

Systematic research review of observational approaches used to evaluate mother-child mealtime interactions during preschool years^{1–4}

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ABSTRACT

Background: The family meal and social interactions during the meal are important events in a child's life. Specifically, mealtime interactions have been linked to child weight status, the development of children's eating patterns, and socialization. Mealtime interactions may be observed and evaluated to provide insights into this important event beyond self-reported measurements.

Objective: We aimed to identify, review, and examine studies in which mother-child mealtime behaviors were measured through observation.

Design: MEDLINE Complete, PsycINFO, and PsycARTICLES were systematically searched by using sensitive search strategies. We included observational studies of mother-child eating and meal-times and associations between mother-child interactions and preschool child eating or weight status published to March 2014.

Results: Thirteen articles were included in our review. All studies but one were cross-sectional, and none of the studies evaluated how mutual dimensions (e.g., parent responsiveness to the child and child responsiveness to the parent) of dyadic interactions between mothers and children influence maternal feeding practices, children's eating, and weight. The parenting style was associated with maternal feeding practices but not directly with children's eating. Parental discouragements to eat and negative statements about food were associated with higher child weight status. Parental encouragement to eat was associated with higher child weight status as well as maternal body mass index. No associations were shown between maternal reports of feeding practices and observed maternal feeding practices.

Conclusions: Parents' overarching attitudes and approaches to parenting appear to be associated with their feeding practices or styles. Future studies should implement longitudinal observational methods with the capacity to measure levels of dimensions within bidirectional parent-child interactions and the extent to which these factors influence maternal practices, children's eating, and weight status. *Am J Clin Nutr* 2015;101:7–15.

Keywords children's eating, childhood obesity, mealtime observations, mother-child interactions, preschoolers

INTRODUCTION

Parents are the primary social force influencing the development of children during the formative preschool years, including the socialization of their children's eating habits. Parental, in particular maternal, feeding styles, feeding practices, role modeling, and

nutritional knowledge have been shown to be associated with children's eating and weight status (1–6). Moreover, parents and children can each influence the quality of their relation such as the degree of reciprocity in the dyad (7–11). More specifically, parents' and children's bi-directional levels of responsiveness and emotional tone have been shown to be implicated in preschool children's internalization of social values and self-regulation (8–11).

Mealtimes are frequent interactive activities shared by parents (typically mothers who are almost always the primary caregivers) and their children. Types of interactions that occur during meals may also influence the extent to which eating patterns are internally or externally driven. For example, positive bi-directional mother-child interactions may promote smooth-flowing routines, less power struggles, and a healthier dietary self-regulation (7). However, the majority of studies that evaluated associations between maternal feeding or mother-child relationships and child eating and weight status have largely relied on unidirectional parent self-report measures. Measures of mother-child relationships have not been comprehensive or well defined (12–15).

Furthermore, biases in maternal reports (16–18) and these quantitative methods have been limited in that they have not had the capacity to capture real-time actual behaviors as opposed to idealized or intended behaviors. Observational approaches provide a valuable method for collecting detailed, rich information about the mother-child dyad by providing a window into real-time overt behaviors, which is especially the case when observations are conducted in naturalistic environments (17, 19). Observational approaches, however, are less-typically implemented because of resources required to conduct the research, which make it difficult to obtain large longitudinal samples (7, 17). Quantitative and

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observational methodologies each present strengths and limitations (17). Combined, mixed-method approaches provide the opportunity to draw on the strengths of each of these methodologies enabling a more-rigorous study to draw stronger inferences than either method alone (20). What is lost in sample size is gained in methodologic rigor.

The overall aim of this systematic research review was to identify and review studies in which mother-child mealtime behaviors were measured through observation. The central questions of our review were as follows: What methodologies have been used to evaluate observations of mother-child mealtime interactions within the context of preschoolers' eating and weight status, and are these observations designed with the intent to examine the bidirectional nature of the interactions? What do findings reveal about the associations between observed mother-child mealtime interactions and preschoolers' eating and weight status? What are the strengths and limitations of current observational approaches evaluating mother-child mealtime interactions, and what recommendations can be made for future research? Our review was based on guidelines set out by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement (21).

