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Maternal Decisions about the Initiation and Termination of Infant Feeding

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Abstract

Caregiver responsiveness to infant hunger and fullness cues is thought to play a role in the development of overweight during infancy, but this aspect of infant feeding has received little study. This research used a qualitative approach to understand aspects of feeding responsiveness involving maternal perception and interpretation of infant feeding cues by asking mothers about factors they used to initiate and terminate infant feeding. Participants were 71 ethnically diverse mothers of healthy, term infants at 3, 6, or 12 months of age. Mothers were asked three questions about feeding initiation and termination. Qualitative content analysis was used to derive major themes. Results revealed that the extent to which infant cues were prominent in maternal approaches to feeding was variable. Some mothers focused on amount consumed or eating schedule whereas others reported sole orientation to infant state and/or oral behaviors. Other themes involved the range of intensity and specificity of the infant cues that prompted feeding initiation and termination. The qualitative findings suggest that mothers may differ in the extent to which they perceive and rely upon infant hunger and fullness cues to initiate and terminate feeding.

Keywords

feeding; responsiveness; infant; maternal; parenting; qualitative content analysis

Introduction

A primary goal of parenting in the early years of life is to support appropriate child growth and development. That 10% of infants and toddlers are overweight with the prevalence as high as 18% among non-Hispanic black children (Ogden, Flegal, Carroll, & Johnson, 2002), suggests that this goal is not being met for many. Overweight is recognized as a multifactorial problem of energy balance involving genes, environment, and behavior. One context in which these factors come together is the daily feeding interactions between parent and child. The human infant is born dependent upon caregivers to meet their nutritional

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needs, underscoring the importance of dyadic feeding interactions for the infant's early nutritional health and growth. The enduring nature of this dependency in early development implicates dynamics involving feeding initiation and termination as modifiable contributors to over-nutrition.

Responsiveness to infant hunger and satiety cues is a central dimension of responsive feeding, which refers to broad aspects of caregiving behavior believed to support healthy food intake and growth (Ainsworth & Bell, 1969; P. Engle, 1999; P. L. Engle, Bentley, & Pelto, 2000). Previous work on responsive feeding has focused primarily on caregiving behaviors (e.g., encouraging eating) germane to the prevention of child malnutrition and growth stunting, with relatively little attention given to the parallel role of responsiveness in child overnutrition and overweight. Responsiveness to infant hunger and satiety cues is central to the idea that a chronic mismatch of infant state and caregiver feeding behavior may alter the child's learned self-regulation of eating and increase the risk of overweight (Birch & Fisher, 1998; Bruch, 1973; Costanzo & Woody, 1985). Consistent with a conceptualization of responsive parenting from the child development literature (Lamb & Easterbrooks, 1981), responsive feeding necessitates *perception*, *accurate interpretation*, and *appropriate response* to the infant's hunger and fullness cues at any given point in development. Each of these aspects of feeding responsiveness deserves further explication. *Perception* involves the caregiver's awareness of the infant's cues. *Accurate interpretation* involves the correct assignment of meaning to a cue such that a hunger cue is understood to be a hunger cue and not, for example, an indication of pain or a desire to play. Finally, in the context of feeding, *appropriate response*, at the most basic level, involves feeding in response to hunger cues and cessation of feeding in response to fullness cues.

Empirical description of infant hunger and fullness behaviors, as well as maternal responses to these behaviors, particularly in the context of overnutrition, is limited. Mouthing appears to be hunger related (Korner, Chuck, & Dontchos, 1968) while slowing of eating pace, becoming sleepy, taking interest in surroundings, refusing nipple/food, and spitting have been identified as satiation cues (Crow, 1977; Morris, Rogers, & Taper, 1983). Little else is documented regarding the temporal sequencing, normal variability, and developmental progression of hunger and fullness cues during infancy. Moreover, the extent to which mothers rely upon such cues to initiate and terminate feeding is not well elucidated. Prior qualitative research has suggested that infant crying and/or perceived infant interest in adult foods can prompt the early introduction of solids (Anderson et al., 2001; Bentley, Gavin, Black, & Teti, 1999). While this research suggests ways in which infant behaviors may influence maternal decisions regarding timing of solid introduction, it does not address responsiveness to infant feeding cues during daily feeding interactions over the course of the infant's development. In a recent observational study, low to moderate maternal control (restriction of intake or pressure to eat) during solid feeding at 6 months was found to predict infant weight gain over the next six months, with early rapid gainers decelerating and early slow gainers accelerating in their rate of weight gain (Farrow & Blissett, 2006). While that study used an observational approach to quantify responsive feeding, it did not provide insight into how mothers approached decisions about when feeding initiation and termination.

