Chapter 3

Interpersonal Characteristics in the Home Environment Associated with Childhood Obesity

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Abstract

Childhood obesity remains a leading cause of health problems that tend to persist into adulthood. The environment is increasingly noted as an important component of obesity prevention and treatment. For children, the home is a key shared environment where diet and activity behavioral patterns develop. The interpersonal home environment includes parenting styles and feeding practices, parent modeling of food behaviors, family meal environments, parent and child eating styles, as well as family functioning and organization. Numerous measures have been created to assess the food-related aspects of the interpersonal home environment and are discussed in this chapter.

Introduction

Obese children are at immediate risk for health problems, including asthma, cardiovascular problems, diabetes, low-grade inflammation, as well as musculoskeletal injury, sleep apnea, and non-alcoholic fatty liver disease [1-9]. In addition to these health consequences, obese children experience increased rates of social stigmatization [10] and depression [10-14]. Obesity in childhood is particularly problematic because obesity status during childhood tracks into adulthood, thereby setting up children for lifelong weight problems [15-19].

To adequately provide treatment for and prevention of obesity in children and adults, it has become increasingly apparent that the environment must be consid-
ered [20,21]. For children and their parents, the prevailing shared environment is at the micro level—the home. Parents function as role models and ‘gate keepers’ in the home, strongly influencing weight-related behaviors of children [22-29], and establishing practices that may increase or decrease their children’s obesity risk [11,30]. For instance, parents decide which foods are permitted in the home, prepare food, allow and deny children to eat certain foods, establish meal patterns, provide snacks, set portion sizes, model eating behaviors, discuss foods, and convey attitudes about foods [31]. Changing the home physical and social environment may help children avoid obesity [32-34] in the present, as well as in the future, because the eating and physical activity patterns developed during childhood tend to serve as the basis for later behaviors [35-39].

The home is where parents teach children, intentionally or not, the most about food and eating. This chapter will explore key interpersonal food related-aspects of the home environment, including parenting styles and practices related to feeding, parent modeling of healthy food behaviors, family mealtime environment, parent eating styles, child temperament and eating styles, and family functioning and organization. In addition, this chapter will briefly review instruments for assessing the interpersonal food-related aspects of home environments.

Parenting Styles, Feeding Styles, and Practices

Parenting style is an overall philosophy about how children should be raised and goals parents have for their children [31,40,41]. Parenting style reflects parent attitudes and beliefs that create the broad emotional climate for parent-child interactions [40,42-44]. Parenting style classifications are based on parental responsiveness and demandingness [45-47]. Responsiveness is conceptualized as parental warmth or supportiveness [48], and refers to “the extent to which parents intentionally foster individuality, self-regulation, and self-assertion by being attuned, supportive, and acquiescent to children’s special needs and demands” [46], p.62. Demandingness is conceptualized as behavioral control [48] and refers to “the claims parents make on children to become integrated into the family (as a) whole, by their maturity demands, supervision, disciplinary efforts, and willingness to confront the child who disobeys” [46], p.61-62.

Parents may be categorized according to how demanding and responsive they are, which results in these parenting styles: indulgent/permisive, authoritarian, authoritative, and uninvolved [47]. Each style is a different, naturally occurring pattern embodying parental values and practices [46]. These parenting styles have been adapted to address specific feeding practices or strategies that a parent uses to influence food intake in children, and
thus, child weight.

Ventura and Birch have conceptualized the mutual influences of parent feeding practices and styles and child eating and weight [41] as having 3 bi-directional pathways: parenting and child eating, parenting and child weight, and child eating and child weight. This conceptual model emphasizes that parents not only influence child behaviors and weight, but child behaviors and weight in turn influence parenting [41]. Strategies parents use to influence food intake, and ultimately child weight, include pressure to eat, food restriction, control of child’s dietary intake, and use of incentives to promote food intake or reward good behavior [40]. Parental behaviors surrounding feeding of their children also include the amount of foods served to the children, as well as the actual foods that are available, accessible, and consumed within the home. A parent may fall into a style with regard to feeding, however, she or he does not automatically have the same style across other domains of parenting [31]. Regarding feeding styles, the parenting styles as defined by Baumrind [46] and Maccoby and Martin [47] are:

- **Indulgent/Permissive:** High responsiveness and low demandingness. Parents have lax or few rules or expectations for child’s dietary intake (either quality or quantity), with food availability being the only limit on intake (parent may be indulgent or neglecting).

- **Authoritarian:** Low responsiveness and high demandingness. Mealtimes focus on disciplinary encounters rather than harmonious interactions. Specific strategies authoritarian parents use to influence child dietary intake are pressuring children to eat and controlling feeding practices.

- **Authoritative:** High responsiveness and high demandingness. Parents have high expectations for child’s dietary intake and usually engage in modeling expected behavior, communicating and negotiating with the child, and providing warm emotional feeding environment.

- **Uninvolved:** Low responsiveness, low demandingness. Parents tend to use fewer child-centered parenting techniques, such as allowing children to determine amount of food to eat, and generally uses more physical punishment [40,49-51].