METHODS

Articles were sourced from the following 3 relevant computer databases: MEDLINE Complete, PsycINFO, and PsycARTICLES; all databases were accessed through Elton B. Stephens Co. (EBSCO) Host (<http://www.ebscohost.com>). Only published, peer-reviewed articles in English that included observational measures of children's mealtimes for children aged 2–6 y were included. Searches included combinations of the following groups of key terms: 1) child* OR preschool*; 2) observ* OR home visit OR film*; 3) eating OR feeding OR food OR diet or "dietary intake" or weight* OR obes* or bmi or "body mass index"; and 4) mother*, maternal, parent* (**Supplemental Figure 1**). In addition, reference lists of sourced articles were also reviewed for the potential inclusion of studies. No limitations were put on publication dates; however, the database searched for articles dated from January 1925 through to March 2014.

Inclusion and exclusion criteria

Articles were included in the search if they examined observational measures of children's eating or mealtimes associated with child BMI or weight gain. Articles were excluded from the search if 1) children's eating or mealtimes were not collected by means of observational methods; 2) mothers were not present during the observed eating or mealtimes; 3) they did not focus on healthy child populations; and 4) they did not report at least one of the following outcome measures: children's eating behaviors or cognitions, maternal feeding practices or behaviors, and child weight status.

Review procedures and data abstraction

After the removal of 22 duplicates, 906 articles were identified. Titles and abstracts were screened for possible inclusion by the first author of this review. Thirty-seven articles remained after the initial screening stage, which were read in their entirety by 2 authors (HB and HS) and resulted in the elimination of an additional 24 articles (**Supplemental Figure 2**). Data from the 13

studies that met the inclusion criteria were collated and manually tabulated to reveal the sample size, ethnicity, child sex, significant mealtime factors associated with child weight, and major conclusions (**Table 1**). An extended summary table of study aims, sample, methodology, measures, and findings is shown in **Supplemental Table 1**.

Summary of included studies

Of the relevant 13 studies, all studies but one (22) were cross-sectional. Of cross-sectional studies, Koivisto et al. (23) filmed participants twice, ~2 wk apart, to allow families to become accustomed to the video camera. Data from the second observation were analyzed. Orrell-Valente et al. (24) also filmed families twice and included averaged scores across home observations in the analysis, whereas Hughes et al. (25) observed families on 3 separate occasions set ~2–3 wk apart, and variables were averaged across the 3 meals for analysis. Four of 13 studies evaluated ethnic minorities (25–28). Although the majority of studies included mostly white samples, ~41% of participants in one of the studies (29) were classified as non-white (Table 1). Two studies (18, 23) did not report participants' race-ethnicity. As shown in **Table 2**, the majority of studies were from the United States ($n = 10$), 2 studies were from England (16, 18), and 1 study was from Sweden (23).

RESULTS

Observational mother-child mealtime settings

Eight (18, 24–28, 30) of the cross-sectional studies obtained eating or mealtimes observations of participants' usual home-based mealtimes. The majority ($n = 6$) of these home-based observations were recorded with video cameras operated by research team members (18, 23–25, 28, 30). Cousins et al. (26), Hays et al. (27), and Hughes et al. (25) differed; their research team members coded observed behaviors live during mealtime sessions and used audio recorders to ensure the accuracy of verbal interactions. Researchers in the study of Klesges et al. (30) also coded observational data in real time during mealtime sessions.

The remaining 5 cross-sectional studies (16, 29, 31–33) and the 1 longitudinal study (22) obtained observational measures of video-recorded laboratory-based eating procedures. An overview of each study's home observation coding interrater reliability is presented in **Table 3**.

Child weight status measures

The majority of studies (16, 18, 22, 25, 27–30, 32) defined overweight at or above the 85th percentile of BMI and obesity at or above the 95th percentile of BMI. Lumeng et al. (22) calculated weight-for-length scores at 15 mo of age as well as BMI scores at 24 and 36 mo of age. Only one of the 12 studies that evaluated child weight did not use BMI classifications; Koivisto et al. (23) used weight-length index (WLI)⁵ (34) classifications. Children in their study were categorized into 2 groups of overweight (WLI >109) and normal weight (WLI ≤109).

