The impact of a self-directed online resource for parents to recognise and respond to infant's satiety cues

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Abstract

Introduction: Maternal feeding practices can shape a child's ability to self-regulate food intake and impact upon the development of a healthy weight. This study examined whether use of a self-directed online 'Mealtime Mindreading' responsive feeding resource would influence the response to infant satiety cues. It was hypothesised that, due to parents being more able to recognise and respond to their infants' satiety cues, fewer satiety cues would be displayed after parental engagement with the resource.

Method: Two mealtime observations took place within the participants' homes for 19 mother-infant dyads (28-38 years, M= 31.3, SD= 2.8; 4-14 months, M= 8.8, SD= 2.9). Between each home visit (2-4 weeks) mothers were asked to engage with the resource via YouTube and to provide feedback regarding accessibility. Frequency of infant satiety cues, rate of acceptance, and gaze were analysed within each mealtime.

Results: Behavioural cues, such as turning the head away, were most frequently shown by infants. A statistically significant decrease was found in distraction cues from visit 1 to visit 2. Overall, a trend was observed for fewer satiety cues during visit 2, but no other statistically significant reductions were found with the category (i.e. behavioural or affective) of cues. A statistically significant decrease in rates of early acceptance was found between visits 1 and 2 for only the savoury part of the mealtime. A trend of fewer enforced acceptance and refusal responses were observed at visit 2. Responses within a debrief questionnaire provided positive feedback for the Mealtime Mindreading resource, alongside suggestions for future alterations.

Conclusion: Results from this initial feasibility assessment indicate that some small changes in distraction and early acceptance cues were found after use of the Mealtime Mindreading resource. Trends for changes to satiety cues were observed but a larger study needs to be conducted to provide sufficient power to assess the impact of the resource on responsive feeding.

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1.0 Introduction

It feels important to begin by acknowledging some of the language used throughout this thesis. Firstly, I will use the term parent. Whilst I understand that a number of people care for infants who would not identify themselves as a parent, or are not biologically parents, this is the term used within much of the research I have explored. It was also used within my own research inclusion criteria. Secondly, mothers are often referred to within this thesis. Again, I fully acknowledge the importance of fathers in the role of feeding behaviours and parent-infant interactions. However, mothers are often the parent most frequently recruited and discussed within these areas of research.

1.1 Wider Context

Childhood obesity continues to be a major public health concern (World Health Organisation, WHO, 2019). Worldwide, it is predicted that 70 million infants and preschool aged children (0–5 years) will be affected by overweight and obesity by 2025 (World Health Organisation, 2016, cited by Bergmeier et al., 2020). In England, 10% of reception year children (age 4-5), and 20% of year 6 children (age 10-11), were classified as obese in 2016/17 (National Health Service, NHS, 2018). Children are being classified as having obesity at earlier ages and remaining in this classification for longer, with long-term health concerns (GOV, 2017). Implications of early childhood overweight and obesity can also have negative impacts upon self-esteem, well-being, and quality of life (e.g. Russell-Mayhew, McVey, Bardick, & Ireland, 2012; Wille, Erhart, Petersen, & Ravens-Sieberer, 2008, cited by Begmeier et al., 2020, p.1). Having an understanding of these early risk factors for obesity can help to inform prevention strategies (Bergmeier et al., 2020). Wood et al. (2019) suggest that the focus should not only be around what a child eats, but also how they eat.

1.2 Development of Infant Feeding

Parents are faced with daunting decisions following the birth of a child. One of the first decisions mothers face is the option of whether to breastfeed or to formula-feed (Radzyminski & Callister, 2016).

The WHO and the United Nations Children's Fund (UNICEF, 2018) recommend that infants are exclusively breastfed for the first six months of life. This is, in part, due to the benefits of breastmilk, including nutrient, flavour and antibody content (Shloim, Shafiq, Blundell-Birtill, & Hetherington, 2018). Breastfed infants are less likely to become overweight or to develop chronic health conditions later in life (Binns, Lee, & Low, 2016). Furthermore, formula-feeding, alongside introducing solid foods earlier than recommended, can be associated with excess weight gain in childhood (Victora et al., 2016). Modrek et al. (2017) found that "for every extra week that the child was breastfed, the risk of having obesity at age 2 years was reduced by around 1%" (cited by Shloim et al., 2018, p. 304).