Understanding how caregivers make decisions about when feeding begins and ends is critical to interpret feeding interactions and effectively intervene to improve feeding responsiveness. Improved feeding responsiveness during infancy and toddlerhood may, in turn, lead to effective prevention of and/or intervention in early childhood obesity. To date, little is understood about the factors that influence the initiation and termination of infant feeding. Thus, the primary aim of this study was to examine aspects of maternal feeding responsiveness involving perception and interpretation by describing infant cues and other factors reported by mothers in the initiation and termination of feeding.

Methods

Design—A qualitative descriptive design was used to evaluate maternal decisions about the initiation and termination of feeding. The data were collected as part of a larger cross-sectional, observational study ($n = 93$) on infant eating and growth among 3-, 6-, and 12-month old infants. Mothers responded to open-ended questions about the initiation and termination of feeding their infants.

Sample—A convenience sample was recruited from multiple community sources, including infant care classes, pediatric offices, family-oriented fairs, infant-oriented stores, mothering groups, websites, and newsletters. Potential participants were told that the purpose of the study was to assess eating behavior and growth during infancy. Inclusion criteria included: singleton-birth and English proficiency. Exclusion criteria included: premature birth (< 37 wks), low birth weight (< 2500 g), chronic illness, congenital abnormalities, and maternal self-reported eating disorder diagnosis in order to control for potentially confounding factors. Participants were offered a small stipend. All procedures were approved by the Baylor College of Medicine Institutional Review Board.

Seventy-one mother-infant pairs participated in the qualitative interview. Male and female infants were approximately equal in number ($n = 35$ and 36, respectively). The mean birth weight for infants was 3.4 (±0.5) kilograms (kg), ranging from 2.5 to 4.7 kg. The average infant weight-for-length percentile ($N = 69$) was 61.3 (±30.4), ranging from 0.5 to 100. Thirteen infants (18.8%) were overweight [≥ 95th percentile weight-for-length (Kuczmarski et al., 2000)] and two (2.9%) were at less than the 5th percentile. Exclusion of the two dyads in which infants were less than the 5th percentile did not alter the findings, so they were included in the analysis. The majority of infants (57-59% across ages) were observed to consume breastmilk, a small number observed to consume only formula (5-10% across ages) and approximately one-third (32-36% across ages) were observed to consume both breastmilk and formula. While the majority of 3-month old infants were not observed eating solids (95.2%), most 6- and 12-month olds were (86.4% and 92.9%, respectively).

Maternal age was 28.9 (±5.7) years on average, ranging from 18-47. The majority of mothers had 1-2 children, with the number of births ranging from one to seven (see Table 1). More than half of mothers were not working outside the home. Of those who were employed ($n = 29$), 12 (41.4%) reported full-time employment. Annual family income ranged from less than $20,000 to greater than $80,000, with median income category between $40,000 and $49,999. The majority of mothers were married ($n = 55$; 77.5%) and just over half were

white (n = 38; 53.5%). At 3 to 12 months post-partum, maternal BMI averaged 29.7 (8.5) with a range of 19.7-52.1; the majority of mothers were overweight, with 27 (38%) obese. There were no significant differences among any of the demographic variables when assessed by infant age (data not shown).

Measures

Infant feeding decisions: A single interviewer asked each mother three questions: (1) How do you decide when to feed your baby?; (2) How do you know when your baby wants to eat?; and, (3) How can you tell when your baby has gotten enough to eat? Responses were recorded by hand at the time of interview to capture their essential elements.