⁵ Abbreviations used: BATMAN, Bob and Tom's Method of Assessing Nutrition; CFQ, Child Feeding Questionnaire; CFSQ, Caregiver's Feeding Style Questionnaire; WLI, weight-length index.

TABLE 1
Observational studies of mother-child mealtimes during preschool years

First author (reference)	Sample, <i>n</i>	Ethnicity	Sex	Mealtime factors ¹	Major conclusions
Cousins (26)	84	Mexican-American	38 girls 42 boys	Maternal education	Less-acculturated mothers were more likely to believe their health outcomes were due to chance and less likely to use healthy-eating internalization techniques.
Drucker (32)	77	Mostly white	39 girls 38 boys	Maternal prompts to eat	Maternal prompts related to the child's total energy intake and total meal time. Controlling behaviors correlated with maternal prompts and supportive behaviors negatively correlated with maternal prompts.
Farrow (16)	56	Mostly white	25 girls 31 boys	Child BMI	For healthy-weight children, there was no significant relation between observed and reported practices. For overweight children, there was a significant negative relation between maternal reports and independent observations of mothers' use of restriction. Accuracy of reports may depend on child BMI <i>z</i> score.
Haycraft (18)	23	Not collected	14 girls 9 boys	Parental BMI	Maternal reports of child feeding practices did not correlate with observed mealtime practices. Parents' self-report of BMI was significantly related to higher reported restriction in mothers and to greater observed use of pressure in both mothers and fathers but not to any other observed or reported feeding. Children's BMI <i>z</i> scores were not related to observed or reported feeding practices.
Hays (27)	79	Mexican-American	37 girls 42 boys	Maternal commands	Mothers who were overweight, discouraged unhealthy eating, and used nutrition rationales had children who gave more physical appearance or weight responses.
Hughes (25)	177	African American Hispanic	85 girls 92 boys	Indulgent feeding style	Results suggest that emotional climate created by indulgent parents during dinner and their lack of demands on their children to eat may play an important role in how children become overweight.
Klesges (30)	14	White	7 girls 7 boys	Parental prompts to eat Length of time eating Child BMI Sex	Children in this sample spent very little time making active decisions about what and how much they ate. Child food refusal elicited more prompts to eat, and child request for more food did not elicit parental response.
Koivisto (23)	50	Not reported	25 girls 25 boys	Parental negative statements about food Child energy intake Maternal BMI	Results indicate parental influences on children's eating, which may have implications for the development of food preferences and overweight in childhood.
Lewis (33)	10	Mostly white	10 girls	Maternal concern about child weight	No significant relation between what mothers reported they did and what they were observed doing.
Lumeng (29)	71	42 White 29 Nonwhite	32 girls 39 boys	Type of food Maternal BMI Maternal education	Children of obese mothers may be more responsive to environmental cues to eat. Maternal pressure to eat was modified in the sample by maternal obesity status and type of food in question.
Lumeng (22)	1218	Mostly white	609 girls 609 boys	Maternal education Ethnicity, eating prompts	Assertive prompting and intrusive style had small but significant associations with greater child adiposity.
Olvera-Ezzell (28)	38	Mexican-American	17 girls 21 boys	Type of prompt to eat Maternal education	Mothers predominantly used nondirective verbal control strategies; however, child compliance was more likely to follow a maternal serving or command than a nondirective behavior. Mothers with >4 y of formal education served healthier foods and were more likely to report the use of reasoning, prohibit the consumption of unhealthy food, monitor out-of-home food consumption, and allow child input in eating situations than were less-educated mothers.

(Continued)

TABLE 1 (Continued)

First author (reference)	Sample, <i>n</i>	Ethnicity	Sex	Mealtime factors ¹	Major conclusions
Orrell-Valente (24)	142	Mostly white	74 girls 68 boys	Type of prompt to eat SES ² Sex	85% of parents tried to get their children to eat more, and 83% of children ate more than they would have. Higher SES parents used reasoning, praise, and food rewards significantly more than low-SES families did. Fathers pressured sons to eat, and mothers praised girls for eating.