Despite the WHO and UNICEF (2018) recommendations, breastfeeding rates within the UK are amongst the lowest in Europe (Emmott, Page, & Myers, 2020). A high proportion of mothers within the UK either feed their infants using a combination of breastfeeding and formula-feeding, or exclusively formula-feed (Goncalves, 2017). This can be a personal preference, due to biological factors (Brown, Raynor, & Lee, 2011), or a decision following difficulties with breastfeeding (McAndrew et al., 2012). "Figures show that, although 72.6% of women initiate exclusive breastfeeding at birth (NHS England, 2017), prevalence dramatically drops to 30% at 6–8 weeks after birth (Public Health England, 2017) and to only about 1% by the time the infant is 6 months old" (McAndrew, et al., 2012, cited by Goncalves, 2017, p. 442). From secondary analysis of the Infant Feeding Survey 2010, Goncalves (2017) found that formula-feeding was predicted "by a range of independent social disadvantage factors, namely being young, single, unemployed, white British and poorly educated" (p. 448). Mothers' social and cultural contexts are therefore important factors to consider with regards to their infant feeding practices.

Mothers have reported feeling unsupported by professionals when formula-feeding (Appleton et al., 2018), and this can have implications for maternal psychological well-being (Diez-Sampedro, Flowers, Olenick, Maltseva, & Valdes, 2019; Fallon, Harrold, & Chisholm, 2019). This has particularly been in relation to feelings of shame and guilt, and thoughts about failing as a mother (Kendall-Tackett & Moberg, 2018). These, in turn, can be strengthened by external pressures from "well-meaning [healthcare] staff who are expected to promote and support exclusive breastfeeding" (Diez-Sampedro et al., 2019, p. 385).

Experiences of stigma can have less of an impact for mothers who actively choose not to breastfeed (Bresnahan et al., 2020).

More support from healthcare providers regarding mothers' choice of infant feeding has been recommended (Diez-Sampedro et al., 2019; Hvatum & Glavin, 2017). This could include encouragement and education about the benefits of breastfeeding, without pressure or judgement about their choices. This approach could help to empower women to make their own decision, whilst feeling valued and supported regardless of their decision (Williams, 2018).

1.2 1 Complementary Feeding

One of the next important decisions parents face is deciding on the timing and method of complementary feeding (CF), commonly known as weaning. Despite the WHO (2018) recommendations regarding exclusive breastfeeding for the first six months, followed by the introduction of complementary foods alongside breastfeeding up until two years of age, approximately 50% of mothers in the UK have reported introducing solid foods prior to this. This can be due to perceiving their child to no longer be fully satisfied with milk feeds (McAndrew et al., 2012). An inverse association has also been suggested, with mothers responding to the energy requirements of heavier babies (Vail et al., 2015).

As infants' fine and gross motor skills develop, they begin to learn how to feed themselves and become more active in the feeding process (Bibbings, 2017). This begins from approximately six months of age, as infants learn, for example, how to hold or grab a spoon (Carruth, Ziegler, Gordon, & Hendricks, 2004). There are individual differences regarding the timing of development of these skills, which can influence when CF is introduced. This further highlights the complexities of parent and infant feeding interactions.

During the weaning process, infants progress from softer foods, to include a range of textures and tastes (Bibbings, 2017). This can be done through spoon-feeding and eating finger foods by hand. It can be difficult for parents to decide what foods to offer their

infants during CF. This decision involves choosing to offer their infant either homemade or commercially bought food options.

Over recent years, there has been an increase in pureed baby food pouches (Koletzko et al., 2019). Although viewed by many parents as being a widely available, simple and convenient approach to CF, the pouches can be expensive in comparison to other baby food jars or homemade options (Koletzko et al., 2019). There are also concerns about the nutritional content of pouches. A research article from Germany suggested that pouches "often have a high energy density and are predominantly extremely high in sugar content, with up to almost 90% of the total energy content. Regular consumption bears the risks of imbalanced nutrient provision and increased risks for dental cavities and [becoming] overweight" (Koletzko et al., 2019, p. 1). Moding et al. (2019) found that within the USA, pouches often contain more sugars, but not more fibre, than similar foods offered in jars. Early, regular exposure to very sweet foods can influence longer-term taste preferences and food choices (Koletzko et al., 2019). Parents may be unaware of the nutritional qualities of the pouches, particularly as they are often marketed as being a healthy option, containing fruit and vegetables (Moding et al., 2019). A further concern regarding pouches is that some parents are feeding their child directly from the pouch, which has been advised against (Koletzko et al., 2019). This is due to concerns about limiting the development of infants' oral motor movements, reducing the need to chew and preventing infants from using their hands to explore food. Important interactions between infant and parents can also become limited during this method of feeding (Koletzko et al., 2019).

