



Responsive feeding: establishing healthy eating behaviour early on in life

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Abstract

Responsive feeding (RF) refers to a reciprocal relationship between an infant or child and his or her caregiver that is characterised by the child communicating feelings of hunger and satiety through verbal or nonverbal cues, followed by an immediate response from the caregiver. The response includes the provision of appropriate and nutritious food in a supportive manner, while maintaining an appropriate feeding environment. The literature indicates that RF is the foundation for the development of healthy eating behaviour and optimal skills for self-regulation and self-control of food intake. Therefore, practising RF is associated with ideal growth standards, optimal nutrient intake and long-term regulation of weight. On the other hand, nonresponsive feeding (NRF) practices are associated with feeding problems and the development of under- or overnutrition. Different types of NRF behaviour have been described, where the caregiver is either uninvolved during meals, too restrictive or controlling, or allows the child to control mealtimes. Consequently, mealtimes may become cumbersome, characterised by inconsistent, nonresponsive interaction, and may result in a relationship that is lacking in trust. The effects of RF and NRF are reviewed in this article and the practical guideline to "Feed slowly and patiently, and encourage your baby to eat, but do not force them" is suggested as appropriate for inclusion in the proposed South African paediatric Food Based Dietary Guidelines. It is also acknowledged that RF practices are best established when mothers choose to breastfeed on demand, as they are less controlling and more responsive to their infants' internal hunger and satiety cues.

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Introduction

It is known that humans are born with the capacity to self-regulate their energy intake. This ability is fostered through cause-effect learning, meaning that signals from the child should be interpreted by the parent or caregiver in the correct manner and in a supportive environment. The facilitation of self-regulation skills early in life may predict future food intake and optimal responses to hunger and satiety cues.¹

Newborn babies express their need for food through cues such as crying, and later (from roughly three months of age), infants are able to show signs of self-regulation of food intake by moving their hands towards their mouths, or heads, turning their bodies or heads away from undesirable food, spitting out food when they have had enough to eat, or displaying irritation when the pace of feeding is slowed (Table 1).^{2,3} It is important that parents and caregivers acquire skills to recognise their infant's hunger and satiety cues, and respond appropriately.

It must be borne in mind that the feeding abilities and needs of children are in parallel with changes in motor, cognitive and social development in the first few years of life.⁶ These changes include progress from a semi-reclined position to a seated position, and from a basic suck-swallow to a chew-swallow mechanism, while learning to

self-feed; and making the transition to the family diet and meal patterns.⁷ According to the principles of psychosocial care, the manner in which infants are fed during these phases influences feeding outcomes, as does the feeding environment in which they are fed.^{8,9}

Furthermore, the infant's emotional responses (temperament) to new circumstances and his or her activity level and socialisation skills may impact on feeding. For instance, an "easy" child adapts quickly to a regular routine and is more eager to try and accept new foods, whereas a "difficult" child struggles to adapt to change and experiencing new foods. Therefore, understanding an infant's temperament, which refers to the behavioural style of the child, is important in resolving infant feeding problems.³

It is a matter of course that the feeding behaviour of children is influenced by the relationship between the child and the parent or caregiver as he or she engages in food selection, ingestion and regulation in the process.^{6,10} Parents and caregivers also influence their children's eating behaviour through communicating their attitudes and beliefs about food and feeding. Eating behaviour may also be associated with genes that are inherited from parents. However, this non-modifiable influence is beyond the scope of this article.¹¹

Table I: The progression of feeding behaviour and responsivity for young children and caregivers^{4,5}

Age	The caregiver's proactive preparation	The child's skills and signals	Hunger cues	Satiety cues	Caregiver responsibility	What the child learns
Birth to 6 months	Prepares to feed when the infant signals hunger.	Signals hunger and satiety through voice, facial expressions and actions, and the rooting and sucking reflex.	Wakes and tosses. Sucks on fist. Cries or fusses. Opens mouth while feeding. Smiles and gazes at the caregiver.	Seals lips. Turns head away. Slows or stops sucking. Spits out the nipple or falls asleep. Turns the head away. Is distracted.	Responds to infant's signals by feeding him or her when he or she is hungry, and stopping when he or she has reached satiety.	The caregiver will respond to and meet his or her needs.
6-12 months	Ensures that the child is comfortably positioned. Establishes family mealtimes and a routine.	Sits, chews and swallows semi-solid foods. Self-feeds by hand.	Reaches for the spoon or food. Points to food. Gets excited when food is presented. Expresses a desire for specific food with words or sounds.	Shakes head to indicate that no more is desired.	Responds to the child's signals, using increased variety, texture and tastes. Responds positively to the child's attempts to self-feed.	To begin to self-feed. To experience new tastes and textures. That eating and mealtimes are fun.
12-24 months	Offers three to four healthy meal choices. Offers two to three healthy snacks each day. Offers food that can be picked up, chewed and swallowed.	Self-feeds using many different foods. Uses baby-safe utensils. Uses words to signal requests.	As above. Increased vocabulary in relation to food requests.	As above. Increased vocabulary when refusing food.	Responds to the child's signals of hunger and satiety. Responds positively to the child's attempts to self-feed.	To try new foods, To do things for him- or herself. To ask for help. To trust that the caregiver will respond to his or her requests.