¹Significant ($P < 0.05$) mealtime factors associated with child BMI or weight.

²SES, socioeconomic status.

Eleven of the studies collected objective child BMI or WLI. Olvera-Ezzell et al. (28) did not report how they collected their measures of child weight and height, and Orrell-Valente et al. (30) did not include measures of child weight status in their study.

Maternal feeding practices

Twelve of the studies included measures of maternal feeding practices. The studies of Farrow et al. (16) and Haycraft and Blissett (18) used the Family Mealtime Coding System to code the observed maternal pressure to eat (using verbal or physical prompts) and restriction (verbally disallowing or limiting food or physically moving food out of reach) as well as maternal self-reported practices by using Child Feeding Questionnaire's (CFQ) pressure to eat and restriction subscales (35).

Cousins et al. (26) and Hays et al. (27) coded observed maternal practices during eating as well as nonverbal or verbal directives that were discouraging or encouraging a child from eating. Mothers also participated in eating-habit socialization interviews. Drucker et al. (32) measured observed maternal prompts for the child to eat by using the Bob and Tom's Method of Assessing Nutrition (BATMAN) scale (30), whereas Klesges et al. (30) and Koivisto et al. (23) coded observed parental feeding practices by using the BATMAN scale. Lewis and Worobey (33) developed a coding scheme that was based on

observational and questionnaire items (30, 35, 36) to measure verbal and physical controlling feeding practices. Observed behaviors were classified under 4 categories as follows: verbal restriction, physical restriction, verbal pressure, and physical pressure. They also recorded observations of foods and drinks chosen by mothers during mealtimes and self-reported feeding practices by using the CFQ and Weight Concerns Scales. Lumeng and Burke (29) measured the number of observed bites consumed by the mother as well as prompts for the child to eat during a procedure involving 2 familiar and 2 novel foods (sweet and salty options of familiar and novel foods were provided). Lumeng et al. (22) measured observed maternal feeding practices by coding maternal prompts (assertive and intrusive) for her child to eat. Finally, Olvera-Ezzell et al. (28) coded observed maternal control strategies used during mealtimes, whereas Orrell-Valente et al. (24) devised a coding system derived from a review of the literature, whereby they measured observed parental prompts to eat, food restriction, and food rewards.

Maternal feeding styles

Only one study evaluated maternal feeding styles. Hughes et al. (25) measured observed parental feeding styles by means of self-report by using the Caregiver's Feeding Style Questionnaire (CFSQ) (37) as well as by observation by using the Feeding

TABLE 2

Measures implemented to evaluate parenting and mother-child relation-factor associations with child eating or weight status¹

Country	First author (reference)	Parenting styles	Mother-child reciprocal relationships	Parent feeding styles	Parent feeding practices	Child temperament or self-regulation
United States	Cousins (26)	X	X	X	✓	X
United States	Drucker (32)	✓	X	X	✓	X
England	Farrow (16)	X	X	X	✓	X
England	Haycraft (18)	X	X	X	✓	X
United States	Hays (27)	X	X	X	✓	X
United States	Hughes (25)	✓	X	✓	X	X
United States	Klesges (30)	X	X	X	✓	X
Sweden	Koivisto (23)	X	X	X	✓	X
United States	Lewis (33)	X	X	X	✓	X
United States	Lumeng (29)	X	X	X	✓	X
United States	Lumeng (22)	X	X	X	✓	X
United States	Olvera-Ezzell (28)	X	X	X	✓	X
United States	Orrell-Valente (24)	X	X	X	✓	X

¹✓, used this method; X, did not use this method.