Procedure—The qualitative data were obtained as part of an observational procedure to assess mother-infant feeding interactions in a laboratory setting. Data were collected from September 2003 to August 2005. Mother's consent for their own and for their infant's participation was obtained upon arrival to the Children's Nutrition Research Center, Houston, TX. Vital signs and a brief assessment of the infant's wellness were obtained. Mother-infant interactions were then recorded for a 6-hour period in a private room. Self-report questionnaires and the qualitative interview of interest were administered at the end of the observation period.

Qualitative Content Analysis—Conventional qualitative content analysis was chosen because the study's main aim involves description of a phenomenon for which there has been little research or prior theoretical consideration (Hsieh & Shannon, 2005). The qualitative analysis group consisted of six members (including authors EAH and JOF) with a variety of educational and ethnic backgrounds. Members were instructed to read all of the responses to immerse themselves in the data and get a sense of the whole (Tesch, 1990 as cited in Hsieh & Shannon, 2005). The next step involved highlighting specific words and/or phrases within the responses that were representative of distinct thoughts (Hsieh & Shannon, 2005). Group members were instructed to make notes in the margins of their texts to record their initial impressions about the data. Using the highlighted words/phrases, members independently derived categories and grouped conceptually linked words/phrases within these categories, noting the relative frequency of responses within these categories. The team then met weekly as a group over a two-month period to discuss the findings and resolve any differences in coding and category development. This process was undertaken for each of the three questions of interest. Response frequencies within each of the identified categories, were used to identify dominant themes within and across each of the three questions to which mothers responded.

The frequency distribution of each dominant theme was assessed by coding the data using a 3-category operational definition. A score for each theme was assigned to each maternal response independently by the primary author and another author (SOH), who was not a member of the initial qualitative analysis group. Interrater reliability was assessed through percent agreement and Cohen's Kappa.

Results

Maternal responses to two questions ("How do you decide when to feed your baby?; and, How do you know when your baby wants to eat?") were grouped to evaluate the frequency of words and phrases related to the initiation of infant feeding (Table 1). Across ages, the most frequent elicitors of feeding were infant crying/fussing, infant oral behaviors, and time-related factors, such as schedule and time demand. Responses to the third question ("How can you tell when your baby has gotten enough to eat?") were used to evaluate the frequency of words and phrases related to the termination of feeding (Table 2). The most frequently cited cues to terminate feeding included relatively overt cues, such as turning/pulling away, pushing away, and fussiness in the older children, with nipple detachment predominating for 3 month olds.

The frequency of responses was evaluated both within and across age groups to identify central themes pertaining to maternal feeding responsiveness. Three themes were derived involving the prominence, intensity and specificity of infant cues that mothers reported to use when initiating and terminating feeding.

Theme 1: Use of Infant Cues

Mothers varied widely in the extent to which infant cues were prominent in their decisions about when to feed. Some mothers cited feeding solely in response to infant cues: "Licking lips, cries" and "She will reach for food." Alternatively, some mothers reported feeding according to a fixed time interval or schedule without reference to the infant: "Every 2 hours" or "By eating schedule." There were also mothers who cited a combination of external factors and infant cues: "Schedule, otherwise feed when he cries." A similar pattern was characteristic of decisions about the termination of feeding. Examples of responses focusing on infant cues included: "Turns away" and "She will say 'no more.'" Some mother-based responses were: "I am mindful of amount given to him" or "…breast is not full anymore." Responses reflecting a combination of maternal factors and infant cues included: "Belly sticks out & baby shakes her head saying no."

The use of infant clues was used as the theme to reclassify the responses of each mother as being infant based, mother based, or a combination of the two (Figure 1). Over the first year, infant cues became less salient in mothers' reports of decisions to initiate and terminate infant feedings. At 3-months, 81% of mothers reported the sole use of infant cues. At 6 and 12 months, these percentages decreased to 68% and 64%, respectively.