Parenting practices and styles

Infant and child feeding is guided by parenting practices and parenting styles, both of which are aspects of parental care. According to Ventura and Birch,¹² three parenting practices are recognised, namely parents as providers, role models or controllers. These practices determine what, when and how a child should eat through what is made available, by the effect of modelling eating behaviour and through restricting, pressuring and monitoring the child's food supply and intake. These practices can differ from sibling to sibling within a family, and are often context specific, for example when the child is sick, overweight or obese.¹²

"Parenting style" refers to the manner in which parents and caregivers interact with a child in terms of attitude and behaviour across all areas of parenting. Therefore, the parenting style filters into the parental feeding style,¹² which refers to the interactive pattern of behaviour between caregivers and children which occurs during feeding.¹³ Black and Hurley¹³ mention four relevant parenting styles, namely authoritative, authoritarian, indulgent and uninvolved (Table II). The authoritative style equates to sensitive or responsive parenting.¹³ Evidence from observational and intervention research indicates

that responsive parenting that is warm and involves positive interaction with the child results in a child who has secure attachments and relationships, better cognitive and language development, and the ability to self-feed earlier.¹⁴ Responsive parenting involves, prompt responses to verbal cues and contingencies which are appropriate to the stage of development.¹⁵ It is argued that this type of approach contributes to the establishment of a partnership between infants and children and their parents and caregivers, by which they learn to recognise and interpret both verbal and nonverbal communication signals from one another.¹⁵ This reciprocal process forms the basis of an emotional bond or attachment that is essential for healthy social functioning, as well as optimal feeding behaviour.^{13,16} Parents and caregivers who practice responsive parenting are most likely to exercise responsive feeding (RF) strategies. Thus, it is unsurprising that the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) have advocated RF as a component of their guidelines for feeding infants and young children.^{17,18}

Responsive feeding

RF is a component of active feeding that provides complementary foods in an "active" manner.¹⁸ Active

Table II: Parenting and feeding styles, as well as the characteristics and consequences of each feeding style^{1,4,11,13,19-21}

Parental style	Feeding style	Characteristics of the parent or caregiver	Characteristics of the child	Consequences
Authoritative (democratic) <ul style="list-style-type: none"> Involved Nurturing Structured 	Responsive (Demanding + and responsive +)	See Table III on how to promote responsive feeding.	Positive behaviour: <ul style="list-style-type: none"> Accepts food when offered it. Learns that the caregiver responds to his or her hunger and satiety cues in a responsive manner. 	<ul style="list-style-type: none"> The child learns: <ul style="list-style-type: none"> To self-regulate food intake via hunger and satiety cues To self-feed That mealtimes are fun. The child develops healthy eating habits
Authoritarian (controlling) <ul style="list-style-type: none"> Forceful Restrictive Structured Low in nurturance 	Nonresponsive feeding style (controlling) (Demanding + and responsive -)	<ul style="list-style-type: none"> Dominates the feeding situation. Uses forceful and restrictive strategies to control mealtimes. Speaks loudly to get the child's attention. Uses force-feeding. Overpowers the child. 	<ul style="list-style-type: none"> Has no say. Displays negative behaviour, such as refusing to eat, crying, and being distracted or picky. 	<ul style="list-style-type: none"> Distress and/or avoidance. Overweight or obesity. Controlling type: <ul style="list-style-type: none"> The child does not develop the ability to self-regulate food intake and to respond to natural hunger and satiety cues. Eats in the absence of hunger. Has a lower body mass index. Restrictive type: <ul style="list-style-type: none"> Seeks out food that has been restricted by parents and when finding it, overindulges. Could lead to overweight or underweight.
Uninvolved (neglectful) <ul style="list-style-type: none"> Unengaged Insensitive Unstructured Low in nurturance 	Nonresponsive feeding style (uninvolved) (Demanding - and responsive -)	<ul style="list-style-type: none"> No or little active physical help during mealtimes. No or little verbalisation during mealtimes. Provides no guidelines regarding food intake. Lack of reciprocity; ignores the child's hunger and satiety cues. Creates a negative feeding environment. Provides no feeding structure or routine. Ignores the child's nutritional needs or has limited knowledge of them. Is unaware of when and what the child is eating. 	Decides when and what to eat, as well as how much.	<ul style="list-style-type: none"> Child is unable to recognise hunger and satiety cues. Eats just because food is there. Is overweight or obese.
Indulgent (permissive) <ul style="list-style-type: none"> Involved Nurturing Unstructured 	Nonresponsive feeding style (indulgent) (Demanding - and responsive +)	<ul style="list-style-type: none"> Provides no guidelines regarding food intake. Uses food as a reward. Uses food as a comforter or to control a child's behaviour. 	Decides when and what to eat, as well as how much.	<ul style="list-style-type: none"> Child has a high intake of food that is high in salt and sugar. Child has a low intake of fruit and vegetables. Child is overweight or obese.