TABLE 3
Overview of reported mealtime observation coding reliability

First author (reference)	Analysis	Score
Cousins (26)	Cohen's κ	0.70–0.95
Drucker (32)	Interobserver reliability	0.87–0.99 ($P \leq 0.01$)
Farrow (16)	Intraclass correlation coefficient	0.95–0.97 ($P < 0.001$)
Haycraft (18)	Interrater agreement	86.57–100%
Hays (27)	Cohen's κ	0.70–0.90
Hughes (25)	Interobserver correlations	0.66–0.86 (emotional climate) 74–100% (feeding)
Klesges (30)	Interrater agreement	94–96%
Koivisto (23)	Mean interrater reliability	80% (child behavior) 63% (parent behavior)
Lewis (33)	Interrater agreement	93–100%
Lumeng (29)	Cohen's κ or intraclass correlation coefficient (as appropriate)	>0.70
Lumeng (22)	Cohen's κ or intraclass correlation coefficient (as appropriate)	>0.70
Olvera-Ezzell (28)	κ Coefficients	0.81–0.96
Orrell-Valente (24)	κ Coefficients	0.93–1.00

Behavior Coding System, which is an observational checklist of the CFSQ. However, the study of Lumeng et al. (22) considered whether maternal prompts were intrusive (imposing the mother's agenda on the child).

Children's eating and child responses to maternal feeding

Measures of children's eating or compliance were collected in 10 cross-sectional studies with methodologies that varied extensively. Cousins et al. (26) recorded observed child responses to maternal eating socialization practices (e.g., behaviors that the mother was trying to elicit or inhibit; verbal and nonverbal techniques used to influence behavior) by using a coding adapted from a system used by Olvera-Ezzell et al. (28). Olvera-Ezzell et al. (28) and Orrell-Valente (24) collected measures of observed child responses to maternal feeding strategies (e.g., ignore, resist, and comply).

Hays et al. (27) recorded the child's responses to maternal eating socialization practices (verbal and nonverbal attempts to elicit, inhibit, modify, or influence the target child's eating behavior) during a home-based dinner. The authors obtained child knowledge and awareness of the relation between nutrition and health during a laboratory-based structured play-interview session. Both Klesges et al. (30) and Koivisto et al. (23) obtained observational measures of children's eating behaviors (e.g., food requests, food refusals, and playing with food) by using the BATMAN scale, but Koivisto et al. (23) also collected data from 7-d dietary surveys completed for 39 children in the study. Lumeng and Burke (29) recorded child compliance to maternal prompts to eat (i.e., the proportion of prompts with which the child complied; how many prompts per bite of food eaten) during the tasting of 2 familiar and 2 novel foods (i.e., familiar and novel sweet; familiar and novel salty).

Finally, Drucker et al. (32) measured the observed children's eating rate and energy intake during laboratory visits. Farrow et al. (16) estimated the energy (kcal) content of food eaten by children during the observed laboratory procedure, whereas Lewis and Worobey (33) measured child energy intake during a standardized buffet lunch.

Mother-child interactions

As shown in Table 2, 10 studies collected observational measures of simultaneous mother-child mealtime interactions (e.g., maternal feeding practice and child response). Only 2 of these studies (25, 32) included measures that pertained to the quality of the relation between the mother and child. Drucker et al. (32) evaluated observed general parenting styles (support and control) during mealtimes by using a 2-dimensional coding scheme (38), and Hughes et al. (25) used the Home Observation Coding System (39) to measure the observed emotional global climate (i.e., parental affect, sensitivity, responsiveness, intrusiveness, and detachment) during dinner. None of the studies evaluated the quality of mother-child relationships from a reciprocal perspective from the mother to child and from the child to mother (e.g., mother responsiveness and child responsiveness).

Associations between observed maternal feeding practices and self-reported maternal feeding practices and child weight status or eating behaviors

Three studies evaluated the relation between observed maternal feeding practices, self-reported maternal feeding practices, and child weight status or eating behaviors. No significant relations between self-reported maternal feeding practices and those independently rated during observations were reported; however, relations between maternal feeding practices and concerns about their child's weight and actual child weight were identified. The study of Farrow et al. (16) evaluated associations between maternal self-reported and observed feeding practices to determine whether the reliability of self-reported maternal feeding practices varied according to child BMI z score. The results of Farrow et al. (16) revealed that maternal reports of controlling feeding practices were related poorly to independently rated observations. Their findings, however, showed that the interaction between observed maternal pressure to eat and child BMI z score was a significant predictor of maternally reported pressure to eat. Moreover, the interaction between observed maternal restriction and child BMI z score was a significant predictor of maternally reported restriction. Similarly,

Lewis and Worobey (33) showed no significant correspondence between what mothers reported doing and what they were observed doing. Thus, maternal concern about her child's weight was related significantly with self-reported restrictive feeding practices but not observed practices. Haycraft et al. (18) showed no significant relation between maternal self-reported and observed feeding practices or between these practices (reported and observed) and child BMI *z* scores.