Theme 2: Intensity of Infant Cues

Mothers also reported a wide range in the intensity of infant cues that prompted feeding. Strong, overt cues included: "When she is hungry she cries" and "Pulls at my shirt, tries to grab food I am eating." Infant cues of moderate intensity included: "She nuzzles against chest" or "Chews on her fingers." Finally, some mothers reported using relatively subtle cues, such as "licking lips." A similar range of infant cue intensity was reported to prompt the termination of feeding. Overt cues included: "He spits out bottle," "Shakes his head 'no more,'" and "Smash or throw food." Others cited cues of a more moderate nature, such as

"Lets nipple go" and "Stops eating," or more subtle cues: "…distracted" or "He'll get really slow between spoonfuls."

The infant cues that mothers reported using to initiate and terminate feeding were classified as follows (Figure 2): 1) *Subtle* cues were those of low intensity, which could be missed by less attentive caregivers; 2) *Moderate* cues were those of a mid-level of intensity; 3) *Overt* cues were designated as those of relatively high intensity which would be likely to elicit immediate attention, such as crying or fussiness. Over the first year, a minority of mothers reported cues of subtle or moderate intensity, with 19, 23, and 30 percent of mothers reporting such cues at 3, 6, and 12 months, respectively.

Theme 3: Specificity of Infant Cues

The final theme involved the degree to which infant cues cited by mothers were specific to feeding. Vague or non-specific cues included the following: "When she gets fussy" and "He is jumpy and moves around a lot." Others cues were more probable to represent hunger: "She tries to nibble me" and "She chews her hands." Finally, there were some cues with a high degree of hunger specificity: "He tries to latch onto my breast" and "He pulls bottle out of diaper bag." As for the preceding themes, a parallel pattern was noted in the infant cues mothers cited in terminating a feeding. Examples of vague or non-specific cues include: "He is happy or asleep" or "…distracted." Others were probable fullness cues: "Let's nipple go" or "Starts to play with food." Some cues left little doubt to whether the infant was finished with eating: "He won't open his mouth" or "She pushes the spoon away."

Infant cues cited by mothers were classified as follows (Figure 3): 1) vague or non-specific infant cues could easily be an indication of another state besides hunger or fullness; 2) probable infant cues were those that were likely an indication of hunger or fullness; and, 3) specific infant cues were those that invoked little doubt or were easily interpretable as indications of hunger or fullness. By the end of the first year a greater percentage of infant cues were specific in nature compared to those reported for 3 and 6 months olds (26%, 10%, and 9%, respectively).

Discussion

Feeding that is responsive to infant hunger and fullness cues can be conceptualized as involving the accurate perception, interpretation, and appropriate response to infant's behavioral, affective, etc. cues. The results of this study provide new empirical description of perceptual and interpretive aspects of feeding responsiveness during the 1st year of life. Mothers varied in the extent to which they cited infant behavior as cues to initiate and terminate feeding. Further, the range of intensity and specificity of infant cues mentioned also implies variation in maternal perception and/or interpretation of infant feeding cues. Data generated from open ended questions provides a perspective on infant feeding initiation and termination not accessible by alternative methods such as dyadic observation or self-reports of experimenter defined behaviors.

The primary theme that emerged from our analysis involved the extent to which mothers cited the use of infant cues in their approach to feeding. On average, more than one of five

mothers cited maternal-based factors, such as schedule or how much was fed, in making decisions about the initiation and termination of feeding. Of interest is whether mothers who cite such factors are more likely to mismatch their feeding behavior with the infant's state than mothers who solely rely on infant cues. Morris, Rogers, and Taper (1983) found that mothers of 3-month old infants engaged in more feeding for reasons other than hunger compared to later feeding at 13 and 23 months. A lack of parental understanding of their younger infant's communication cues and increasing communication skill among older infants were cited among the potential reasons for this difference (Morris et al., 1983). Daily infant state regulation, thought to arise from caregiver-infant mutual adaptation by 6 to 9 months of age (Sander, 1975), may increase the likelihood that mothers recognize hunger states more readily later in infancy than during earlier periods of relative disorganization. In the present study, the percentage of mothers citing infants' cues solely in their feeding decisions decreased from 3 through 12 months. It is possible that mothers of younger infants cite infant cues more readily than mothers of older infants, but these cues may not necessarily reflect infant hunger or satiety.