feeding is when the parent or caregiver engages in positive behaviour with the child, while encouraging and bearing in mind the interests of the child during mealtimes. Examples of positive active behaviours include having conversations about food, modelling good food behaviour (healthy choices), playing food games and encouraging the child verbally. Conversely, negative behaviour includes aversive and intrusive attempts at direct feeding, i.e. force-feeding, holding the child's head, and threatening or shaking the child, and is known as nonresponsive feeding (NRF).¹⁹

The term "responsive feeding" was first introduced as a construct of psychosocial care and developmental psychology in order to explain the feeding situation.⁸

Since its introduction, the framework surrounding RF has grown and can be defined as "reciprocity between the child and the caregiver", conceptualised as a four-step process:

1. The creation of a structured routine, whereby expectations are made known and emotions promote interaction.
2. The signalling of cues by the child through motor actions, facial expressions or vocalisation.
3. The prompt response of the caregiver to these signals in a manner that is supportive, contingent and appropriate.
4. The perception of the response by the child in a predictable manner.²²

Nonresponsive feeding

A lack of reciprocity between the caregiver and child consequently leads to NRF. Three different types have been described:

1. Indulgence type, where the child controls the feeding situation.
2. Uninvolved type, where the caregiver ignores the child during meals.
3. Pressuring and controlling or restricting type, where the caregiver takes excessive control and dominates the feeding situation.

The restrictive type is either covert (high-fat food and purchases from fast-food restaurants are avoided), or overt (the caregiver limits the total amount of food the child eats).²³

It is likely that parents or caregivers who do not practice responsive parenting will not exercise RF strategies. Consequently, feeding times may become cumbersome, characterised by inconsistent, nonresponsive interaction and a relationship lacking in trust.^{16,24} This has potentially negative effects on the child's internal hunger and satiety cues, self-regulation and social and emotional development, including the development of temperament and autonomy, all of which may contribute to feeding problems.^{6,13,15,25}

Common feeding problems in young children include:

- Overeating.
- Poor eating, i.e. failure to thrive and picky eating.
- Feeding behaviour problems, i.e. post-traumatic feeding disorders, such as phobias, because of a food-induced allergy or reaction, such as choking.
- Unusual food choices, i.e. the ingestion of non-food substances, known as pica.
- Unhealthy food choices, i.e. poor food preference or alternative diets.

Feeding problems, such as overeating, may manifest as a medical condition, i.e. diabetes mellitus or hypertension, as well as disturbances in self-esteem, body image and socialisation later in life. Therefore, it is crucial to avoid early-life problems with regard to parent-child feeding experiences.⁶

Other factors that affect responsive feeding

Various other factors, including time, socio-economic status, the environment, perceptions, ethnicity and birthweight, may influence the feeding style of the parent or caregiver.

For instance, parents or caregivers who display controlling behaviour usually have competing demands on their time and resources and feel pressured. Therefore, the feeding situation is often characterised by frustration and inattention to the child's verbal and internal cues, which, in turn, may result in mistrust. Parents or caregivers who display disinterest often struggle with feeding times, as the child may throw food around or refuse to eat to attract the attention of the parent or caregiver.¹⁵

According to Faith et al,²⁶ parents and caregivers may also engage in restrictive NRF behaviour if a child is overweight or obese, in an attempt to address the child's weight status. Investigations showed that the mothers of infants born with a low birthweight showed signs of indulgent feeding, compared to the mothers of their higher birthweight counterparts, who displayed signs of restrictive feeding.²⁷ Furthermore, parents and caregivers who feel highly responsible for their child's food intake, as well as those who are restrained eaters themselves, may exhibit restrictive feeding behaviour.²⁸ Hurley et al²⁰ also noted that parental weight status and psychosocial characteristics may result in restrictive behaviour.

Moore et al¹⁹ point out that the majority of parents and caregivers in low-income populations, such as Bangladesh, use controlling feeding behaviour, which results in frequent refusals by children to feed. Inevitably, parents and caregivers turn to forceful tactics and subsequently do not allow the child to feed him- or herself, even when he or she is developmentally capable of, and shows an interest in, doing so.²⁹ As the prevalence of undernutrition is rife in many low- and middle-income countries, health and nutrition counsellors are tasked with the enormous

