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# Mealtime interactions: the role of sensitive parental feeding behavior in the first years of life

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# Chapter 1

## General Introduction

In 2006, James and Chrissy have their first child, a healthy boy named Isaac. They are over the moon with their beautiful baby, and are determined to give him everything he needs. Because Chrissy is not able to continue breastfeeding due to several reasons, Isaac receives formula from the second week onwards. James and Chrissy soon find out Isaac does not have a big appetite, and that he structurally drinks less than what is recommended. During the first check-up at the child welfare center at the age of 4 weeks, Isaac is found to be slightly underweight. James and Chrissy decide not to worry, and to simply try to offer the bottle more often and to persist a little longer during every feed. When Isaac is 14 weeks of age, the child welfare center mentions that James and Chrissy may soon start complementary feeding. Because Isaac was slightly underweight during all check-ups so far, they recommend that James and Chrissy start offering complementary food as soon as Isaac turns 4 months. James and Chrissy are happy with the advice and start offering solid food with a lot of motivation and enthusiasm. Because the only advice they received was "you can start at 4 months", they decide to google to find some tips and tricks on complementary feeding. When Isaac is offered his very first bites, he has trouble processing and swallowing the 'new stuff', and starts crying after a few attempts. James and Chrissy offer different kinds of fruit and vegetable purées each day to find out what he likes, but Isaac keeps rejecting the food. Although James and Chrissy notice Isaac does not seem to like the food, they also feel it is important for him to gain some weight. Because they are so determined to increase his food intake, they start pressuring Isaac to eat as much as they think is enough. During the next check-ups at the child welfare center at 8 and 12 months, Isaac is found to have an average weight, and James and Chrissy are happy their strategy pays off. However, Isaac still does not seem to enjoy eating, and family mealtimes are often stressful to Isaac, as well as to James and Chrissy, who have continued their pressuring feeding style. In an attempt to maintain his healthy weight, James and Chrissy teach Isaac to always finish his plate, a habit he eventually internalizes throughout the rest of his childhood. In addition, Isaac starts overeating, by consuming large amounts of mostly unhealthy foods. By the age of 10 years, Isaac has officially become overweight. James and Chrissy are very much surprised by this development, because mealtimes with Isaac had been such a struggle for so many years.

## Promoting healthy eating habits in children

Over the past decades, childhood overweight and obesity have increased substantially (Dabas & Seth, 2018; Ebbeling, Pawlak, & Ludwig, 2002; Kiefner-Burmeister & Hinman, 2020; Wang & Lobstein, 2006). The physical and psychological consequences that are associated with childhood overweight are numerous, and may include diabetes, high blood pressure, low self-esteem, bullying and sadness (Bray, Kim, & Wilding, 2017; Janssen, Craig, Boyce, & Pickett, 2004; Strauss, 2000; Widhalm, 2018). Early prevention is considered important to reducing and ultimately ending the obesity pandemic (Widhalm, 2018). To this end, promoting healthy eating habits from infancy onwards is essential.

Obesity is a direct consequence of long-term energy imbalance, where energy intake exceeds energy expenditure. Modernization involving large changes throughout history such as the development of agriculture, industrialization and advances in technology have influenced our dietary pattern (Cordain et al., 2005). For example, following the Industrial Revolution, food-processing procedures were developed that significantly changed the production of food and types of food available to consumers. As a consequence, today's environment is characterized by an almost unlimited supply of convenient, relatively inexpensive, highly palatable, energy-dense foods (Hill & Peters, 1998). Moreover, the same advances in technology brought us modern ways of transport, as well as modern media such as television, electronic games, and computers, which have reduced the necessity of physical activity in daily life. Unless food intake is limited in accordance with the resulting more sedentary life, overweight and ultimately obesity are likely to arise (Hill & Peters, 1998). Taken together, the current environment promotes high energy intake and low energy expenditure, which has resulted in an obesity pandemic. Next to increasing physical activity, changing our dietary pattern is the key to solving the problem. On an individual level, it is essential to adopt a healthy diet from the first years of life onwards.