The findings of Lumeng et al. (22) revealed observed assertive prompting and an intrusive style (maternal behavior that was adult centered rather than child centered; e.g., not allowing the child to respond at his or her own pace) had small but significant associations with greater child adiposity in children at 36 mo of age.

Associations between observed maternal feeding practices or styles and child weight status or child attitudes relating to weight

Five of the studies that evaluated mother-child mealtime interactions evaluated its associations with child weight status, and one study evaluated child attitudes regarding weight. All of the studies revealed significant relations between parental feeding practices or styles and child weight status or weight attitudes. The study of Drucker et al. (32) revealed that child BMI was correlated significantly with maternal discouragements to eat per minute; Hughes et al. (25) showed that Hispanic boys with indulgent (high-responsiveness and low-control) parents had significantly higher BMI *z* scores than those of Hispanic boys from other feeding groups. The findings of Klesges et al. (30) showed that parental prompts to eat were correlated positively with child weight, and parents of overweight children gave significantly more encouragement to eat, offers of food, and prompts to eat than did parents of normal weight children. In contrast, Koivisto et al. (23) showed that parents of overweight children were more likely to receive parental negative statements about food, whereas normal-weight children were more likely to receive parental neutral statements about food. After child age was controlling for, a significant relation remained between parental negative statements and child energy intake, and child energy intake was associated significantly and positively with child WLI. The evaluation of Lumeng and Burke (29) of maternal prompts to eat and child compliance showed that predictors of BMI *z* scores in children of obese mothers were low maternal education, more prompts to eat novel foods, fewer prompts to eat familiar foods, and fewer child bites of familiar foods; however, none of these covariates predicted child BMI *z* scores in children of nonobese mothers.

In relation to child attitudes toward weight, the study of Hays et al. (27) showed that children of mothers who were overweight, discouraged unhealthy eating, and used nutrition rationales gave more physical appearance or weight responses during interviews about the relation between health and weight.

Associations between observed maternal feeding practices, children's eating, and compliance with maternal practices

Six of the studies evaluated associations between maternal practices and subsequent child responses. Drucker et al. (32) evaluated child energy intake. Their study showed that the

number of maternal prompts to eat was related significantly to child total energy intake and eating time. Maternal controlling feeding practice was not associated significantly with children's eating behaviors but was correlated with the number of maternal prompts. Their study also showed that supportive behaviors were associated negatively with prompts. The findings of Klesges et al. (30) showed that parental prompts to eat correlated positively with the length of time eating, which was different from the duration of the mealtime. They also revealed that child food refusal elicited more prompts to eat, and child request for more food did not elicit a parental response. Koivisto et al. (23) also measured energy intake with results that showed that child energy intake was related inversely to parental negative statements about food and positively associated with child compliance to parental eating prompts, albeit after controlling for age, the only significant relation remaining was between energy intake and WLI. Lumeng and Burke (29) investigated the proportion of maternal prompts to eat and child compliance rates while eating novel and familiar foods; their findings revealed that mothers prompted their children to eat an average (\pm SD) of 17.5 ± 12.1 times, and children complied with $63.5 \pm 21.1\%$ of prompts. Obese mothers and their children ate significantly more of the familiar sweet food than did nonobese mothers and their children; however, consumption of other food types (salty or sweet; familiar or novel) did not differ. Although there were no significant differences in prompts between obese compared with nonobese mothers, children of obese mothers were more likely to comply with maternal prompts to eat (70% compared with 59%) and were significantly more likely to comply with prompts to eat novel foods than were children of nonobese mothers. An older child age and familiarity with the food type also predicted child compliance. In contrast, the findings of Olvera-Ezzell et al. (28) revealed that, on average, children of overweight and obese Mexican-American mothers predominantly complied with maternal controlling feeding practices. The second most-common response was resistance followed by ignoring maternal strategies. The maternal threat or bribe strategy was significantly and negatively associated with child compliance and associated positively with the child ignore response, whereas helping and serving food was associated positively with child food consumption and correlated negatively with child resistance to food. The study of Orrell-Valente et al. (24) evaluated children from a diverse range of socioeconomic backgrounds in the United States, with results that showed that 85% of parents tried to encourage their children to eat more. In turn, 83% of children ate more than they would have unprompted, and children's compliance with parental strategies was associated with neutral prompts; only 2% of children ate substantially more, most children ate a few more bites (41%) or moderately more (35%), and 17% of children did not eat more than they would have in the absence of prompts. Higher socioeconomic status parents used significantly more reasoning, praise, and rewards than did lower socioeconomic status families.