Table III: Strategies to promote responsive feeding^{4,18,32}

How to feed responsively			
Actively engage in: <ul style="list-style-type: none"> • Conversations and eye-to-eye contact with your child during feeding times. • Clear communication regarding expectations. • Responding to hunger and satiety cues. • Feeding infants directly, or assisting older children to feed themselves. 		Feeding progression: <ul style="list-style-type: none"> • Slowly and patiently, while encouraging and motivating the child to eat. • Never force-feed children. 	
Modelling healthy behaviour: <ul style="list-style-type: none"> • Parents, caregivers and family members should all make healthy food-based choices. 		Required environment <ul style="list-style-type: none"> • Pleasant feeding environment • Child is seated in a relaxed and comfortable manner • Child is face to face with other family members • Distractions are minimised during meals • Routines are established as a result of organising mealtimes, following a predictable schedule, and eating preferably at the same time and place 	
Offered food must be: <ul style="list-style-type: none"> • Healthy, tasty and developmentally appropriate. 			
To overcome food refusal, experiment with: <ul style="list-style-type: none"> • Different food combinations, tastes and textures. • Various methods of encouragement. 			
Additional responsive feeding strategies during special circumstances			
When the child is sick: <ul style="list-style-type: none"> • Feed slowly and patiently. • Give mashed or soft food, especially if the child has difficulty swallowing. • Give the child his or her favourite foods. • Give small, frequent meals. • Breastfeed more often and for longer at each feed, and increase fluid intake. 	When the child is recovering from illness: <p>Be responsive to the child's increased hunger and escalate the amount of food by giving additional meals or snacks each day for two weeks, and offering more food per meal.</p>	When the child refuses to eat: <ul style="list-style-type: none"> • Give an alternative food. • Make food more presentable to the child, e.g. in the shape of a character or a smiley face. • Talk and/or sing to the child. • Ensure that the child does not eat alone. 	When the child has a reduced appetite: <ul style="list-style-type: none"> • Feed slowly and patiently. • Feed the child his or her favourite food. • Breastfeed more often. • Provide more feeding opportunities. • Prepare smaller portion sizes, as opposed to three main meals.

burden of reducing the prevalence of child morbidity and mortality.¹⁵ As a result, they may unintentionally promote force-feeding as parents and caregivers may interpret the recommendations as “get the child to eat more under any circumstances”.¹⁵

Various cross-sectional studies have shown that parental responsivity is affected by beliefs about care giving and the perceptions of children's needs and abilities. For example, in Bangladesh, parents and caregivers believe that children are unable to appropriately self-feed in the first 2-3 years of life.¹⁵ It has also been indicated that ethnicity may play a role in the feeding style adopted by mothers. It was observed that most caregivers in Hispanic and African American populations engaged in NRF styles, compared to their Caucasian counterparts.³⁰

NRF practices are also often used when children are sick or recovering from illness. Results from a study conducted in Ghana indicated that 81.2% of parents and caregivers of children aged 6-24 months used NRF practices, such as force-feeding, when the child was recovering from illness. However, the recommended RF practices during the recovery period such as “giving an additional meal each day for two weeks” and “giving more food per meal” (Table III) was only practised by 11.8% of parents and caregivers.³¹

When children were sick, Ghana parents and caregivers used NRF practices, such as ceasing the feeding, force-feeding, administering punishment, or putting the child to sleep. However, the recommended RF practices during child illness is to feed slowly and patiently, offer the child his or her favourite food, or breastfeed more frequently. In Ghana, this was carried out by 35.2%, 17.8% and 38.9% of parents and caregivers, respectively.³¹

Feeding options

Breastfeeding has well-recognised benefits, such as the establishment of attachment, as well as optimal nutrition and protection from illness. Hence, the recommendation of exclusive breastfeeding for the first six months and continued breastfeeding up until two years of age with the introduction of solids at six months, remains unchanged.^{17,33}

Breastfeeding has been shown to promote the self-regulatory ability of infants.¹¹ It is most likely that this can be attributed to the feed-on-demand system that is encouraged in breastfeeding, which ensures that both mother and infant become more in sync with the child's natural hunger and satiety cues. Consequently, there is lower maternal control of food intake and greater maternal responsiveness to infant cues.²⁷ The amount that the infant or child consumes depends equally upon his or

her self-regulating capacity and on the sensitivity of the parents to these cues.¹¹ The latter has a beneficial effect on infant feeding style and food intake, acknowledges the infant's ability to self-regulate appropriate food intake, and may contribute to healthier eating patterns.²⁷

The results of several studies suggest that breastfeeding may promote parenting styles that are more responsive to infant hunger and satiety cues, and maternal feeding styles that are less controlling.³⁴ For instance, in a longitudinal study of mother-infant pairs, Fisher et al³⁵ reported that mothers who breastfed their infants for at least 12 months used less control when feeding their infants at 18 months of age, including less restriction and pressure, compared to mothers who did not breastfeed. They also reported a significantly higher energy intake at 18 months, which was associated with a lower level of maternal control.³⁵

Taveras et al³⁴ examined the type of feeding during the first six months and the duration of breastfeeding after six months, and whether or not the type of feeding was related to maternal control of infant feeding. The mother's level of agreement with the statement "I have to be careful not to feed my infant too much" was used as the measure of restriction. The authors found that increased breastfeeding duration predicted less restriction of the child's food intake at one year, even after adjusting for demographic characteristics, the mother's pre-existing attitudes, and infant birthweight or six-month weight for length.³⁴

Farrow and Blisset³⁶ explored whether or not breastfeeding, mediated by lower maternal use of controlling strategies, predicted interaction at mealtimes between mothers and their one-year-old infants. It was found that mothers who breastfed, rather than formula fed, were less likely to exert control over their child's intake, and were more sensitive to the child's cues at mealtimes, which predicted more positive mother-child mealtime interactions at one year of age.³⁶