Poor eating habits, such as eating too much energy-dense food, eating in the absence of hunger, or low vegetable consumption increase the risk of developing overweight and obesity (Lansigan, Emond, & Gilbert-Diamond, 2015; Schwingshackl et al., 2015). From early toddlerhood onwards children already consume too much energy-dense food and too little fruit and vegetables (Denney, Afeiche, & Eldridge, 2017; Emmett & Jones, 2015; Fox, Pac, Devaney, & Jankowski, 2004; Goldbohm, Rubingh, Lanting, & Joosten, 2016; Ocké et al., 2008). In the Netherlands, 40-80% of preschoolers fail to meet daily recommendations for vegetable intake (Goldbohm et al., 2016; Ocké et al., 2008). In addition, in two recent experimental studies, around 40 up to almost 70% of 1 to 4-year-olds ate without being hungry. When children eat without being hungry, they are ineffectively regulating their own energy intake, which in turn puts them at risk of overeating and developing overweight (Fogel et al., 2018; Schultink et al., 2021). Over the

past decade, the modification of self-regulation of eating is more and more considered a promising way to prevent children from becoming overweight (e.g., Lumeng et al., 2017; Murray, Rosanbalm, & Christopoulos, 2016).

In early childhood, parents play an important role in their child's dietary pattern. Every day, parents decide *what* food is offered, *when* food is offered, and *how* food is offered, thereby laying the foundation of experiences with food and mealtimes which the child continues to build upon. To foster healthy eating habits in children from the very beginning and to prevent children from becoming overweight, it is important to study which parental approach to feeding is effective. Although many earlier studies focused on the impact of *what* food is offered, more and more studies emphasize the importance of *how* food is offered, by studying how parents interact with their child during mealtimes (Black & Aboud, 2011; DiSantis, Hodges, Johnson, & Fisher, 2011; Hurley, Cross, & Hughes, 2011). The present dissertation aims to examine these parent-child interactions during mealtimes and their relation to child health outcomes during infancy and toddlerhood.

## Feeding during the first years of life

The transitions infants go through in the first years of life regarding eating can be considered a pivotal developmental task. After a few months of an exclusively liquid diet, infants need food other than milk to meet their energy and nutritional requirements (Butte, Lopez-Alarcon, & Garza, 2002; Reilly, Ashworth, & Wells, 2005). This transitional period from milk to a diet that mainly consists of solid food is called the process of complementary feeding, and generally starts around the age of 4-6 months in Western countries. This process can be seen as a window of opportunity in terms of influencing eating behavior, given that the foundation of how children relate to food and eating is formed during those very first experiences (Van Dijk, Hunnius, & van Geert, 2012).

When introducing solid food to their infant, parents usually offer grains, fruits, or vegetables (Chambers, 2016; Voedingscentrum, 2017). To date, there is some evidence that it is beneficial to start complementary feeding with exclusively vegetables instead of fruits, because sweet tastes would impede vegetable acceptance (Barends, de Vries, Mojet, & de Graaf, 2013; 2014; Fildes et al., 2015). In general, other studies have shown ways to teach children to like vegetables and increase vegetable intake, such as for example to a) *repeatedly* expose them to the taste of a certain vegetable (Barends et al., 2013; 2014; Hetherington, Schwartz, & Madrelle, 2015; Maier-Nöth, Schaal, Leathwood, & Issanchou, 2016; Remy, Issanchou, & Chabanet, 2013), and b) to expose them to a *variety* of vegetables (Coulthard, Harris, & Fogel, 2014; Gerrish & Mennella, 2001; Lange, Visalli, Chabanet, Schlich, & Nicklaus, 2013).

As with Isaac in our case study, the transition to complementary food and further development of eating behavior can be influenced by various parent- and child-characteristics. Certain characteristics of the parent and the child will affect their own behavior as well as influence the other's behavior. With regard to infant characteristics, the development of eating behavior is influenced by several factors, such as progress in digestive and oral motor skills, internal cues of hunger and satiety, cognitive skills, and temperament (Figure 1; (Birch, 2016)). Parental characteristics that may influence the feeding process include behavioral habits and values related to food in their own family and broader culture, food access and availability, or their knowledge and abilities around feeding (Figure 1; (Black & Hurley, 2017)). All of these factors might influence a child's feeding experience, and these factors are likely to differ in every family.