The second theme involved the intensity of cues to which mothers reported responding. A minority of mothers reported the use of subtle or moderate infant cues in initiating or terminating feeding. Beebe and Stern (1977) have suggested that there is a spectrum of “engagement and disengagement” behaviors (p. 52) that infants use to communicate wants and needs in social interactions. Feeding cues are thought to follow a temporal sequence with those of increasing intensity seen when there is little response to more subtle cues. For instance, in the young neonate, a progression of satiety cues from slowing and/or becoming sleepy to refusal to open the mouth and/or spitting the nipple out has been observed (Crow, 1977). Whether mothers who fail to respond to subtle or moderate infant feeding cues are more likely to over- or underfeed the infant is not known.

Finally, while increasing specificity of cues should facilitate matching of maternal feeding behavior with infant state, ¾ of mothers at 12 months did not report the use of specific infant feeding cues. Given prior observations suggesting an increasing specificity of infant communication over the course of the first year (Givens, 1978), this is a surprising finding. An important question that remains to be answered is whether mothers who respond to cues not specific to eating, such as fussiness, are more likely to overfeed their infants. In prior work by Bentley et al. (1999) mothers with temperamentally difficult infants have reported the use of food and/or liquids to successfully soothe or ‘quiet’ them. Feeding when used as a behavior modifier in response to difficult behavior rather than solely in response to true infant hunger may play a role in the associations others have noted between difficult temperament and increased infant weight gain over the first year of life (Carey, 1985; Darlington & Wright, 2006).

This study has its limitations, including the hand-recording of maternal responses during the qualitative interview and a cross-sectional design which does not address causality. Future qualitative work should include the use of follow-up probes to enrich the data and audio-recording and transcription of maternal responses. Observational research is needed to evaluate the extent to which maternal descriptions of their approach to feeding represent their behavior during feeding.

In conclusion, the findings of this research provide an initial description of the variations in infant cues that mothers perceive and interpret as hunger and fullness indications during the first year. The variable intensity, specificity, and prominence of cited infant cues suggests that mothers may differ in the extent to which they perceive infant hunger and fullness cues and use them when initiating and terminating feeding. Insight into the types of infant cues that mothers perceive as salient to their feeding decisions underscores opportunities for interventions with mothers that may improve their ability to differentiate hunger and fullness cues from other types of cues over the course of their child's development, thereby improving feeding responsiveness. This may, in turn, ultimately lead to increased facilitation of healthy growth and development and a decreased incidence of early childhood obesity.

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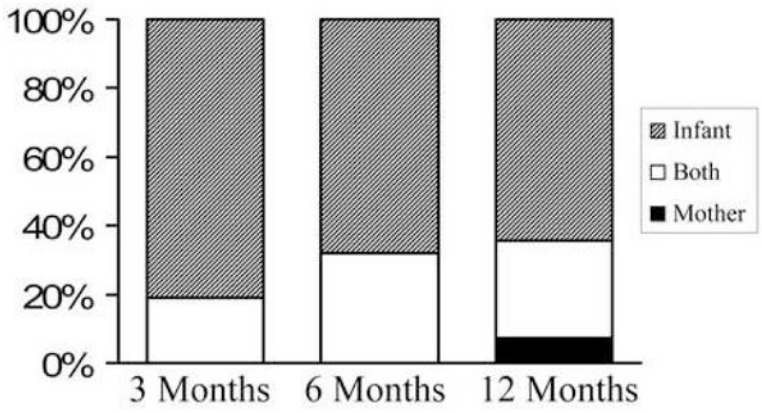

Figure 1. Use of Infant Cues

The proportional distribution of maternal use of infant cues in initiating and terminating infant feeding. Maternal responses were coded (independently by authors EH and SOH) as being infant based, mother based, or a combination of the two. Mean percent agreement between raters = 94%; Cohen's κ = 0.84.

