl 1)s22–30.

3. Nader PR, O'Brien M, Houts R, Bradley R, Belsky J, Crosnoe R, Friedman S, Mei Z, Susman EJ.; National Institute of Child Health and Human Development Early Child Care Research NetworkIdentifying risk for obesity in early childhood. Pediatrics. 2006;118:e594–601.

4. Robinson S, Yardy K, Carter V. A narrative literature review of the development of obesity in infancy and childhood. J Child Health Care. 2012;16:39–54.

5. Hurley KM, Cross MB, Hughes SO. A systematic review of responsive feeding and child obesity in high-income countries. J Nutr. 2011;141: 495–501.

6. DiSantis KI, Hodges EA, Johnson SL, Fisher JO. The role of responsive feeding in overweight during infancy and toddlerhood: a systematic review. Int J Obes (Lond). 2011;35:480–92.

7. Chaidez V, Kaiser LL. Validation of an instrument to assess toddler feeding practices of Latino mothers. Appetite. 2011;57:229–36.

8. Baumrind D. Child care practices anteceding three patterns of preschool behavior. Genet Psychol Monogr. 1967;75:43–88.

9. Baumrind D. (1971). Current patterns of parental authority. Developmental Psychology Monograph 4 (1, Pt.2).

10. Hughes SO, Power TG, Orlet Fisher J, Mueller S, Nicklas TA. Revisiting a neglected construct: parenting styles in a child-feeding context. Appetite. 2005;44:83–92.

11. Black MM, Aboud FE. Responsive feeding is embedded in a theoretical framework of responsive parenting. J Nutr. 2011;141:490–4.

12. Eshel N, Daelmans B, de Mello MC, Martines J. Responsive parenting: interventions and outcomes. Bull World Health Organ. 2006;84:991–8.

13. Tamis-LeMonda CS, Bornstein MH, Baumwell L. Maternal responsiveness and children's achievement of language milestones. Child Dev. 2001;72:748–67.

14. Field T, Diego M, Hernandez-Reif M. Depressed mothers' infants are less responsive to faces and voices. Infant Behav Dev. 2009;32:239–44.

15. Hurley KM, Black MM, Papas MA, Caulfield LE. Maternal symptoms of stress, depression, and anxiety are related to nonresponsive feeding styles in a statewide sample of WIC participants. J Nutr. 2008;138:799–805. Erratum in: J Nutr. 2008;138:1982.

16. Hughes SO, Shewchuk RM. Child temperament, parent emotions, and perceptions of the child's feeding experience. *Int J Behav Nutr Phys Act.* 2012;29;9:64.

17. Ystrom E, Barker M, Vollrath ME. Impact of mothers' negative affectivity, parental locus of control and child-feeding practices on dietary patterns of 3-year-old children: the MoBa Cohort Study. Matern Child Nutr. 2012;8:103–14.

18. Faith MS, Scanlon KS, Birch LL, Francis LA, Sherry B. Parent-child feeding strategies and their relationships to child eating and weight status. Obes Res. 2004;12:1711–22.

19. Birch LL, Fisher JO, Grimm-Thomas K, Markey CN, Sawyer R, Johnson SL. Confirmatory factor analysis of the Child Feeding Questionnaire: a measure of parental attitudes, beliefs and practices about child feeding and obesity proneness. Appetite. 2001;36:201–10.

20. Black MM, Quigg AM, Cook J, Casey PH, Cutts DB, Chilton M, Meyers A, Ettinger de Cuba S, Heeren T, Coleman S, et al. WIC participation and attenuation of stress-related child health risks of household food insecurity and caregiver depressive symptoms. Arch Pediatr Adolesc Med. 2012;166:444–51.

21. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. J Health Soc Behav. 1983;24:385–96.

22. Beck AT, Steer RA, Brown GK. Manual for the Beck Depression Inventory II. San Antonio, TX: San Antonio TX Psychological Corporation; 1996.

23. van Knippenberg F, Duivenvoorden H, Bonke B, Passchier J. Shortening the state-trait anxiety inventory. J Clin Epidemiol. 1990;43(9):995–1000.

24. Marteau TM, Bekker H. The development of a six-item short-form of the state scale of the Spielberger State-Trait Anxiety Inventory (STAI). Br J Clin Psychol. 1992;31:301–6.

25. Bates JE, Freeland CA, Lounsbury ML. Measurement of infant difficultness. Child Dev. 1979;50:794–803.

26. Gibson RS. Principles of nutritional assessment. 2nd ed. New York: Oxford University Press; 2005

27. de Onis M, Onyango AW, Borghi E, Garza C, Yang H., for the WHO Multicentre Growth Reference Study Group. Comparison of the World Health Organization (WHO) Child Growth Standards and the National Center for Health Statistics/WHO international growth reference: implications for child health programmes. Public Health Nutr. 2006; 9:942–7.

28. Sacco LM, Bentley ME, Carby-Shields K, Borja JB, Goldman BD. Assessment of infant feeding styles among low-income African-American mothers: comparing reported and observed behaviors. Appetite. 2007;49: 131–40.

29. DeVellis RF. Scale development. Theory and applications. 3rd ed. London: Sage Publications; 2012.

30. Muthén LK, Muthén BO. Mplus user's guide. 6th ed. Los Angeles: Muthén & Muthén; 2010.

31. Brown MW, Cudeck R. Alternative ways of assessing model fit. In: Bollen KA, Long JS, editors Testing structural equation models Newbury Park, CA: Sage; 1993. p. 445–55).

32. Bentler PM. Comparative fit indexes in structural models. Psychol Bull. 1990;107:238–46.

33. Bentler PM, Bonett DG. Significance tests and goodness of fit in the analysis of covariance structures. Psychol Bull. 1980;88:588–606.

34. Hughes SO, Shewchuk RM, Baskin ML, Nicklas TA, Qu H. Indulgent feeding style and children's weight status in preschool. J Dev Behav Pediatr. 2008;29:403–10.

35. Steiner DL, Norman GR. Health measurement scales: A practical guide to their development and use. Oxford: Oxford University Press; 1989.

36. Lewis M, Worobey J. Mothers and toddlers lunch together. The relation between observed and reported behavior. Appetite. 2011;56:732–6.