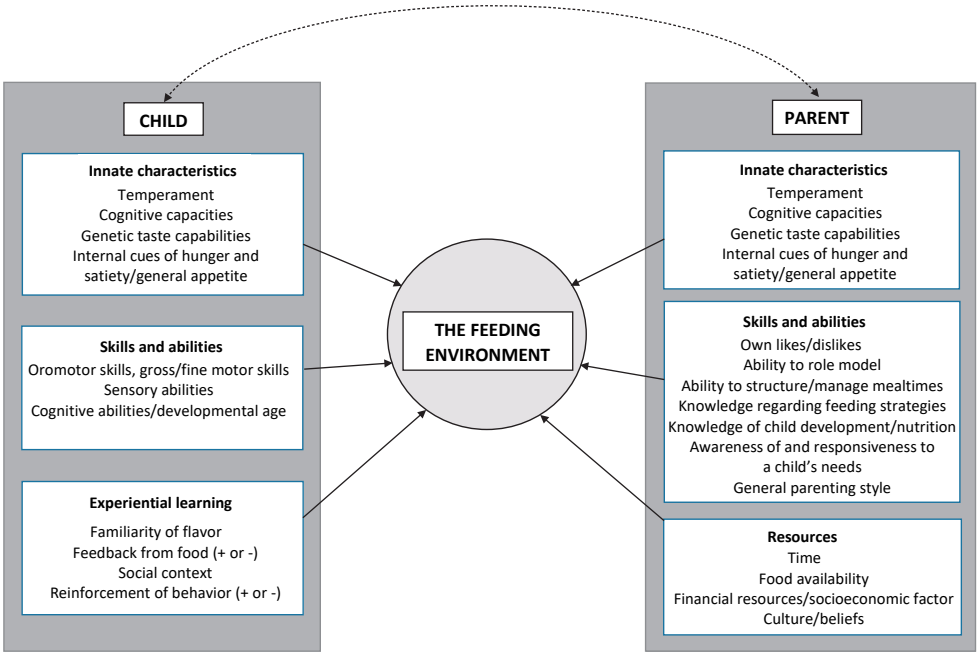


**Figure 1. Characteristics influencing the feeding environment. Based on Ross, 2017.**

All these parent and child characteristics do not only influence the feeding environment individually, but always as part of a complex interactive system. For example, the resources of the parents, as well as their own likes and dislikes, influence the kind of food they offer to their child, as well as their ability to model consumption of healthy food. Or, a child's genetic taste capabilities and general appetite influence the child's eating behavior, which may in turn influence the level to which the parent is likely to pressure the child to eat.

In order to foster healthy eating habits in children and prevent them from becoming overweight, parental recommendations on child feeding often concern *what* to feed children rather than focusing on parental skills and abilities (i.e. *how* to feed) (Black & Hurley, 2017). Because parents play a substantial role when it comes to influencing their child's feeding experiences, health behavior, and weight, it is important to provide parents with evidence-based guidelines on *what* and *how* to feed their child during the first years of life. The present dissertation mainly focuses on the role of *how* to feed children, and more specifically on sensitive feeding behavior.

## Sensitive parenting

During the first year of life, caregivers and infants learn to recognize and interpret each other's verbal and nonverbal communication signals. This reciprocal process underlies the emotional bonding or attachment within a dyad that may foster a healthy social-emotional development (Ainsworth, Blehar, & Waters, 1978). On the other hand, inconsistent and nonresponsive reactions that disrupt communications among caregiver and infant may cause a distrustful and insecure relationship to develop, which may impair the child's social-emotional development (Kochanska, Woodard, Kim, Koenig, Yoon, & Barry, 2010; Kretchmar & Jacobvitz, 2002).

Sensitive parenting reflects parent-child reciprocity, and is often studied in the context of play. Sensitive caregivers observe and interpret their children's signals correctly, and subsequently respond to those signals promptly and adequately (Ainsworth, Bell, & Stayton, 1974). Sensitive parenting does not necessarily mean caregivers should comply with the child's request, but rather that they acknowledge and engage with the child's point of view and communications. Evidence from observational and intervention studies has shown that parental sensitivity is related to positive child outcomes on several domains, such as secure attachment (Bakermans-Kranenburg, Van IJzendoorn, & Juffer, 2003), social functioning (Kochanska, 2002) and adaptive cognitive development (De Wolff & Van IJzendoorn, 1997; Mesman, Van IJzendoorn, & Bakermans-Kranenburg, 2012).

### Sensitive parenting in the feeding context

The principles of sensitive parenting can be applied to the feeding context as well. In her feeding observations during the first year of life, Mary Ainsworth observed that mothers who fed on demand, who adapted their feeding pace and who promptly responded to their infant during feeding had infants who cried less in early infancy and demonstrated greater attachment to their mothers at the end of the first year (Ainsworth and Bell, 1969). In the current literature, a distinction is made between a responsive parental feeding style, and nonresponsive parental feeding styles, with a responsive feeding style being