When compared to breastfeeding, bottle feeding, is driven by infant cues to a lesser degree.¹² The explanation for this may be that, with bottle feeding, the infant can extract milk with less effort than from the breast. The result is that the formula-fed infant assumes a more passive role in the feeding process. By contrast, the breastfed infant assumes an active role in the process of extracting milk from the breast. Hence, this may suggest that bottle feeding promotes higher levels of maternal control, which, in turn, reduces the infant's opportunities to control the amount consumed at a feeding, making it easier for overfeeding to occur.³⁵ Furthermore, in formula-fed or mixed-fed infants, higher energy intake at the age of four months predicted greater weight gain in the first three years, and higher body weight and body mass index (BMI) from 1-5 years of age.³⁷

In summary, the self-regulating ability of infants can be influenced by maternal feeding practices.³⁵ Wright³⁸ reported that mothers of bottle-fed infants were less able to recognise changes in their infants' hunger states throughout the day, compared to the mothers of breastfed infants. This may be because of the greater dependence that mothers of bottle-fed infants have on visual cues, i.e. the volume of milk remaining in the bottle.³⁵ These differences do not infer that bottle feeding is necessarily less responsive than breastfeeding, but instead that responsiveness to the infant by the parent or caregiver is of great importance in feeding.²¹

Advantages of responsive feeding

Fostering a reciprocal relationship between the parent or caregiver and the child, and thus practising RF, is hypothesised to be beneficial to both parties. For the child, RF encourages eating in a competent and responsible manner, being attentive to internal hunger and satiety cues, and cultivating skills of optimal self-regulation and self-control of food intake.^{1,15} Furthermore, RF promotes the child's attentiveness and interest in feeding, and the ability to communicate his or her needs by distinct and meaningful signals.¹⁵ In the long term, RF may foster healthy eating habits and growth, as well as reduce child under- and overnutrition.^{1,15,16}

Studies that have investigated the effect of RF on eating behaviour, growth, dietary intake and illness in children have recently been summarised and reviewed.¹⁶ It seems the effect of RF on eating behaviour in children has been investigated mainly in observational studies. There have been promising results with regard to caregiver verbalisation, but inconclusive findings on maternal encouragement, physical action and child autonomy.¹⁶ For instance, in a cross-sectional observation study in Vietnamese mother-child pairs, it was found that children aged 12-18 months were 2.4 times more likely to accept the food offered to them when they received positive comments from the parent and caregiver, compared to those who received no encouragement. However, mechanical and directive comments resulted in the children being less likely to accept what was being offered.^{21,39}

The work by Dearden et al²¹ has indicated that parental control that restricts the child's mobility or opportunity to reject food negatively affects food intake in 12-month-old children, but it is not applicable to those who are 18 months of age. These authors specifically found that 12-month-old children who sat on the caregiver's lap, or were in their arms while eating (thus restricting their mobility), were less likely to take food than those who were unrestricted in terms of mobility (being allowed to crawl during feeding time) and who were consequently more likely to accept bites of food.²¹ By contrast, children of 17 months of age were more likely to accept bites of food when they sat on

a lap, on the floor or on a chair, stool or bed, or were in the arms of the caregiver. Furthermore, it was found that children who fed themselves were 10.6 times more likely to accept bites of food, compared to those who were fed by others.³⁵ In addition, distraction during mealtimes (e.g. children who played), was associated with reduced intake (less likely to accept bites of food) in 17-month-old children. This was also more evident in boys than in girls.²¹

In a study conducted in Bangladesh, Moore et al¹⁹ illustrated that the children of mothers who used RF practices clearly indicated when they were hungry or thirsty, and ate more mouthfuls of food. However, the children of mothers who employed different strategies to enhance eating, such as verbal direction or temporarily diverting the child's attention (defined as active behaviour, whereby the mother focused, stimulated and encouraged the child to act), were less responsive and refused food.¹⁹

The effect of RF on child growth outcomes have been investigated in several intervention studies. Bentley et al¹⁶ summarised the results of 15 intervention studies with an RF component that they were able to trace. The authors concluded that the results of 14 of the 15 studies showed a positive effect on child growth outcomes. However, it was noted that most interventions consisted of a number of strategies, such as education on nutrition, supplementation and managing a child's sleep and crying, in which RF messages were embedded. Therefore, the isolated effect of RF on child growth could not be elucidated. Only two of the 15 studies were specifically designed to investigate the sole effect of RF.¹⁶ These two studies were both clustered, randomised intervention trials that were conducted in low-income mothers from Bangladesh, with children aged from 8-24 months.^{29,39} In both studies, the intervention consisted of a six-session educational programme that focused on improving self-feeding and the mother's responsiveness, while the control group received information on child feeding and sickness. The results indicated that the intervention had a positive effect on child growth (weight and weight gain) and increased child self-feeding and maternal responsive verbalisations during mealtimes.^{29,39}

The effect of RF on the nutrient and food intake of children has been investigated in four intervention studies, as summarised by Bentley et al.¹⁶ Although the results were promising (all of the studies reported improved nutrient and/or healthy food intakes in the intervention groups), RF was again not an isolated intervention strategy and other treatment modalities could have influenced these results.¹⁶

Lastly, although investigated in three studies, no definite conclusions can be made about role of RF in nutrition-related child illnesses.¹⁶ It can be speculated that RF could help to reduce the development of nutrition-related diseases or improve treatment outcomes in these children. However, the isolated effect of RF still needs to be investigated.