With the above in mind, it is recommended that infants are ideally offered balanced homemade foods, with a variety of tastes and textures. These would be lower in sugar content and higher in vital nutrients such as iron, zinc, iodine, B vitamins, and long-chain polyunsaturated fatty acids compared to commercially available foods; all of which support healthy development (Koletzko et al., 2019). Commercial fruit purees are recommended to be offered alongside, rather than in replacement of, a meal (Koletzko et al., 2019).

1.2.2 Baby-led Weaning

A traditional approach to CF is to initially spoon-feed pureed solid foods. An alternative homemade feeding trend, known as “baby-led weaning” (BLW), has increased in popularity over the last decade (Rowan, Lee, & Brown, 2019). BLW involves allowing infants to explore and grasp whole solid foods (finger foods), or portions of family meals, using their hands and, later, utensils to feed themselves (Theurich, 2018). The BLW approach suggests that infants choose what, when and how much they eat (Anderson, van den Heuvel, Omand, & Wong, 2019). Some parents opt to feed their infant using a combination of spoon-feeding and BLW approaches.

The BLW approach has been associated with protecting infants against overfeeding, and potential longer-term benefits upon weight and health (McNally, Hugh-Jones, & Hetherington, 2020). This is associated with infants learning appetite control and self-regulation (Anderson et al., 2019). However, concerns have also been raised regarding choking risk, poor growth in relation to insufficient food intake, and low iron intake (Anderson et al., 2019). Although BLW is recommended in some parenting books, websites and blogs, the approach is not currently included within official UK weaning guidelines (Rowan et al., 2019). This is due to limited research exploring the safety, health impact and nutritional benefits of BLW.

One large randomised trial has been carried out to explore BLW, known as The Baby-Led Introduction to Solids Study (BLISS, Daniels et al., 2015). The primary outcome was body mass index at 12 months of age. Taylor et al. (2017) found no differences in weight between infants who were BLW, compared to those who had been spoon-fed, at 12 months old. It is unknown if there were any weight differences in later years (Rowan et al., 2019). Infants in the BLW intervention group of BLISS showed less food fussiness when observed at 2 years of age (Taylor et al., 2017). No differences between BLW or spoon-feeding were found for risk of choking.

Rowan et al. (2019) explored whether there were differences in exposure to foods when using either a spoon-feeding or BLW approach. Within younger infants (6-8 months),

BLW led to significantly increased exposure to vegetables and protein. In contrast, spoon-fed infants across ages (6–12 months) were more exposed to composite meals (i.e. jarred or homemade meals containing a number of different items), indicating exposure to (and familiarity with) a greater variety of tastes, textures and nutritional components. Rowan et al. (2019) found no significant differences in exposure to iron-containing foods between spoon-feeding or BLW approaches.

The results from the BLW studies suggest that BLW may be a weaning approach which offers sufficient nutrients, and increased exposure to vegetables, at least in younger infants. It may also be a safe approach, which can potentially lead to longer term health benefits for infants. However, further research is recommended.

In summary, parents have many important decisions to make in regards to feeding their infant. This includes considerations of breast- vs formula-feeding, timing of introducing solid foods, whether these foods will be homemade or commercially bought, and whether the weaning process will involve a spoon-feeding or baby-led approach. The development of infant feeding comes alongside a crucial time-period for developing physical and emotional attachments between the infant and parents (Saltzman, Fiese, Bost, & McBride, 2018).

1.3 Interactions between Parents and Infants

1.3.1 Attachment and Mind-mindedness

According to attachment theory, the stability of parental-infant bonds, involving parental sensitivity and responsiveness, is critical to development (Ainsworth, 1979; Bowlby, 1969). The way in which parents respond to their infants' distress can shape attachment security. The main attachment styles of infants are secure, insecure avoidant, insecure ambivalent, and disorganised (Ainsworth, 1979; Main & Solomon, 1990). An insecure attachment style has been linked to poor general self-regulation (Kochanska, Philibert, & Barry, 2009) and increased weight (Anderson & Whitaker, 2011). This suggests a link between attachment and self-regulation of appetite (Saltzman et al., 2018). This link is bi-directional; infants who are difficult to feed or who experience feeding difficulties may be a challenge to the attachment process.