Authoritative parent feeding has been generally shown to be the most positively associated (and Authoritarian the most negatively) with availability and intake of fruits and vegetables in homes with preschoolers (from low-income families) [52] and adolescents [53]. Compared to Authoritarian parents, Indulgent/Permissive and Uninvolved low-income parents have children with the lowest intake of fruits and vegetables and less optimal eating behaviors [54,55], and these parents also engage in
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less monitoring of children’s intake of lower nutrient density foods [51]. Evidence from diverse groups of families has shown that young children with Indulgent/Permissive parents tend to have a higher weight status [49,56,57]. The four parent feeding styles also display ethnic variability, with an Indulgent/Permissive feeding style being more common in Hispanic and East Asian parents and Uninvolved style more typical of African American parents [49,58]. However, many studies have shown that parent or child weight status mediate parental feeding practices and styles [59-62].

Although individual studies show some evidence that parenting styles affect child weight status and eating behaviors, a recent review indicated that the evidence overall is mixed. Differing findings may be a result of the need to better conceptualize general parenting styles, or the interplay of specific parental feeding practices and child eating temperaments (discussed later) [31]. Another review of parent feeding styles and child outcomes reported that studies of parental feeding restriction, versus overall feeding control or other feeding domains, tended to report positive relationships among feeding restriction, child eating, and weight status.

Parental concern about children’s weight, as well as pressuring and/or restricting child eating also is linked with child eating behaviors and weight. Parents who put more pressure on children to eat have children who eat fewer fruits and vegetables (parents themselves also consume fewer vegetables) [63,64]. Experimental research supports that pressuring children to eat certain foods lead to reduced intake of the pressured food items [65]. Indeed, parents who restrict children’s food choices, pressure children to eat, or reward children with food may unintentionally encourage behaviors contrary to their intentions [66].

Several studies report that mothers who pressure children to eat tend to have leaner children [59-61,67], possibly because child thinness precipitates parent pressure on children to eat. For instance, mothers who have higher weight concern put less pressure to eat on their heavier than thinner children [68]. Parental use of feeding restriction also may influence child overweight [69]. An examination of parent feeding styles and child weight revealed that parental feeding restrictions increased child weight status [70]. In fact, 15% of the variance in children’s total body fat was attributable to parental pressure to eat and child weight concern [59].

Some evidence indicates that parental control over child eating is associated with lower child BMIs [71] and greater intake of healthy snacks [72]. Other evidence suggests that parental control in general may not impact some population groups [73]. Some experts believe that high control of children’s dietary intake interferes with their development internal food regulation cues [74], yet
others believe high control may facilitate obesity prevention [71]. A comparison of overt parent control (detectable by the child) and covert parent control (not readily detected by the child; e.g., parent secretly limits children’s access to low-nutrient density foods by avoiding certain environments or by regulating intake of these foods) [75], is associated with decreased intake of unhealthy snacks compared to children whose parents used overt control [76].

Parental control of child eating may be affected by maternal and/or child weight. One study reported that greater control of child eating by obese mothers (but not non-obese mothers) is associated with higher BMI in the children [61]. Other research, however, has found no difference between obese and non-obese mothers with regard to feeding practices associated with using food to cope with emotional upset, using food rewards, or encouraging children to eat greater amounts than desired [71], or use of control [77]. Parents who perceive their children are heavier tend to use covert control, whereas those of a higher socio-economic status (SES) have a greater propensity to use overt control of snack food intake [76].

**Instruments for Assessing Parenting Feeding Style and Practices**

Parental influence on child dietary practices may be classified and analyzed at several levels of parenting practices or style measures, but accurately assessing the influence of parenting presents numerous challenges. Most weight-related parenting practices are assessed via self-report questionnaires [42-45, 78-80], with few observational studies with younger children [78, 79]. The cost of performing observational studies often limits researchers, thus resulting in the need for parental self-report questionnaires to assess parental feeding styles. A recent systematic review yielded 56 unique instruments to measure parenting food practices [81]. Numerous instruments measure food parenting, yet several decades of their use has failed to yield a good understanding of ideal food parenting, or explicit guidelines for parents to use [31, 40]. Consensus on the various types of parental influence on child eating behaviors is emerging to promote cohesive use of terminology and measurements. The most commonly used methods to assess parenting feeding styles and specific feeding behaviors are discussed below (Table 1).
Table 1: Feeding-Related Aspects of the Home Environment.