Disadvantages of nonresponsive feeding

NRF behaviour is thought to be linked to the development of overnutrition, mostly in high-income countries, and undernutrition and stunting, mostly in low- and middle-income countries.¹⁶ For instance, in the 1980s, studies conducted in Nigeria showed that women chose to hand feed their children in order to save time, as most women worked an average of eight hours per day as market traders. This resulted in restrictive NRF, as the children were effectively force-fed. From the results of this study, it was observed that children who were force-fed by hand had lower z-scores for weight for age, weight for height and height for age, compared to infants whose mothers did not hand feed their children.⁴⁰

In a systematic review of studies conducted in high-income countries, Hurley et al concluded that current evidence points to an association between NRF and child overweight and obesity.²⁰ This relationship is evident in toddlers and preschool children. However, studies performed in infants aged 0-12 months were limited and showed mixed results. Thus, more research in this age group is necessary before conclusions can be made. Overall, the most common association that was found was a positive relationship between parental control of feeding and overweight status in children. More specifically, restriction was associated with a higher BMI and overweight or obesity, while pressure during feeding was associated with a lower BMI. Furthermore, the majority of studies linked indulgence with overweight and obesity. For example, this indulgent behaviour was apparent in the children of parents or caregivers who used food as a reward or to calm or regulate the child's behaviour.²⁰ Indulgent behaviour has also been associated with a lower intake of fruit and vegetables⁴¹ and a higher intake of sweets and soft drinks.⁴²

Providing a pleasant feeding environment is the cornerstone of RF, and research has linked non-ideal environments with having a negative impact on food intake and weight. Conflict during mealtimes predicts heavier weight in preschool children,^{43,44} while watching TV during mealtimes, instead of eating at a table, predicted less healthy eating, such as food containing high fat, as well as a low fruit and vegetable intake in children.^{44,45} On the other hand, the presence of household routines, including family mealtime routines, has been associated with reduced odds of obesity in preschoolers.⁴⁶

Strategies to promote responsive feeding

Standards for infant and young child feeding⁴⁷ have been set by WHO^{17,33,48} and UNICEF,¹⁸ and incorporate five different guidelines for RF, namely:

- Feed infants directly and assist older children when they feed themselves, being sensitive to their hunger and satiety cues.
- Feed slowly and patiently, and encourage children to eat, but do not force them.

- If children refuse many foods, experiment with different food combinations, tastes, textures and methods of encouragement. Or, offer new foods several times. Children sometimes refuse new food for the first few tries.
- Minimise distractions during meals if the child loses interest easily.
- Remember that feeding times are periods of learning and love. Talk to children during feeding, with eye-to-eye contact.

Strategies to ensure an optimal feeding environment during mealtimes that subsequently promote RF have been summarised in Table III, based on the core messages from the abovementioned guidelines, as well as strategies proposed by others.^{15,19}

When a child is sick or recovering from illness, additional strategies have been suggested to ensure optimal and responsive feeding. These include behaviour that focuses on the quantity and quality of food, the frequency of feeds, and the duration of attention and care. It must also be borne in mind that a child's appetite increases during the recovery period after illness, and that parents and caregivers should be responsive to this.³² These additional RF messages for the sick child and those recovering from illness, as well as strategies to use when children refuse to eat or have reduced appetites, are also summarised in Table III.

Conclusion

From the body of literature on RF, it is evident that more research is necessary to provide further insight and formulate clear evidence-based conclusions and recommendations. Limitations in the research methodologies of available studies must be addressed. For instance, various questionnaires or observational methods are currently used to measure RF, which makes comparisons across studies and the interpretation of the results difficult. Therefore, standardised and validated instruments to assess RF and treatment outcomes, such as acceptance of food intake or mouthful of bites taken, should be developed. Secondly, randomised controlled trials with RF as an isolated treatment arm are required, as only two studies that show mixed results could be traced with such a design. Furthermore, longitudinal studies, beginning in early infancy, are also necessary to confirm the long-term effects of RF, as well as changes in caregivers' feeding practices because of the developing characteristics of the child.¹⁶

However, bearing these limitations in mind, it is widely recognised that RF is necessary to cultivate optimal skills for self-regulation and self-control of food intake. Furthermore, current evidence on the effects of RF on various outcomes definitely points in the direction of benefits that relate to children's growth, eating behaviour and nutrient and food intake, as well as the long-term regulation of healthy

eating habits and weight.¹⁶ On the other hand, NRF has been associated with feeding problems and both under- and overnutrition.

In South Africa, the available draft paediatric Food-Based Dietary Guidelines (FGDGs) for children between one and seven years of age focus largely on "what" and "how much" should be eaten.⁴⁹ Black and Aboud¹⁵ argue that "nutritional recommendations which focus on food and ignore the feeding context may be ineffective". Currently, RF messages are encouraged in interventions for children at primary healthcare centres in South Africa as part of the Integrated Management of Childhood Illness guidelines.⁵⁰ However, including RF as an essential topic in infant and young child feeding strategies will provide specific standardised guidelines for health professionals (Table III), and will strengthen the current approach to the management of nutritional challenges (undernutrition and obesity) in children. Therefore, we suggest that it is essential that an RF guideline is incorporated into existing nutrition interventions and policies.