Associations between parenting style, feeding practices, and risk of obesity in children

The study of Drucker et al. (32) investigated the relation between observed general parenting style (control and support) and specific maternal feeding behaviors. Their findings showed

that the number and rate of maternal encouragements and discouragements (physical and verbal) to eat were associated with the general parenting style. The control of behaviors was associated positively with prompts to eat, and supportive behaviors were associated negatively with prompts to eat. In turn, the number and rates of prompts were associated positively with child energy intake and time spent eating; however, the maternal level of support or control was not associated directly with child eating behavior. Hughes et al. (25) were the only researchers to evaluate global emotional climate at the dinner table. Their results showed that parents with self-reported indulgent feeding styles (high responsiveness and low control or demandingness) exhibited lower levels of negative affect and intrusiveness as well as higher levels of emotional detachment during dinner. Direct associations between the emotional climate and children's eating or weight status were not reported; however, children in the study who experienced indulgent feeding styles had significantly higher BMI *z* scores than did children in the other feeding style groups.

DISCUSSION

This review accentuates the diversity of methodologies implemented to evaluate mother-child mealtime behaviors associated with preschoolers' weight development. Specifically, it highlights the differing methods used to code observations of parent-child mealtime interactions with more-recent approaches implementing the Family Mealtime Coding System (18) and the CFSQ (37). The findings reveal that only one of the studies (27) evaluated observed parenting factors from a bi-directional perspective (e.g., parent sensitivity and responsiveness). However, none of the reviewed studies evaluated mutual parent-child dimensions of these interactions (e.g., parent and child responsiveness to one another). Hodges et al. (40) recently showed the importance of evaluating both parent and child responsiveness and sensitivity during feeding. Their study showed that 70% ($n = 78$ or 111) of mothers who were observed to be generally responsive to their child during feeding had children who showed a similarly high responsiveness to their mothers. Although this study focused on parent-child interactions during the first 2 y of life, it is useful in highlighting associations of feeding-responsiveness dimensions and child-obesity risk factors. Specifically, feeding-responsiveness dimensions were associated with maternal education, maternal BMI, child age, and aspects of child feeding including breastfeeding duration and self-feeding (40).

All but one of the studies reviewed were cross-sectional, and although Lumeng et al. (22) evaluated measures across 3 different time points, children were only 15, 24, and 36 mo of age, respectively. This longitudinal study and 4 of the cross-sectional studies observed mother-child dyads eating in laboratory environments. In addition, the findings of this review emphasize that one of the most widely used measures of self-reported parent feeding practices, the CFQ (35), was not associated significantly with observational measures of parent feeding practices. Although this finding may suggest that other factors (e.g., maternal BMI and concern regarding child weight) may influence parental reports, it should be noted that, in one of the studies (18) family observations required mothers and fathers to be present, which may not have been a representative mealtime scenario for most families. Indeed, mothers in the study reported eating signifi-

cantly more meals with their children than fathers, therefore, Haycraft and Blissett (18) suggested that the presence of fathers may have altered the feeding interaction of mothers. Taken together, these findings suggest that observational measures of maternal practices may provide better representations of practices performed as opposed to parents' ideals and intentions. Therefore, future research should aim to evaluate associations between maternal self-reported and observed feeding practices longitudinally and in settings that best represent typical mealtimes interactions. Furthermore, because mothers' feeding practices may differ when fathers are present, additional work should examine maternal feeding practices with and without fathers participating in mealtimes.