<table>
<thead>
<tr>
<th>Scale/Inventory Name</th>
<th>Original Number of Items</th>
<th>Domain Choices</th>
<th>Scoring Methodology</th>
<th>Popularity Used for</th>
<th>Reliability and Validity</th>
<th>Reliability and Validity Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caregiver's Feeding Style Questionnaire (CFSQ) [50]</td>
<td>19 items</td>
<td>120 items</td>
<td>Likert-type responses</td>
<td>Overt and Covert styles</td>
<td>Cronbach’s alpha = 0.79 (overt) and 0.71 (covert)</td>
<td>Good reliability evidence includes results that parents with indulgent/permissive feeding styles are more likely to have children who are overweight vs those with authoritarian parents.</td>
</tr>
<tr>
<td>Feeding Style Questionnaire (FSQ) [71]</td>
<td>30 items</td>
<td>150 items</td>
<td>Likert-type responses</td>
<td>Overt and Covert styles</td>
<td>Cronbach’s alpha = 0.79 for each subscale and good test-retest validity (Pearson correlations ranging from 0.70 to 0.75)</td>
<td>Good internal reliability coefficients with other validated measures of parenting. Cronbach’s alpha = 0.79 for each subscale and good test-retest reliability (Pearson correlations ranging from 0.70 to 0.75)</td>
</tr>
<tr>
<td>Family Environment Scale (FES) [131]</td>
<td>40 items</td>
<td>200 items</td>
<td>Likert-type responses</td>
<td>Overt and Covert styles</td>
<td>Cronbach’s alpha = 0.79 (covert) and 0.75 (convergent)</td>
<td>Acceptable internal consistency (average Cronbach’s alpha = 0.75)</td>
</tr>
<tr>
<td>Parent and Child Feeding Practices [76]</td>
<td>30 items</td>
<td>150 items</td>
<td>Likert-type responses</td>
<td>Overt and Covert styles</td>
<td>Cronbach’s alpha = 0.79 (covert) and 0.75 (convergent)</td>
<td>Acceptable internal consistency (average Cronbach’s alpha = 0.75)</td>
</tr>
<tr>
<td>Parental Feeding Style Scale [90]</td>
<td>10 items</td>
<td>50 items</td>
<td>Likert-type responses</td>
<td>Overt and Covert styles</td>
<td>Cronbach’s alpha = 0.79 (covert) and 0.75 (convergent)</td>
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<tr>
<td>Parent-Child Feeding Scale [103]</td>
<td>20 items</td>
<td>100 items</td>
<td>Likert-type responses</td>
<td>Overt and Covert styles</td>
<td>Cronbach’s alpha = 0.79 (covert) and 0.75 (convergent)</td>
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</tbody>
</table>

Caregiver’s Feeding Style Questionnaire (CFSQ)

This instrument assesses parental demandingness and responsiveness to feeding practices and categorizes parent feeding style as Authoritarian, Authoritative, Indulgent, or Uninvolved [49,50]. This 19-item, Likert-type, self-report survey assesses demandingness and responsiveness via 7 child-centered (e.g., encourage child autonomy such as reasoning, praising, helping children eat) and 12 parent-centered feeding items (e.g., regulate child eating via external pressure, like demands, threats, and rewards). The CFSQ has been validated with white, black, and Hispanic families and is available in Spanish. Test-retest reliability for the items is very good (0.82 and 0.85 for child- and parent-centered directives), and convergent validity was established by comparing it with extant validate parenting measures (e.g., Parenting Dimensions Inventory PDI-S [82], Child Feeding Questionnaire CFQ [83]). Evidence for construct validity includes demonstrating that children of parents with indulgent/permissive feeding style tend be overweight vs those with authoritarian parents [49]. Scores near cut-off points for a certain feeding style indicate that a style is less distinct in that parent [50]. Continuous measures based on this instrument may permit comparisons of differences between parents with distinct feeding styles and those who fall between two styles [50].
Child Feeding Questionnaire (CFQ)

This is 31-item self-report, Likert-type survey measures parental beliefs, attitudes, and practices concerning child feeding, and perceptions and worries regarding obesity in their children [83]. The CFQ also may be used to assess inappropriate child feeding practices [63,65,84]. This survey is based on the premise that parents do not have a distinct, constant parenting feeding style, but that styles differ within parents, across child development domains, and among children in the same family [73]. It posits that high levels of parental feeding control may impede children's development of self-control and responsiveness to hunger and satiety cues, thereby increasing their risk of obesity [73]. CFQ subscales may be analyzed to characterize parents' feeding styles (authoritative, authoritarian, indulgent/permissive, uninvolved) or to assess other child feeding behaviors (pressure, control, restriction). A brief description of the subscales follows:

- Parent responsibility for child feeding: 3 items measure the degree to which a parent feels responsible for feeding his or her children, determining portion sizes, and providing a healthy diet.
- Parent perception of his or her own weight: 4 items assess the parent's own weight during his or her childhood, adolescence, twenties, and at present.
- Parent perception of child's weight: 6 items assess parent perception of child weight during 6 ages from the first year of life to 8th grade.
- Parent concern about child's weight: 3 items assess the extent of parent concern about his or her child being or becoming overweight and needing to restrict calories.
- Parent restriction of child's diet: 8 items measure parent tries to constrain his/her child's eating by limiting access to palatable foods and food quantities.
- Parent pressure on child to eat: 4 items measure how much the parent encourages child eating though strategies, such as pushing the child to eat all that is served to him or her.
- Parent monitoring of child's diet: 3 items assess the extent to which a parent tracks his or her child's ingestion of low-nutrient density foods (high sugar and/or high-fat foods).

The CFQ has been used with white, black, Hispanic, Japanese, Australian, and Hmong parents [59, 60, 68, 75, 83, 85-88]. Ethnic and cultural differences have emerged when using the CFQ to assess parental behaviors and attitudes surrounding child feeding. For example, compared to white mothers, African American mothers indicated a higher degree of monitoring, feelings of responsibility, feeding restrictions, pressure to eat, and concern about child weight [59]. Factor analysis indicates that the CFQ
may benefit from modification when used with non-white populations [61,83,87]. The CFQ is generally the most widely used, studied, and validated survey of parental feeding practices [70,89].