Interactions are immediate and central between parent and infant during the feeding process. Breastfeeding can offer opportunities for mother-infant proximity and sensitive interactions (Jackson, 2016). Linde, Lehnig, Nagl, and Kersting (2019) carried out a systematic review of the literature regarding breastfeeding and attachment. Four out of seven studies included in the review found that breastfeeding for a longer period of time was significantly associated with attachment security. No significant differences in attachment security were found between infants who were either breast- or formula-fed. Linde et al. (2019) also included four studies concerning maternal attachment style and breastfeeding behaviour. Three of these reported significant associations between maternal secure attachment and a preference for breastfeeding in comparison to formula-feeding. These results have implications for supporting mothers who may have an insecure attachment style with regards to potential difficulties with breastfeeding. However, further studies were recommended due to methodological limitations involving sample size, and valid and reliable measurements.

In relation to attachment is mind-mindedness; parents' attunement to their infants' thoughts, feelings and state (Meins et al., 2002). Mind-mindedness can predict sensitive and responsive parenting behaviour (Farrow & Blissett, 2014). Research suggests that mind-mindedness can be developed. For example, Schacht et al. (2017) concluded that a one-off session with mothers using video-feedback to facilitate mind-mindedness may have benefits for parent-infant interactions. With this in consideration, perhaps developing parents' mind-mindedness may in turn promote parental responsiveness.

1.3.2 Responsive Parenting

Both attachment and mind-mindedness are linked to a responsive parenting approach. Responsive parenting is defined as "developmentally appropriate, prompt, and contingent parenting responses to a child's needs" (Eshel, Daelmans, Mello, & Martines, 2006, p. 991). Responsive parenting can be referred to in the context of feeding, sleeping, soothing, and play (Pérez-Escamilla, Segura-Pérez, & Lott, 2017). The WHO and UNICEF have developed the Care for Child Development (CCD), to improve responsive caregiving across 19 countries (Lucas, Richter, & Daelmans, 2018). Evaluations of CCD interventions have

reported initial positive outcomes. Such outcomes can foster the development of self-regulation, as well as promoting optimal cognitive, social and emotional development in infants (Pérez-Escamilla et al., 2017).

Black and Aboud (2011) suggest that mind-mindedness and responsive parenting are important within a feeding context, in relation to responsive feeding practices and the development of healthy eating behaviours. Within a feeding context, mind-mindedness has been found to be greater in breastfeeding mothers (Farrow & Blissett, 2014). Regardless of breast- or formula-feeding approaches, Farrow and Blissett (2014) also found that maternal mind-mindedness when infants were six months old was correlated with observations of more sensitive and positive feeding behaviours when the infants were 1 year old. Interventions which may help to promote parental mind-mindedness are therefore encouraged (Farrow & Blissett, 2014).

1.3.3 Responsive Feeding

Parents can use a variety of behaviours and strategies to influence the food intake of their infant (Bibbings, 2017). Research has suggested a bi-directional model of understanding parent-child interactions during mealtimes, whereby parental behaviours are also influenced by the child's behaviour (Walton, Kuczynski, Haycraft, Breen, & Haines, 2017). Khalsa et al. (2019) suggested that parental feeding style shapes a child's ability to self-regulate food intake and has an impact on their future risk of obesity.

Five feeding styles are commonly referred to within the literature: "Restrictive – a parent limits the quality and quantity of foods offered to the infant; Pressuring – the parent cajoles the infant to finish a certain quantity of food; Indulgent – the parent does not set limits on the quantity or quality of foods provided; Laissez-faire – the parent does not set limits on the quantity or quality of foods provided and there is little interaction with the child; and Responsive – the parent monitors the quantity and quality of food provided and is attentive to the infant's hunger cues" (cited by Khalsa et al., 2019, p. 78). Black and Aboud (2011) further suggest that responsive feeding involves responding in emotionally

supportive and developmentally appropriate ways. This promotes optimal communication between parents and infants (Shloim et al., 2018).