We suggest that the following messages are adopted in the South African paediatric FBDGs:

- For the age group 6-12 months of age: "Feed slowly and patiently, and encourage your baby to eat, but do not force them".
- For the age group 12-36 months of age: "Assist your child when they feed themselves, and encourage them to eat, but do not force them".

References

1. DiSantis KI, Hodges EA, Johnson SL, Fisher JO. The roles of responsive feeding in overweight during infancy and toddlerhood: a systematic review. *Int J Obesity*. 2011;35(4):480-492.
2. Bronson MB. *Self-regulation in early childhood: nature and nurture*. 1st ed. New York: The Guilford Press; 2000.
3. Brown JE. *Nutrition through the life cycle*. 4th ed. Australia: Wadsworth, Cengage Learning, 2011; p. 222-247.
4. Aboud FE, Akhter S. A cluster-randomized evaluation of a responsive stimulation and feeding intervention in Bangladesh. *Pediatrics*. 2011;127(5):e1191-e1197.
5. WIC. When to feed: birth to 6 months. Comparison of infant feeding recommendations in WIC's old and new pamphlet. California Department of Public Health [homepage on the Internet]. 2009. c2012. Available from: <http://www.cdph.ca.gov/programs/wicworks/Pages/WICNInfantFeedingGuidelinesandPamphlets.aspx>
6. Lui HY, Stein MT. Feeding behaviour of infants and young children and its impact on child psychosocial and emotional development. In: Tremblay RE, Boivin M, Peters R Dev, editors. *Encyclopedia on early childhood development*. Montreal: Centre of Excellence for Early Childhood Development and Strategic Knowledge Cluster on Early Child Development; 2012 [homepage on the Internet]. c2012. Available from: http://www.child-encyclopedia.com/pages/pdf/eating_behaviour.pdf
7. Ramsay M. Feeding skill, appetite and feeding behaviour of infants and young children and their impact on their growth and psychological development. In: Tremblay RE, Boivin M, Peters R Dev, editors. *Encyclopedia on early childhood development*. Montreal: Centre of Excellence for Early Childhood Development and Strategic Knowledge Cluster on Early Child Development; 2012 [homepage on the Internet]. c2012. Available from: <http://www.child-encyclopedia.com/documents/RamsayANGxp.pdf>