**Parental Feeding Style Questionnaire (PFSQ)**

This Likert-type parental self-report questionnaire assesses parental feeding style with 25-items in four scales [71]:

- Emotional feeding: 5 items assess parent use of food to help child cope with emotions.
- Instrumental feeding: 4 items assess parent use of food to reward children for preferred behaviors
- Prompting and encouragement to eat: 8 items assess parent use of praise and encouragement to entice child to eat more than the child wants
- Control over eating: 10 items assess parent control over child's dietary intake

The PFSQ was tested with normal and obese parents of children (mean age 4.4 years) residing in the United Kingdom, having diverse education and occupations, and participating in the Twins Early Development Study (TEDS) [90]. The PFSQ had good internal reliability and good test-retest reliability [71]. Use of the PFSQ has shown that obese mothers in the TEDS and normal-weight mothers behaved similarly with regard to giving children food as a means for coping with emotional upset, rewarding them, or encouraging them to eat more than wanted [71]. Additionally, there was no relationship between PFSQ subscale scores and child weight status [71]. The questionnaire also has been tested in low-income African American families [61]. As with many surveys, the PFSQ does not appear to be widely used in its full form in the literature. One study using the control subscale found that in a low-income African American sample, maternal control was positively linked with preschool children's BMI z-score for obese mothers, but not non-obese mothers [61].

**Feeding Demands Questionnaire (FEEDS)**

FEEDS is an 8-item questionnaire that assesses the parents' demand for certain child feeding behaviors. Its subscales related to parental feeding are: anger/frustration, food amount demandingness, and food type demandingness [91]. FEEDS appears to be unique in its goal to assess parental beliefs about child compliance with parental eating rules, a cognition that may be important for elucidating parental drive to engage in restrictive feeding practices [91].

Used with parents of 3- to 7-year old children (from diverse backgrounds), FEEDS showed good internal consistency and validity. Convergent validity assessment showed mothers with higher FEEDS scores tended to pressure children to eat and to monitor their fat intake [91]. Mothers with higher scores on the FEEDS food amount demandingness subscale tended to restrict, pres-
sure, and monitor child eating. Mothers scoring higher on the food type demandingness subscale tended to monitor child fat intake [92]. Discriminant validity assessment revealed that that FEEDS scores were not associated with mother’s performance on the Fear of Fat Scale [92] or depression [91,93].

One study reported that FEEDS food amount demandingness and food type demandingness scores differed significantly among East Asian, African American, and other races/ethnicities of parents. African American parents scored higher on the food amount demandingness and food type demandingness subscales than other parents, indicating they put greater feeding demands on their young children [58].

**Overt and Covert Parental Feeding Practices**

This 9-item questionnaire expands conceptualization of parental control of feeding to incorporate parental “overt” control of feeding as ‘controlling a child’s food intake in a way that can be detected by the child’ (5-item subscale) and “covert” control as ‘controlling a child’s food intake in a way that cannot be detected by the child’ (4-item subscale) [76]. Testing with mostly white and middle class parents revealed good internal consistency for both the overt and covert subscales [76].

Parents with lower BMIs and who perceived their children as heavier tended to use covert control more so than those with higher BMIs or who did not perceive their children as heavier [76,94]. Parents from higher income groups also tended to use overt control [76]. Children whose parents used covert control were more likely to consume less healthy snacks [76], yet no relationship between the overt or covert control practices were associated with child BMI [94]. A study of an American Indian population also found no association between parental control and child BMI [77].

**Parent Modeling of Eating**

The food that parents consume has a direct effect on the foods their children consume. Due to their function as purchasers of food and gatekeepers, parents determine the foods available and served in the home. Parents also can influence children’s diets by acting as role models [95-97]. Parental modeling of poor dietary habits, such as low intake of fruits and vegetables, is linked to lower intake of fruits and vegetables by their children [98].

The foods that parents typically consume in front of a child may be used to determine how a parent models his or her diet to his/her children. The 6-item Parental Dietary Modeling Scale [99] assesses how often parents model dietary behaviors to their children, in particular the constructs of modeling defined by Rosenthal and Bandura [100] (i.e., observational learning, disinhibiting-inhibiting behavior, facilitating similar responses, and setting cognitive standards for self-regulation). The full scale has moderate reliability to measure parental modeling of
diet. Other measures of covert and overt control [76] (described previously) may be used to determine how parents overtly model healthy eating behaviors in front of their children (Table 2).

**Table 2: Parent Eating Styles and Behaviors.**

<table>
<thead>
<tr>
<th>Scale/Survey Name</th>
<th>Original Number of Items</th>
<th>Answer Choices</th>
<th>Scoring Methodology</th>
<th>Populations(s) Used for Validity/Reliability Testing</th>
<th>Validity and Reliability Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three-Factor Eating Questionnaire [134]</td>
<td>55 items</td>
<td>True/false Likert-type responses</td>
<td>Scores for true summed; higher scores indicate greater dietary restraint, distraction, and perceived hunger [134]</td>
<td>Middle-aged men and women [135]</td>
<td>Good reliability and validity [134]</td>
</tr>
<tr>
<td>Eating Habits Subscale from the Project EAT survey [138]</td>
<td>30 items</td>
<td>Varies; Likert-type and open-ended responses</td>
<td>Varies</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Dutch Eating Behavior Questionnaire (DEBQ) [140]</td>
<td>15 items</td>
<td>Likert-type frequency responses</td>
<td>College Students</td>
<td>High validity (Cronbach alpha, respectively, 0.88 to 0.90)</td>
<td></td>
</tr>
</tbody>
</table>