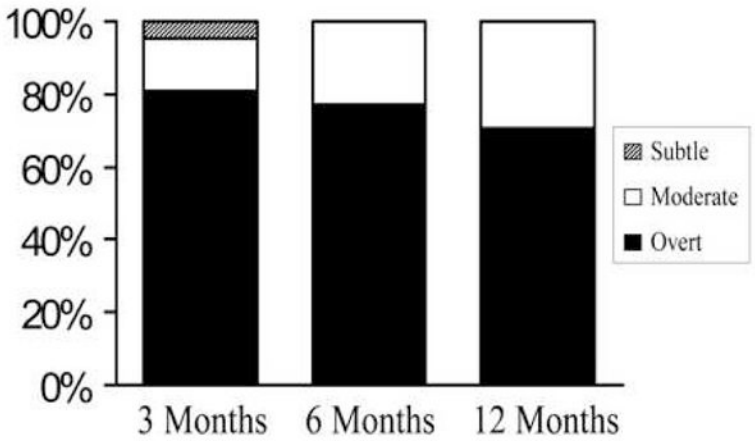

Figure 2. Intensity of Infant Cues

The proportional distribution of the intensity of infant cues cited by mothers in initiating and terminating infant feeding. Maternal responses were coded (independently by authors EH and SOH) as being subtle, moderate, or overt. Mean percent agreement between raters = 79%; Cohen's $\kappa = 0.69$.

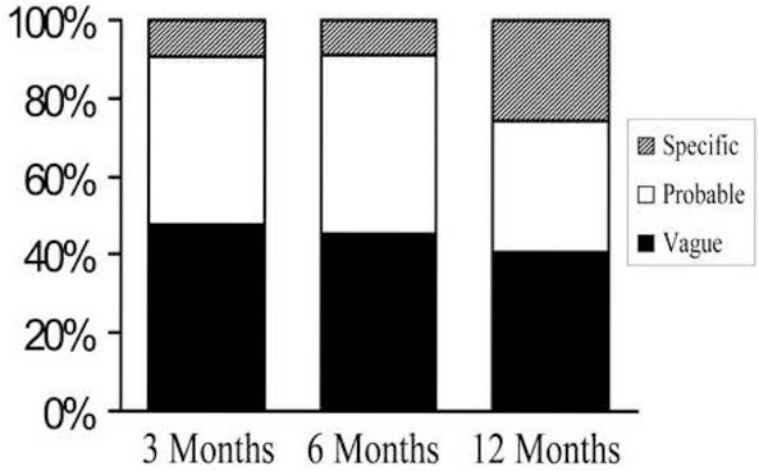

Figure 3. Specificity of Infant Cues

The proportional distribution of the specificity of infant cues cited by mothers in initiating and terminating infant feeding. Maternal responses were coded (independently by authors EH and SOH) as being specific, probable, or vague. Mean percent agreement between raters = 79%; Cohen's κ = 0.69.

Table 1
Qualitative Analysis: Feeding "Initiation" Categories

	3 Months	6 Months	12 Months
Frequent (≥ 3 Maternal citations)	Fussy/Crying	Fussy/Crying	Fussy/Crying
	Schedule	Schedule	Schedule
	Time Interval	Time Interval	Time Interval
	Increased	Rooting	On demand
	Sucking/Mouthing	Over-stimulated	Rule out other needs
	Rooting On demand	Increased mouthing	Grab/reach for food
Infrequent (< 3 Maternal citations)	Routine	Routine	Routine
	Squirming/fidgety	Rule out other needs	Pointing at food
	Rule out other needs	Staring	Body language
	Negative affect	Temperament	Increased mouthing
	Breast fullness	Can't tell	Food specific vocalization
			Goes to refrigerator
			To keep quiet

Table 2
Qualitative Analysis: Feeding "Termination" Categories

	3 Months	6 Months	12 Months
Frequent (≥ 3 Maternal citations)	Nipple detachment	Turn/pull away	Turn/pull away
	* Releases	Push away	Throw food
	* Spits	Fussy/agitated	Push away
	Stops	Stops	Cry/fuss
	Refuses	Spits food	
		Closes mouth	
Infrequent (< 3 Maternal citations)	Pull away	Distracted	Uninterested/distracted
	Push away	Sleepy	Smash/play with food
	Food finished	Finishes food	Say 'no more'
	Happy/asleep	Plays with food	Lateral head shake
	Hand-to-mouth	Turns food over	Slowing
	Lateral head shake		Stomach distention
			Touch face/head
			Mom mindful of quantity
			Stops
			Spits
			Trying to escape