considered the most optimal (DiSantis et al., 2011; Pérez-Escamilla, Segura-Perez, & Lott, 2017; Schwartz, Scholtens, Lalanne, Weenen, & Nicklaus, 2011). Although responsive feeding has been defined in different ways, the core principle is similar to Ainsworth's definition of parental sensitivity, as it includes that parents correctly perceive their child's hunger and satiety cues and respond appropriately to those cues, for example by letting the child decide how much (s)he eats (DiSantis et al., 2011; Schwartz et al., 2011). By letting the child be in control of its food intake, responsive feeding behavior would foster self-regulation of energy intake, which in turn would promote a healthy weight (DiSantis et al., 2011). To date, responsive feeding has indeed been found to be associated with a reduced risk of overweight and rapid weight gain in early childhood (DiSantis, Hodges, & Fisher, 2013; Lindsay, Sitthisongkram, Greaney, Wallington, & Ruengdej et al., 2017; Spill et al., 2019). However, when promoting responsive feeding behavior in parents, it might be beneficial to not only focus on hunger and satiety cues, but also on other child communications during the meal, for example concerning attachment behavior, or the urge for autonomy. In order to broaden the concept so that it includes sensitive responses to other relevant child behavior during the meal as well, it has recently been suggested to add the term *sensitive feeding* (Van der Veek et al., 2019). Next to sensitivity to all child signals during the meal, sensitive feeding includes the use of positive strategies to deal with challenging child behavior during the meal (Van der Veek et al., 2019). Mealtimes are daily occurring situations that can be stressful to both parent and child. Because parents often have certain goals and expectations regarding their child's food intake and mealtimes in general, conflict situations during mealtime may easily arise, making the use of positive and sensitive disciplining techniques highly relevant. Examples of such sensitive disciplining techniques include showing understanding of the child's point of view, positive reinforcement, distracting the child to prevent conflict, appropriate pacing, and supporting and guiding the child's urge for autonomy (Mesman et al., 2008). Sensitive parental feeding behavior is thought to promote a pleasant atmosphere during mealtimes in which the child feels secure, thereby fostering positive associations with eating and food, as well as the child's willingness to eat and try new foods (Van der Veek et al., 2019).

## Insensitive feeding

The majority of research on responsive feeding has focused on the consequences of its counterpart: nonresponsive feeding. Nonresponsive feeding is considered to reflect insensitive behavior to the child's needs, because of a lack of reciprocity between caregiver and child (Black & Aboud, 2011). Caregivers might either take too much control over the child by pressuring the child to eat or restricting them from eating, or too little control by either allowing the child to decide on all the food choices or entirely ignoring the child. Nonresponsive feeding during the first two years of life usually takes on the form of exerting too much control instead of too little. More specifically, the practice of pressure to eat is applied by many parents. For example, one study showed that 54% of parents of 1–3

year-olds sometimes kept insisting after their child refused a food, and that 25% reported to insist after refusal often or all the time (Chan, Magarey, & Daniels, 2011). When a parent takes too much control by pressuring the child to eat, the child's hunger and/or satiety cues are overruled on a regular basis, and the development of the child's autonomy might be disturbed (Birch, Fisher, & Davison, 2003). Indeed, pressure to eat is found to be related to an impaired ability of self-regulation of energy intake (Birch, McPheee, Shoba, Steinberg, & Krehbiel, 1987). Like Isaac in our case study, children that have been pressured to eat from the beginning may not maintain the innate ability to self-regulate feelings of hunger and satiation, thereby being at risk to start overeating and become overweight (DiSantis et al., 2011; Hurley et al., 2011). Moreover, with respect to eating vegetables, pressure to eat has been found to have a counterproductive effect, in such a way that children who are pressured to eat, eat and like vegetables less (Galloway, Fiorito, Francis, & Birch, 2005). However, the reverse scenario is also likely to occur, as parents of children who show picky eating behavior or have a small appetite are often found to start pressuring their child to increase their food intake (Moore, Akhter and Aboud, 2006). In general, it is important to realize that (feeding) interactions are always bidirectional, and that parent and child may end up in a vicious circle.