**Family Meal Environment**

The effect of family mealtime environment on obesity and obesity-related health behaviors has been studied mainly in older children/adolescents and parents. Among adults, arguments during dinner about eating behavior were linked with higher fat intake [101]. Adolescents who reported positive family meal environments had fewer disordered eating behaviors than those who did not have positive family mealtime environments [102-104]. Yet, among 4-year old children and their parents, never arguing at mealtimes was related to greater daily energy in-take compared with families who argue often or always at mealtimes [105]. Among older children (ages 8 to 16 years), parents of obese youth report less positive family mealtime interactions [106]. It appears that calm family mealtime environments may be more beneficial for adolescents compared to young children, yet the results require further investigation.

Mealtime distractions, such as watching TV during meals may result in unhealthy eating patterns [107-111]. People may overeat while watching TV [112-120] and learn unhealthy food habits from TV ads for sugary, fatty foods [119-126].

**Assessing Family Meal Environment**

The Project EAT survey [103,127] includes three 4-point (strongly agree to strongly disagree) Likert-type scales to assess family mealtime environment characteristics (Atmosphere at Family Meals; Priority of Family Meals; Structure/Rules at Family Mealtimes). The scales are scored by averaging responses on the scale. Item test-retest reliabilities and subscale internal consistency were acceptable.

- Atmosphere at Family Meals: 4 items assess family member enjoyment of sharing meals with the family.
- Priority of Family Meals: 5 items assess importance that members place on sharing meals.
• Structure/Rules at Family Meals: 5 items assess where family meals are consumed and how parents expect children to behave at mealtimes.

The 21-item About Your Child's Eating survey uses Likert-type scale rated from ‘never’ to ‘nearly every time’ to assess parent frequency of eating behaviors, as well as family meal perceptions and interactions [128]. The survey’s 3 subscales (list below) have good Cronbach alpha scores.

- Child Resistance to Eating: 11 items
- Positive Mealtime Environment: 5 items
- Parent Aversion to Mealtime: 5 items

Another study used a modified version with two subscales (Positive Mealtime Interaction and a revised Resistance to Eating scale that excluded 6-items about under-nutrition), which showed adequate internal consistency [106]. Mothers of obese 8- to-16-year-olds reported more Mealtime Challenges (a revised sub-scale) and lower Positive Mealtime Interaction scores (using the About Your Child’s Eating-revised scale [129,130]) than mothers of normal weight children.

The Mealtime Environment Scale [131], developed for the Québec Longitudinal Study of Child Development [132], has 6 items answered using a 4-point Likert-type scale that assesses mealtime conflicts. The items rate how often mealtime can be described as:

- Enjoyable for everyone
- Being in a rush
- Providing time to talk to each other
- Including arguments between the children
- Including arguments between adults and children
- Including arguments between adults

Internal consistency was moderate with 150 parents of preschool children in Quebec [131].

A sample of children from the Québec Longitudinal Study of Child Development found that more mealtime conflicts were connected to higher weights and (unexpectedly) healthier eating habits [133]. Never arguing at mealtimes was linked with a higher daily calorie intake vs frequently arguing at mealtimes [105].

**Parent Eating Styles and Behaviors**

Parents eating styles are a part of the home food environment that can affect children’s eating behaviors, and, in turn their weight patterns [23,95-97]. Additionally, parents who have difficulty regulating their own food intake may embrace child feeding practices that they believe will prevent their children from gaining excess body weight [23].
Measures of Parent Eating Styles and Behaviors

Several assessment tools are available to characterize parent eating styles. The Three-Factor Eating Questionnaire (TFEQ) assesses dietary restraint, disinhibited eating, and emotional eating [134,135].

- The Emotional Eating scale evaluates the impact of emotions on desire to eat (e.g., When I feel lonely, I console myself by eating).
- The Disinhibited Eating scale assesses uncontrolled eating behaviors (e.g., Sometimes when I start eating, I just can’t seem to stop).
- The Dietary Restraint scale assesses intentions to restrict or regulate food intake to prevent weight gain (e.g., I avoid “stocking up” on tempting foods).

The TFEQ has been used in samples of college students and middle-aged men and women [135,136] and has demonstrated good reliability and validity [134]. Emotional and disinhibited eating has been shown to be associated with obesity, and among obese people or those currently or previously dieting for weight control, more dietary restraint is associated with lower weight [137].

The Eating Habits Subscale from the Project EAT survey [138] consists of 9 items concerning meal skipping, location where dinner was eaten, and frequency of grocery shopping, eating at fast food restaurants, eating snacks, and eating salty snacks. The survey was originally developed for adolescents, but has been used with samples of low-income pregnant women with success [139]. In this low-income postnatal parent sample, mothers with less nutritious diets indicated less control over meal preparation and were more likely to skip meals [139].