Responsive feeding practices have been related to self-regulation and healthy weight status (Hurley, Cross, & Hughes, 2011). Unresponsive parent feeding practices (e.g. pressure to eat or restriction) can disrupt self-regulation by overriding infants hunger and satiety sensations (Ventura & Birch, 2008). In turn, this can affect frequency of feeds offered, and the quantities eaten (Shloim et al., 2018). Jansen, Williams, Mallan, Nicholson, and Daniels (2018) found maternal feeding practices to be related to child food responsiveness over a five year period. Less responsive feeding practices were associated with child food responsiveness over time, but not child satiety responsiveness. Results from the study highlight "complex bi-directional relationships between maternal feeding practices and child eating behaviours" (Jansen et al., 2018, p. 8).

In summary, feeding interactions between parents and infants seem to involve complex, bi-directional processes. This can be understood in relation to attachment theory and mind-mindedness, both of which underpin responsive parenting. Parents will develop their own feeding styles, and a responsive feeding approach can help parents to become better attuned to recognising hunger and satiety cues within their infants, as well as having potential benefits upon infants' self-regulation and physical health.

1.4 Infant Feeding Cues: Hunger and Satiety

Throughout their early development, infants begin to understand hunger and fullness signals within their bodies, and communicate these to caregivers (Bibbings, 2017). These signals are displayed through a diverse range of hunger and satiation cues (Shloim et al., 2018). Although difficult to know for sure, observational studies suggest "some consensus on basic hunger, appetite, satiation, and liking cues" (Hetherington & McNally, 2020, p. 42).

1.4.1 Recognising Infant Feeding Cues

During the milk-feeding stage, hunger is signalled via hand sucking, hand to mouth agitation, orienting towards the breast or bottle, and via the hunger cry (Glodowski, Thompson, & Martel, 2019; Hetherington & McNally, 2020). During this stage, infants communicate satiation through disinterest and sleep. As infants develop, the ways in which they communicate hunger and satiation increase in complexity. These can be communicated via bodily movements, facial expressions and gaze (Hetherington & McNally, 2020). Following a systematic review of studies exploring infant feeding cues during the first two years of life, McNally et al. (2016) found that mothers were more easily able to recognise infant hunger, rather that satiation, cues. Feeding cues were found to become easier to interpret as children grew older. As infants develop, their motor and language skills improve. This enables them to assert themselves more clearly regarding hunger and satiation (Hetherington & McNally, 2020).

Studies involving structured observations of infants during mealtimes have been carried out. From these studies, measures have been developed to identify the ways in which infants communicate feeding cues. Following semi-structured interviews with mothers, Hodges, Hughes, Hopkinson, and Fisher (2008) identified common hunger cues as crying, fussing and licking lips, across age groups (3, 6 and 12 months). Common satiation cues included the infant pulling away, spitting food out, and stopping feeding. Hodges et al. (2013) identified 20 hunger cues and 28 satiation cues which led to the development of the Responsiveness to Child Feeding Cues Scale (RCFCS). The cues were further categorised as ‘early’ (e.g. increased alertness), ‘active’ (e.g. excitatory movements) and ‘late’ (e.g. fussing and crying) to reflect changes in cue intensity (cited by McNally, 2018). Approach cues tend to signal hunger and avoidance cues can signal satiation (Hetherington & McNally, 2020).

The Feeding Infants: Behaviour and Facial Expression Coding System (FIBFECS; Hetherington et al., 2016) is an evidence-based video coding tool, involving the first 9 spoonfuls of a meal. It consists of 13 items. Six avoidance/approach gross behavioural cues (turning away, arching back, pushing spoon away, crying/fussy, leaning forward and rate of acceptance) assess wanting or rejecting food. Seven, more subtle, facial expressions (brow

lowered, inner brow raised, squinting, nose wrinkling, upper lip raised, lip corners down and gaping) assess liking or not liking food. Lower scores on the total scale indicate greater wanting and/or liking. Although initially developed to explore the wanting and liking of foods during the weaning period, Hetherington et al. (2016) suggest that the FIBFECS may be used to assess mealtime interactions using only part of the tool.

Shloim et al. (2018) explored changes in type and frequency of hunger and satiety cues expressed during a meal across the first 2 years of life. Mealtime interactions were filmed, and feeding cues were explored from the beginning of CF up until independent feeding. Thirty-eight mother-infant dyads took part in the study. Feeding cues were identified and recorded using the Nursing Child Assessment Satellite Training (NCAST, Barnard, 1979; Beel-Bates, Stephenson, Nochera, & Rogers, 2012). NCAST can be used as a coding framework for infant communication during mealtimes, including engagement cues, indicating hunger (e.g. babbling and mutual gaze), and disengagement cues, indicating satiety (e.g. crying and lateral head shake). Shloim et al. (2018) coded the frequency and timings of cues during a mealtime. Communication of engagement cues increased with age of the infants, however disengagement cues did not. Perhaps raising parental awareness of such cues would encourage the development of more responsive feeding styles (Shloim et al., 2018).