## Challenges around mealtime

Like James and Chrissy at the beginning of this chapter, many parents struggle with the way they should feed their children. Indeed, 25 to 40% of parents report feeding problems with their infants and toddlers, including food refusal and picky eating (Mitchell, Farrow, Haycraft, & Meyer, 2013; Reau, Senturia, Lebailly, & Christoffel, 1996). Infants are generally willing to try several different tastes during the first year of life, but children become more particular in their food preferences from (early) toddlerhood onwards (Carruth et al., 2004; Dovey, Staples, Gibson, & Halford, 2008; Taylor, Wernimont, Northstone, & Emmett, 2015). Many children go through a phase of picky or fussy eating behavior somewhere between the age of 1 and 6. The phase of picky eating often peaks during toddlerhood, when the food neophobia phase, or the unwillingness to try new foods that is considered an integral part of picky eating behavior, often emerges as well (Dovey et al., 2008; Taylor et al., 2015). Because the child's urge for autonomy is often prominent during toddlerhood as well, mealtimes during this developmental period can be highly challenging for parents. Indeed, parents of children who are considered "picky" are found to have more conflicts during mealtime, and to use more pressuring techniques to get their child to eat (more) (Galloway et al., 2005; Jacobi, Agras, Bryson, & Hammer, 2003; Mascola, Bryson, & Agras, 2010; Ventura & Birch, 2008). Because of concerns about their child's intake, appetite, and/or weight, parents of picky eaters often start pressuring their child to increase food intake (Moore et al., 2006). In addition, parents also may confuse their child's urge for autonomy

with poor appetite, thereby misinterpreting their child's signals and wishes. Picky eating, as well as a mismatch in communication between parent and child during the meal, might lead to feelings of frustration in both parent and child, causing mealtimes to become stressful, daily recurring situations. Feeding the child in a sensitive way, by correctly perceiving, interpreting and responding to his/her communications during the meal, might be a powerful way to get through this challenging phase in a positive way, thereby minimizing stress during meals. In order to design parental guidelines, experimental studies testing the effectiveness of parental feeding interventions focusing on sensitive feeding are essential.

## The promotion of sensitive feeding behavior

To date, several randomized controlled trials aimed to promote (components of) sensitive feeding behavior (Aboud, Moore, & Akhter, 2008; Daniels et al., 2009; Fangupo et al., 2015; Harvey-Berino & Rourke, 2003; Horodynski, Hoerr, & Coleman, 2004). However, in light of obesity prevention, those interventions included modules on other health topics as well, such as physical activity, dietary advice, or sleeping behavior. Therefore, it is still difficult to infer if and how sensitive feeding behavior alone contributes to child health outcomes. Moreover, although some trials were able to establish changes in sensitive feeding behavior (Daniels et al., 2015; Fangupo et al., 2015), they all evaluated parental feeding behavior through self-report questionnaires instead of observations. However, video observations are thought to more effectively measure parental behavior that reflects real-life behavior than self-report measures, because those are likely to rather capture parental attitudes, i.e. what parents *think* they are doing or even what they think they *should* be doing (Hawes & Dadds, 2006; Hodges Johnson, Hopkinson, Butte, & Fisher, 2013). Therefore, including observations to measure parental feeding behavior is highly important.

## The Baby's First Bites study

In an attempt to learn more about the effectiveness of advice on what food to provide (*What*) as compared to advice on sensitive parental feeding behavior during mealtime (*How*), the Baby's First Bites study was designed. The effectiveness of a vegetable-exposure (*What*) and a sensitive-feeding intervention (*How*) on child health outcomes was tested, with child vegetable intake and child self-regulation of energy intake as primary outcomes, and child weight and maternal feeding behavior as secondary outcomes. Interventions were tested both separately and combined, and compared to an attention-control condition, to infer what approach to improving healthy eating behavior is most effective: focusing on the what, the how, or both. The ability to infer the effects of these

distinct types of advice is unique to the Baby's First Bites study, because earlier intervention studies included these different elements all at once. Interventions commenced as soon as the infant was ready to receive its first bites of solid food, and continued until the age of 16 months. Follow-up measurements took place at 18, 24 and 36 months of age. To measure sensitive feeding behavior, self-report measures as well as mealtime observations in the home setting were used.

## Focus of the dissertation

The aim of the present dissertation is to examine the relation between sensitive parental feeding behavior and health outcomes in infants and toddlers up to 24 months. **Chapter 2** describes the background and study design of the Baby's First Bites RCT study. In **Chapter 3**, bidirectional prospective relations are studied between maternal feeding behavior and infant vegetable intake and liking during the very first bites of solid food. In **Chapter 4**, differences in maternal sensitive behavior are tested between a mealtime and a free play situation, examining the moderating effects of child eating behavior. **Chapter 5** reports on the results of the Baby's First Bites RCT, in which the effectiveness of a repeated-exposure and a sensitive-feeding intervention on child health outcomes and maternal feeding behavior at age 18 and 24 months was evaluated. In **Chapter 6**, the main findings are summarized and integrated, and future directions for research and practice are considered.