The Dutch Eating Behavior Questionnaire (DEBQ) [140] is a 33-item instrument developed to improve understanding of emotional and external eating patterns. It includes three scales to measure types of eating behaviors associated with excess weight gain: emotional eating (eating in response to negative feelings), external eating (eating in response to seeing or smelling food), and restraint eating (eating less than desired). The DEBQ has been translated into numerous languages and all show good factorial validity and reliability. In addition to use with adults, it can be used with young children to assess how a child eats, including assessment of eating in the absence of hunger, dietary restraint or disinhibited eating or pickiness, and has also shown high internal consistency with college students [141].
Perceived Family Functioning and Organization

Another aspect of the family environment that may affect childhood obesity directly or affect behaviors in family members that are associated with obesity is family functioning. Family functioning includes the physical, emotional, and psychological activities of family members and is typically defined by dimensions that include support, conflict, cohesion, and control in the family [142]. It is unclear exactly how poor family functioning may lead to childhood obesity, or if it is the presence of a child with obesity that affects family function. The data also are mixed as to whether functioning in families with obese youth differs from those with normal weight children [106,142,143]. Poverty and low socioeconomic status have been associated with poor family functioning, and is a potential confounder of associations with obesity [144].

The concept of “household chaos” describes an environment that is high in noise and crowding and low in routines and organization [145]. A disorganized and chaotic home environment is a risk factor for poor child behavior that may work directly through the child or indirectly through the caregiver. Household chaos can have a direct, negative influence on cognitive performance, and is related to behavior problems in preschool-aged children [146-148]. Among caregivers in households with high levels of chaos, there is lower parenting self-efficacy [149] and caregivers are less responsive and involved with children and more negative parenting in general [150]. Focus group data has indicated that in families with preschool-aged children, chaos among family members in the home increases stress [151].

Measures of Family Functioning and Organization

The most widely used questionnaires for documenting family functioning and household organization and chaos are described as follows (Table 3). The 90-item Family Environment Scale [152] has 10 subscales (9 items in each): cohesion, expression, conflict, independence, achievement-orientation, intellectual-cultural orientation, active-recreational orientation, moral-religious orientation, organization, and control. Each subscale has adequate test-retest reliability and internal consistency. Additionally, each subscale evaluates unique facets of the familial environment. In a study of eating disorder associations with family environment low family cohesion was associated with more disordered eating in female college students [153]. Mothers of obese youth tend to characterize their family functioning as having higher interpersonal conflict and lower in cohesion and structure (conflict subscale factors higher) than parents of non–overweight children [106].
The Family Assessment Device-General Functioning Subscale [154,155] is a 12-item scale measuring overall family functioning. It has been used in numerous population-based surveys and has excellent psychometric properties in various sample groups [154-156]. A longitudinal study of Australian mothers with varied demographic characteristics reported that family functioning and many maternal obesity risk behaviors (e.g., television viewing time, soft drink intake, fast food intake) were significantly related [157].

Table 3: Family Functioning and Environment.

<table>
<thead>
<tr>
<th>Scale/Survey Name</th>
<th>Original Number of Items</th>
<th>Answer Choices</th>
<th>Scoring Methodology</th>
<th>Populations(s) Used for Validity/Reliability Testing</th>
<th>Validity and Reliability Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family Environment Scale [152]</td>
<td>90 items</td>
<td>Likert-type agreement responses</td>
<td>Scores are summed for each subscale, with a higher score indicating more behaviors in that area</td>
<td>Mothers of obese 8–16 year olds.</td>
<td>Each subscale displays adequate test-retest reliability over 8 weeks (estimates average 0.80) and 12 weeks (estimates average 0.75) with adequate internal consistency (average alpha=0.73). Intercorrelation between subscales average .20, indicating that they each measure distinct aspects of the family social environment.</td>
</tr>
<tr>
<td>Family Assessment Device-General Functioning Subscale [154, 155]</td>
<td>12 items</td>
<td>Likert-type agreement responses</td>
<td>Scores summed to provide a score, with a higher score better family functioning</td>
<td>Various families from psychiatric population, stroke rehab, and college students</td>
<td>Good reliability in various sample groups (Cronbach alpha =0.92 [154] [155] Factor analysis shows that the subscale summarizes family functioning well [156].</td>
</tr>
<tr>
<td>Confusion, Hubbub, and Order Scale (CHAOS) [146]</td>
<td>15 items</td>
<td>Likert-type true/false</td>
<td>Scores summed to provide a score, with a higher score indicating a more chaotic, disorganized, and hurried home characteristic</td>
<td>Children and families that were mostly white, but varied SES</td>
<td>Coefficient alpha for the 15-item scale was 0.79. A subsample showed test-retest correlation was 0.74 over a 12-month period and there was no significant change in the mean or variance for the score over the 12-month interval [146]. The correlations of observed home environment chaotic conditions with maternal perceptions in the Twin study were also correlated [146].</td>
</tr>
</tbody>
</table>

The Confusion, Hubbub, and Order Scale (CHAOS) assesses parental perceptions of the degree of “environmental chaos in the home” [146]. CHAOS and was created for the Louisville Twin Study that assessed children and their families from infancy to adolescence [146]. This 15-item scale has good internal consistency and test-retest correlation [146]. Observed home environment chaotic conditions positively correlated with maternal perceptions of household chaos [146]. The scale was modified by other researchers to include just 6 items that were used in a study of English families with 4- to 6-year old children from a mostly white sample of varied education and SES [158]. Within this sample, the internal consistency was lower than the longer version of the scale and the correlation between mothers’ and fathers’ ratings was r=.52 [158]. Findings indicated that household chaos affected children’s problem behavior “over and above parenting” and exacerbated negative parenting [158]. The CHAOS scale is also being used to assess general parenting practices in the MyParenting SOS obesity prevention study (no results could be located at the time of this writing) [159].