McNally et al. (2019) explored the way in which infant gaze can be measured throughout CF mealtimes in regard to signalling hunger and satiation. Twenty infants aged between six and eighteen months were filmed during typical mealtimes in their home environment. Following analysis of the recordings, the Infant Gaze at Mealtime (IGM) coding scheme was developed. McNally et al. (2019) found that over the course of mealtimes, infants' gaze significantly shifted from focusing on food (suggested to be linked to hunger), towards exploratory gaze behaviours (perhaps linked to satiation). Despite positive initial findings, a relatively small and homogenous sample was used within this study. Further studies using the IGM to explore infant gaze during mealtimes are recommended, although it seems that infant gaze may be of importance when supporting parents to follow a responsive feeding approach (McNally et al., 2019).

The findings from the above studies highlight the complex ways in which infants communicate feeding cues. Further high-quality, valid and reliable instruments, appropriate for use in diverse samples, are recommended to assess responsive parental feeding (Heller & Mobley, 2019). As infant feeding involves interactions between the infant and parent, it is also important to also consider the ways in which parents respond to infant feeding cues, particularly in relation to a responsive feeding approach whereby cues need to be responded to promptly and appropriately (Hetherington & McNally, 2020).

1.4.2 Responding to Infant Feeding Cues

Feeding in response to infant hunger cues, and not feeding beyond satiation, supports the development of appetite regulation (Houck & Lecuyer-Maus, 2004; Karreman, Van Tuijl, van Aken, & Deković, 2006). Given the complexity involved during feeding interactions, it is perhaps not surprising that parents have been found to have difficulty in responding to cues appropriately (Hetherington & McNally, 2020). This can be in relation to infants reportedly displaying a mixture of both hunger and satiety cues even in the later stages of feeding (Price et al., 2012). Research also suggests that mothers can be more likely to respond to hunger rather than satiety cues (Hodges et al., 2013; Hodges, Wasser, Colgan, & Bentley, 2016). Such results have been interpreted "in the context of the greater urgency and biological imperative of hunger compared to satiation" (cited by Hetherington & McNally, 2020, p. 43). When deciding when to begin or end a feed, mothers reported being guided by the prominence, intensity, and specificity of their infants' cues (Hodges et al., 2016). Both parental and infant characteristics can also have the potential to influence perceptions of and responses to feeding cues (McNally, 2018).

1.4.3 Parent and Infant Characteristics

Relatively little is known about how parents make sense of and respond to feeding cues (McNally et al., 2020). The developmental stage of the infant, alongside infant temperament, have been considered important when exploring the communication of feeding cues (Hetherington & McNally, 2020; Paul et al., 2018). As infants' age increases, they communicate hunger and satiety cues in more frequent and diverse ways, which

influences parents' ability to feed responsively (Jansen et al, 2018). Parental influences, including individual characteristics of the parent, and modes of feeding are important to consider (Hetherington & McNally, 2020). Maternal responsiveness to satiation has been predicted by lower maternal weight, longer breastfeeding duration, and higher education level (Hodges et al., 2013, cited by Hetherington & McNally, 2020).

Maternal body weight has been explored in relation to responsiveness. Factors associated with childhood obesity include, for example, maternal pre-pregnancy body mass index (BMI), and gestational weight gain (Paul et al., 2018). Mothers classified as having obesity have been found to be less responsive to satiety cues and are less likely to believe that infants know when they are full (Gross et al., 2010). Perhaps such mothers are less sensitive to fullness cues, which may result in overfeeding (Hetherington & McNally, 2020). Khalsa et al. (2019) found parents who reported responding to their own hunger and satiety cues more frequently were significantly more likely to adopt a responsive feeding style with their infants.