Although restriction appears to be the feeding practice that is least observed during mealtimes (16, 18), parent restriction of food was most consistently associated with child weight status or energy intake. The study of Drucker et al. (32) revealed that child BMI was correlated significantly with maternal discouragements to eat per minute, and Koivisto et al. (23) showed that normal-weight children tended to receive more parental neutral statements about food than did overweight children. Parental negative statements were correlated negatively with child energy intake. Their findings also showed that children's eating was associated significantly and positively with child WLI. These findings suggest that parents who may be concerned about their child's food intake or weight may attempt to exert excessive control to restrict their child's food intake. Consequently, parents may instead be inadvertently promoting unhealthy eating behaviors and related weight gain in their children in a number of ways. First, excessive parental restriction of food appears to increase the child's desire and consumption of the food when children are able to access it; second, parental overcontrol of children's eating prevents children from learning to engage with their physiologic satiety cues. Finally, parents may be ill equipped to promote mother-child relationships involved in nurturing child self-regulation.

Contrary to expectations, parental encouragements to eat were associated with higher child BMI *z* scores (30) and maternal BMI (29). The quantitative study of children aged 7 to 9 y by Webber et al. (41) showed that maternal pressure to eat was associated with child fussiness, slowness, and satiety responsiveness. Research also suggested that parents may report the use of more pressure to eat if they are concerned about their child being underweight (16, 42, 43). Therefore, it appears that the association between the pressure to eat and child weight status may vary according to the appropriate guidance a child receives relating to healthy eating behaviors. Indeed, Lumeng et al. (22) highlighted that it was the type of prompt (e.g., assertive prompt) rather than simply the total number of prompts that was associated with greater child adiposity. Taking into account that children of obese mothers in the study of Lumeng and Burke (29) were more likely to receive prompts to eat certain foods and comply with these prompts, it is also possible that children of obese mothers may be more sensitive to environmental cues. Thus, their disengagement from natural satiety cues is being reinforced by maternal practices.

Finally, even though only 2 studies evaluated associations between parenting styles and feeding practices or styles, it appears that parents overarching attitudes and approaches to parenting are associated with their feeding practices or styles. The

finding of Drucker et al. (32) showed that the number and rate of maternal encouragements and discouragements (physical and verbal) to eat were associated significantly with the general parenting style. Although the parenting style was not associated directly with children's eating, the number and rates of prompts were associated with child energy intake and time spent eating. Hughes et al. (25) showed that parents with self-reported indulgent feeding styles (high responsiveness and low control or demandingness) had lower levels of negative affect and intrusiveness as well as higher levels of emotional detachment during dinner. Direct associations between emotional climate and child eating or weight status were not reported; however, children in the study (25) who experienced indulgent feeding styles had significantly higher BMI *z* scores than did children in the other feeding style groups. Findings of both of these studies suggest that it is possible that parenting styles may indirectly influence children's eating and weight status via their relation with feeding practices. This possibility is not surprising because the control exerted during feeding may be underpinned by parenting styles. However, these results do not inform us about the optimal dimensions (control and responsiveness) for socializing healthy child weight and eating development that could become evident when evaluating parenting factors from a bi-directional perspective.

This review highlights a number of strengths and limitations of current observational approaches implemented to evaluate mother-child interactions associated with children's eating and weight status. Because the majority ($n = 12$) of the studies we reviewed were cross-sectional, casual relations could not be concluded. Moreover, the findings of these studies could not be generalized because sample sizes were relatively small or unrepresentative of broader cultural, racial, ethnic, and sociodemographic populations. However, the use of observational approaches of reviewed studies was a clear strength because it provided a valuable method for independently evaluating detailed, rich information about mother-child mealtime interactions; particularly practices that mothers may themselves not have been aware of or willing to report. Observations also provided an opportunity to view the influence that both the mother and child could have on each other such as the degree of maternal control and child compliance. Future childhood-obesity research should thoroughly evaluate the roles that the dyadic mother-child relationship and child temperament play in the development of children's eating and weight patterns.

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