Child Temperament and Eating Styles

Child temperament and eating styles influence how parents choose foods and feed their children [160,161]. Temperament may reflect how a child eats, which then influences how a parent reacts to the child. For instance, difficult infant temperaments are linked with negative meal-times and food refusal in young children [162], as well as...
Parent feeding practices [163]. Feeding difficulties have been identified in unsociable, difficult, and demanding children [164,165].

Children's emotionality component of their temperament may be related eating behaviors that contribute to increased obesity risk [166,167] and parent weight status [132]. Prospective research findings suggest that child temperament may not be an influencer of weight or obesity risk, and instead, parental attributes are the only influences on a child's eating behavior. Duke et al. [168] followed 135 children from birth to age seven years and reported that parental attributes related to disordered eating (i.e., maternal history of eating disorders, body dissatisfaction, drive for thinness, dietary restraint) at infancy predicted parental pressure on children to eat at age seven [168]. Although research is increasingly supporting the associations between temperament and weight [169], there is still no indication of how temperament is directly associated with obesity in children.

The quantity of food children eat is dependent on parent sensitivity to children's hunger and satiety cues and children's individual preferences and ability to self-regulate intake [41,170]. It is accepted that infants have an inborn ability to self-regulate food intake, but parent feeding practices during the first years of life may affect their children's self-regulation ability [170]. A persistent incongruence between this inborn regulation and parent feeding practices may modify inborn eating self-regulation abilities and elevate risk for overweight [171]. Early eating behaviors remain relatively stable as children get older (from ages 4 to 10) [172] even as children lose their innate ability to self-regulate. Children's inability to self-regulate eating behavior is associated with rapid weight gain and excess body fatness in middle childhood [173].

Measures of Child Temperament

Few measures exist to assess a child's temperament in a concise parent-report survey (Table 4). One measure is the Child Behavior Questionnaire (CBQ) [174,175], which was developed for caregivers to assess temperament of children aged 3- to 8-years old. The domains included in the original 195-item instrument include positive and negative emotion, motivation, activity level, and attention. Short and very short forms of the CBQ are available [174]. The very short form includes 3 subscales (36-items total) that have good internal consistency: urgency (sample item: “child seems always in a big hurry to get from one place to another”), negative affect (sample item “child gets quite frustrated when prevented from doing something s/he wants to do”), and effortful control (sample item “child is good at following instructions”). The CBQ has been widely used in research focusing on children and obesity-related behaviors [176-178].

The 20-item EAS (Emotionality, Activity, and Shyness) Temperament Survey [179] for children assesses
these child temperament dimensions: shyness, emotionality, sociability, and activity. The survey shows good internal consistency with Cronbach's alpha values [166] and good internal consistency and interrater reliability [180]. A forerunner of the EAS by the same research group, namely the Colorado Childhood Temperament Questionnaire, also includes a subscale for Reaction to Food [181].

Not to be ignored are the temperament instruments that are conceptually based on the findings of the New York Longitudinal Study (NYLS) [182]. True to the nine dimensions of the NYLS, the Behavioral Style Questionnaire consists of 100 items that measure activity, rhythmicity, approach, adaptability, intensity, mood, persistence, distractibility, and sensory threshold [183]. Based on combinations of subscale scores, children may be categorized as “easy,” “difficult,” or “slow-to-warm-up.” The Temperament Assessment Battery for Children—Parent Form also reflects the NYLS theoretical framework, but contains only six subscales across 48 items, namely, activity, adaptability, approach/withdrawal, emotional intensity, ease of management through distraction, and persistence [184]. As reported by their developers, both of the scales have more than acceptable reliability and internal consistency as well as good external validity [183,184]. Although these NYLS instruments have been underutilized in child obesity research, Carey [185] has reported that babies rated by their mothers as difficult displayed more rapid weight gain over the second six months of life, presumably due to their being fed more to quiet them.

### Table 4: Child Temperament and Eating Styles.

| Scale/Inventory Name | Original Number of Items | Revised/Shortened Version | Scoring Methodology | Population Used for Validation | Reliability Testing | Validity and Reliability 

| Child Behavior Questionnaire (CBQ) [184, 197] | 198 times | Likert-type responses | Norms derived from large normative sample of children aged 1-6 years | United States children 3-8 years old | Good internal consistency (0.72 to 0.85) and good inter-rater reliability (0.43 to 0.64) | Good convergent validity.

| EAS (Eating, Activity, and Temperament) | 19-36 months | Likert-type responses | Calculated from subscale scores | Random sample of 307 children aged 1-6 years | Good internal consistency (0.68 to 0.87) and good inter-rater reliability (0.76) | Significant correlation with another measure of child obesity.

| Children’s Eating Behavior Questionnaire [180] | 10 items | Likert-type responses | Total scores are derived from subscales | Children aged 6-9 years | Excellent internal consistency (0.78) and good inter-rater reliability (0.87) | Significant correlation with another measure of child obesity.

| Mattson Foodiness Questionnaire [186] | 5 items | Likert-type responses | Total scores are derived from subscales | Children aged 6-9 years | Excellent internal consistency (0.86) and good inter-rater reliability (0.79) | Significant correlation with another measure of child obesity.