Research has also explored the influence of breastfeeding in relation to responsiveness and infant weight. Associations between formula-feeding and rapid weight gain have been found at 12 months of age (Ventura & Thompson, 2019). Perhaps during breastfeeding, mothers are more responsive to satiety cues, allowing the infant to control the feed, in comparison to mothers exerting control (Shloim et al., 2018). Breastfed infants have also been reported to communicate more hunger and satiety cues than formula-fed infants (Shloim, Vereijken, Blundell, & Hetherington, 2017), although this has not been a consistent research finding (Whitfield & Ventura, 2019). Mothers who formula-feed have been found to interpret their infants' feeding cues via external sources, such as the amount of milk left in the bottle (Appleton et al., 2018). Relying on such sources can potentially lead to infants being fed more than they need, particularly as some commercial advertisements on formula feeds recommend infants being fed more than recommended in healthcare guidelines (Appleton et al., 2018). However, these findings were from research in Australia and it is not clear if this is also the case within the UK. Further research is therefore warranted regarding breast vs. formula feeding and responsiveness.

With mode of feeding in mind, mothers who use a BLW approach are thought to feed more responsively (Brown, Jones, & Rowan, 2017). McNally et al. (2020) explored maternal perceptions of feeding cues and intake of food between BLW and spoon-feeding approaches in eleven mothers of infants (7–24 months). Mothers watched back videos of themselves feeding their infants and participated in semi-structured interviews. Mothers following either feeding approach were skilful in recognising feeding cues. However, their findings support the view that BLW may be a more responsive feeding approach. Although mothers who spoon-fed recognised a greater number of feeding cues, they were perhaps less inclined to follow these or more inclined to misinterpret them (McNally et al., 2020).

Regarding the amount of food offered to infants, mothers have reported a challenge attributed to the difference between expected and observed behaviour, for example, infants still appearing hungry after being fed (Price et al., 2012, cited by McNally et al., 2020). If BLW is a more responsive approach, further research will be of interest to explore how parents decide upon meal size and ending of the meal, including gauging adequate intake (McNally et al., 2020). This is of interest as infants who have been BLW have been found to sometimes be either under- or over-weight (Townsend & Pitchford, 2012).

Viewing their infants as consuming ‘enough’ can be shaped by maternal views of ‘fussiness’ (Johnson, Goodell, Williams, Power, & Hughes, 2015). Infants may be labelled as being ‘fussy’ or ‘picky’ eaters, referring to an unwillingness to try new foods (Bibbings, 2017). Although common, and often transient, in children up until 2 years of age, it can be a cause of concern for parents (Harris, Jansen, Mallan, Daniels, & Thorpe, 2018). Concern over fussy eating behaviours is suggested to be associated with parental non-responsive feeding practices, for example by driving persuasive and rewarding feeding practices (Harris et al., 2018). This highlights the importance of this being recognised within feeding interventions. Using a BLW approach has been suggested to reduce food fussiness in infants at 2 years of age, although further research is again warranted (Daniels et al., 2015).

In a qualitative study by Carnell, Cooke, Cheng, Robbins, and Wardle (2011) parents were found to utilise feeding behaviours in order to gain particular outcomes, such as promoting food intake or to restrict it. Relational reasons, such as offering food to calm a

child down (relating to using food to soothe), were also reported. It is important for infants to learn to discriminate between hunger/satiety cues and other signs of distress (e.g. tiredness, feeling scared, overstimulated). This can be achieved through parents feeding in response to hunger, but using different soothing approaches for non-hunger related distress. Observations of parents using food to soothe has been found to be related to infant weight (Stifter & Moding, 2015). Jansen et al. (2018) found a higher tendency to overeat at 3 years of age following maternal use of emotional feeding and using food to calm infants. Using food to soothe can also lead to the development of emotional eating styles and poorer diets (Braden et al., 2014; Rodenburg, Kremers, Oenema, & van de Mheen, 2014).

Overall, evidence suggests that mothers and caregivers' interpretation of cues, feeding responses and perceptions of what is 'enough' are shaped by beliefs, experience, and child characteristics. However, findings to date regarding parental judgments of enough are limited to older children rather than infants, while those regarding perceptions of feeding cues have emerged from studies with largely low-income mothers and in traditional weaning, (rather than BLW) contexts. Therefore, it is unclear if such findings apply to different demographic groups or across different CF practices (McNally et al., 2020, p. 2).

Future research is therefore recommended to explore the interactive contribution of parental and child factors and their involvement in the development of feeding behaviour, appetite regulation and weight (Shloim et al., 2018). Feeding behaviours during the first 24 months affects growth and development of future dietary patterns (Reidy et al., 2017). This explains why parents of infants and young children are often targeted in public health interventions relating to the prevention of childhood obesity (Druet et al., 2012; Jansen et a., 2018). These interventions often focus on responsive feeding.