8. Engle PL, Bentley M, Pelto G. The role of care in nutrition programmes: current research and a research agenda. *Proc Nutr Soc.* 2000;59(1):25-35.
9. Pelto GH, Levitt E, Thairu L. Improving feeding practices: current patterns, common constraints, and the design of interventions. *Food Nutr Bull.* 2003;24(1):45-57.
10. Satter EM. The feeding relationship. *J Am Diet Assoc.* 1986;86(3):352-356.
11. Schwartz C, Scholtens PAMJ, Lalanne A, et al. Development of healthy eating habits early in life. Review of recent evidence and selected guidelines. *Appetite.* 2011;57(3):796-807.
12. Ventura A, Birch L. Does parenting affect children's eating and weight status? *Int J Behav Nutr Phys.* 2008;5:15.
13. Black MM, Hurley K. Infant nutrition. In Bremner JG, Wachs T, editors. *Handbook on infant development.* New York: Wiley-Blackwell, 2010; p.33-61.
14. Malmberg LE, Stein A, West A, et al. Parent-infant interaction: a growth model approach. *Infant Behav Dev.* 2007; 30(4):615-630.
15. Black MM, Aboud FE. Responsive feeding is embedded in a theoretical framework of responsive parenting. *J Nutr.* 2011;141(3):490-494.
16. Bentley ME, Wasser HM, Creed-Kanashiro HM. Responsive feeding and child undernutrition in low- and middle-income countries. *J Nutr.* 2011;141(3):502-507.
17. World Health Organization. *Guiding principles for complementary feeding of the breastfed child.* Geneva: WHO, 2003.
18. UNICEF. *Child and mother nutrition survey in Bangladesh, 2005.* Dhaka: Plan International; 2005. [homepage on the Internet]. c2012. Available from: http://www.unicef.org/bangladesh/Child_and_Mother_Nutrition_Survey.pdf
19. Moore AC, Akhter S, Aboud FE. Responsive complementary feeding in rural Bangladesh. *Soc Sci Med.* 2006;62(8):1917-1930.
20. Hurley KM, Cross MB, Hughes SO. A systematic review of responsive feeding and child obesity in high-income countries. *J Nutr.* 2011;141(3):495-501.
21. Dearden KA, Hilton S, Bentley ME, et al. Caregiver verbal encouragement increases food acceptance among Vietnamese toddlers. *J Nutr.* 2009;139(7):1387-1392.
22. Bradley RH. The home environment. *Handbook of cultural developmental science.* Bornstein MH, editor. New York: Psychology Press, 2010; p. 505-530.
23. Birch LL, Fisher JO, Krahnstoever DK. Learning to overeat: maternal use of restrictive feeding practices promotes girls' eating in absence of hunger. *Am J Clin Nutr.* 2003;78(2):215-220.
24. Siberstein D, Feldman R, Gardner JM, et al. The mother-infant feeding relationship across the first year and the development of feeding difficulties in low-risk premature infants. *Infancy.* 2009;14:501-525.
25. Kochanska G, Woodard J, Kim S, et al. Positive socialization mechanisms in secure and insecure parent child dyads: two longitudinal studies. *J Child Psychol Psychiatry.* 2010;51(9):998-1009.
26. Faith MS, Dennison BA, Edmunds LS, Stratton HH. Fruit juice intake predicts increased adiposity gain in children from low-income families: weight status-by-environment interaction. *Pediatrics.* 2006;118(5):2066-2075.
27. Farrow CV, Blisset J. Controlling feeding practices: cause of early child weight or consequence? *Pediatrics.* 2008;121(1):e164-169.
28. Musher-Eizenman DR, de Lauzon-Guillain B, Holub SC, et al. Child and parent characteristics related to parental feeding practices. A cross-cultural examination in the US and France. *Appetite.* 2009;52(1):89-95.
29. Aboud FE, Shafique S, Akhter S. A responsive feeding intervention increases children's self-feeding and maternal responsiveness but not weight gain. *J Nutr.* 2009;139(9):1738-1743.
30. Hughes SO, Shewchuk RM, Baskin ML, et al. Indulgent feeding style and children's weight status in preschool. *J Dev Behav Pediatr.* 2008;29(5):403-410.
31. Ghana Ministry of Health. *The promotion of complementary feeding practices project baseline survey report,* December 2011. Ghana Ministry of Health; 2011.
32. Linkages. *Feeding infants and young children during and after illness* [homepage on the Internet]. c2012. Available from: <http://www.ennonline.net/pool/files/ife/facts-for-feeding-illness-11-21-06-linkages.pdf>
33. World Health Organization. *Indications for assessing infant and young child feeding practices: conclusions of a consensus meeting held November 6-8, 2007.* Washington: WHO; 2008.
34. Taveras EM, Scanlon KS, Birch L, et al. Association of breastfeeding with maternal control of infant feeding at age 1 year. *Pediatrics.* 2004;114(5):e577-e583.
35. Fisher JO, Birch LL, Smiciklas-Wright H, Picciano MF. Breast-feeding through the first year predicts maternal control in feeding and subsequent toddler energy intakes. *J Am Diet Assoc.* 2000;100(6):641-646.
36. Farrow C, Blisset J. Breast-feeding, maternal feeding practices and mealtime negativity at one year. *Appetite.* 2006;46(1):49-56.
37. Ong KK, Emmet PM, Noble S, et al. Dietary energy intake at the ages of 4 months predicts postnatal weight gain and childhood body mass index. *Pediatrics.* 2006;117(3):e503-e508.
38. Wright P. Learning experiences in feeding behaviour during infancy. *J Psycho Res.* 1988;32(6):616-619.
39. Aboud FE, Moore AC, Akhter S. Effectiveness of a community-based responsive feeding programme in rural Bangladesh: a cluster randomized field trial. *Matern Child Nutr.* 2008;4(4):275-286.
40. Oni GA, Brown KH, Bentley ME, et al. Feeding practices and prevalence of hand-feeding of infants and young children in Kwara State, Nigeria. *Ecol Food Nutr.* 1991;25:209-219.
41. Hoerr SL, Hughes SO, Fisher JO, et al. Associations among parental feeding styles and children's food intake in families with limited incomes. *Int J Behav Nutr Phys Act.* 2009;6:55.
42. Vereecken CA, Keukelier E, Maes L. Influence of mother's educational level on food parenting practices and food habits of young children. *Appetite.* 2004;43(1):93-103.
43. Zeller MH, Reiter-Purtil J, Modi AC, et al. Controlled study of critical parent and family factors in the obesogenic environment. *Obesity (Silver Spring).* 2007;15(1):126-136.
44. Tremblay L, Rinaldi CM. The prediction of preschool children's weight from family environmental factors: gender-linked differences. *Eat Behav.* 2010;11(4):266-275.
45. Boutelle KN, Birnbaum AS, Lytle LA, et al. Associations between perceived family meal environment and parent intake of fruit, vegetables, and fat. *J Nutr Educ Behav.* 2003;35(1):24-29.
46. Anderson SE, Whitaker RC. Household routines and obesity in US preschool aged children. *Pediatrics.* 2010;125(3):420-428.
47. *Infant and Young Child Feeding Chapter, Indian Academy of Pediatrics, Rajeshwari K . Infant and young child feeding guidelines: 2010.* Indian Pediatr. 2010;47(12):995-1004.
48. World Health Organization. *Infant and young child feeding. Model chapter for textbooks for medical students and allied health professionals.* Geneva: WHO; 2009.
49. Bowley NA, Pentz-Kluyts MA, Bourne LT, Marino LV. Feeding the 1 to 7-year-old child. A support paper for the South African paediatric food based dietary guidelines. *Matern Child Nutr.* 2007;3(4):281-291.
50. Hendricks MK, Goeiman H, Dhansay A. Food-based dietary guidelines and nutrition interventions for children at primary facilities in South Africa. *Matern Child Nutr.* 2007;3(4):251-258.