| Food Sensitivity Scale [223] | 21 items | Likert-type responses | Total scores are derived from subscales | Adults and children (6 to 13 years) | Excellent internal consistency (0.87) and good inter-rater reliability (0.79) | Significant correlation with another measure of child obesity.
Measures of Child Eating Styles

Several questionnaires exist for assessing children's eating behaviors; however tools for assessing energy intake self-regulation in preschool-aged children, especially using non-observational tools, are limited. The 8-item Self-Regulation in Eating scale examines whether parents feel their children stop eating when full [186,187]. The internal consistency for this scale is good. A study with 3- to 8-year olds found that parents who believe their children are able self-regulate, tend to use less restrictive feeding practices [186].

The 35-item Children’s Eating Behavior Questionnaire (CEBQ) [188] evaluates children’s food approach and avoidant behaviors. Food approach subscales include: food responsiveness (e.g., given the choice, my child would eat most of the time); emotional over-eating (e.g., my child eats more when annoyed); enjoyment of food (e.g., my child loves food); and desire to drink (e.g., if given the chance, my child would drink continuously throughout the day). The food avoidant subscales are: satiety responsiveness (e.g., my child has a big appetite); slowness in eating (e.g., my child eats slowly); emotional under-eating (e.g., my child eats less when s/he is angry); and fussiness (e.g., my child refuses new foods at first) [188]. The CEBQ has good internal validity with child BMI and reliability across parents of young children varying in ethnicity and location [166,188,189]. A longitudinal study found that CEBQ subscales scores were fairly stable over time [166,188], but were not associated with child BMI or temperament [166]. The CEBQ also shows some inability to distinguish between food fussiness and food neophobia [190].

The Food Neophobia Scale has 10 items which assess how a child responds to new foods on a 1-7 scale (disagree strongly to agree strongly), with higher scores indicating more food neophobia (i.e., fear of trying new foods) [191]. The scale has been widely used and cited in studies of children and has been validated in samples from the United States, Finland, and Sweden [192]. Recently, it was used in a baseline obesity prevention intervention analysis [193]. Among preschool aged children, higher Food Neophobia scores was significantly associated with lower vegetable intake and less variety of foods eaten [193].

The Feeding Problem Questionnaire [194] assesses food pickiness (4-items), defined as poor and selective eating, and disturbing mealtime behaviors (4-items), which measure the extent of disturbing behavior during mealtime. The questionnaire was developed for use with a mostly Dutch sample of parents of children aged 1- to 36-months. The pickiness items had relatively high factor loadings (range 0.59-0.74) and internal consistency, and disturbing mealtime behaviors had fair factor loading (range 0.43-0.55) and good internal consistency. No other study could be located that used this questionnaire.

The 25-item About Your Child’s Eating-Revised (AYCE-R) [129] questionnaire evaluates caregiver beliefs and concerns about children's eating and family mealtime
exchanges. Caregivers indicate how often myriad situations related to children’s eating take place in their family using three subscales with good internal consistency: Resistance to Eating, Positive Mealtime Interaction, and Child Aversion to Mealtime. Significant correlation with another environment scale in expected directions showed that the AYCE-R factors had good convergent validity [128]. Validity and reliability was assessed in samples of children 8- to 16-years [129] and 2- to 6-year olds [195]. The AYCE-R has been used in a study of preschool-aged children and their parents enrolled in an obesity-prevention program and has shown improved resistance to eating and positive mealtime interactions between baseline and 6-months after the initiation of the intervention [196].

**Conclusion**

Research has increasingly provided evidence that environmental factors significantly influence diet, physical activity, and obesity in adults [197-199] and children [80, 200-202], yet the causal relationships for many of these associations remain tenuous [80, 199]. In recent years, many health behavior change theories have recognized the influence of environmental factors on health outcomes [203]. This ecological approach to public health issues posits that an individual’s motivation and skills alone are not adequate to facilitate behavior change; environments and policies also need to support and facilitate the practice of healthful behaviors [80,199,204]. Reciprocal determinism, a construct of Social Cognitive Theory, postulates that a person’s characteristics, actions, and environmental milieu, concurrently and mutually affect each other [205]. Environments non-supportive of weight-management behaviors make it challenging for individuals to undertake behaviors that allow them to avoid excess weight gain. Interventions to prevent overweight and obesity in young children have thus far have failed to show an effect in reducing or limiting weight gain [206], perhaps because little attention has been given to social and environmental factors [33].

Given its potentially great influence on the development of behaviors, the home deserves in-depth study to increase our understanding of its role related to obesity risk in children [207]; however, research focusing on the home environment, especially the interpersonal environment, remains limited [80,208-210]. The studies that do exist tend to focus on a small number of factors within the home environment, leaving out potentially vital variables and limiting the ability to explore interactions among variables. Research also is hindered by a lack of validated and reliable environmental measures [207,211-213], which are necessary to create an accurate understanding of potential predictors and modifiers of obesity risk in young children and their parents [210]. It is hoped that the information in this chapter will spur new and expanded research questions that provide insights into how the home interpersonal environment can support or thwart healthy weight status and lead to programs that enable parents to create home environments supportive optimal child growth and
development while preventing childhood obesity.

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