1.5 Responsive Feeding Interventions

Responsive feeding interventions can offer educational support for parents to recognise and respond to their infants' cues (Hetherington & McNally, 2020). Such interventions may be particularly important for parents who are suggested to find it more

difficult to recognise and respond to their infants feeding cues, for example those at higher risk of obesity, or who identify their infants as fussy eaters (Hetherington & McNally, 2020). Responsive feeding interventions can be offered face-to-face, although more self-directed approaches are now being developed too.

Matvienko-Sikar et al. (2018) carried out a systematic review of healthcare professional-delivered early feeding and responsive feeding interventions in relation to parental feeding practices, dietary intake, and weight outcomes for children up to 2 years old. Six interventions were identified that included responsive feeding components. There were positive findings in relation to feeding approaches and weight outcomes. On this basis, the authors recommended that responsive feeding should be "incorporated into healthcare professional delivered early feeding interventions to prevent childhood obesity" (p. 56).

One of the key studies reported within the systematic review by Matvienko-Sikar et al. (2018) was the Intervention Nurses Start Infants Growing on Healthy Trajectories (INSIGHT) longitudinal randomised clinical trial, initially developed by Paul et al. (2014). The aim was to "reduce rapid weight gain in infancy and develop healthy growth trajectories during early life" (Paul et al., 2018, p. 462). Following a responsive parenting framework, first-time mothers were provided with guidance on feeding, sleep, interactive play, and emotion regulation. Those in the control group were provided with information on home safety. A sample of 279 first-time mothers was recruited from a maternity ward. Research nurses conducted home visits when infants were age 3-4, 26, 28 and 40 weeks, followed by annual clinic visits at 1, 2 and 3 years. Receiving the responsive parenting intervention was found to reduce rapid weight gain and prevalence of overweight for infants at one year (Savage, Birch, Marini, Anzman-Frasca, & Paul, 2016), improve sleep related behaviours (Paul et al., 2016), and improve adherence to current dietary guidelines (Hohman, Paul, Birch, & Savage, 2017). Paul et al. (2018) also found a reduction in BMI z scores at age 3 years, suggesting longer-term effects.

Savage et al. (2018) explored the effect of the INSIGHT trial on mothers feeding practices in the first year of birth. Regarding the feeding component, the intervention provided guidance which emphasised feeding in response to hunger and satiety cues, rather

than using food to soothe. The intervention also recommended developmentally appropriate feeding practices, e.g. delaying the introduction of solids, and using age-appropriate portion sizes. These practices were assessed via self-report during phone interviews and online surveys. Dietary intake was assessed using a food frequency questionnaire (Savage et al., 2018). Mothers who received the responsive parenting intervention were more likely to use structure-based feeding practices (e.g. limit-setting), and consistent feeding routines at age one year. They were also less likely to use non-responsive feeding practices (e.g. pressuring infants to finish their bottle or food, and using food to soothe). The authors concluded that providing early guidance on responsive parenting in feeding could potentially reduce future obesity risk. However, it is important to note that findings within this study were from self-report measures, and therefore should be taken with caution due to subjectivity and potential demand characteristics.

A study by Ledoux, Robinson, Baranowski, and O'Connor (2018) involved developing and pilot testing a video to teach parents about responsive feeding. Fifty parents of pre-school children were randomly assigned to watch Happier Meals or a control video about education. The Happier Meals intervention video focused on five key areas: creating a healthy food environment, trusting children to make their own food choices, asking children to help with preparing meals, modelling healthy eating, and offering new foods 10-15 times to get children used to new foods. Knowledge of responsive feeding for participants in the experimental group increased significantly compared to control participants. Such knowledge and beliefs were associated with video engagement. Ledoux et al. (2018) concluded that video-based interventions may be effective vicarious learning tools for teaching responsive feeding practices. Hetherington and McNally (2020) have also observed that mothers value video-based resources in relation to feeding cues.

Although interventions which are delivered face-to-face have been found to be effective, they are costly and time consuming (Franke, Keown, & Sanders, 2016). Self-directed parenting programmes can be cost-effective and accessible alternatives (Metzler, Sanders, Rusby, & Crowley, 2012). Despite this, the use and development of such programmes appears to be limited regarding feeding interventions. Further research regarding the expression of hunger and satiation has been recommended, potentially being

used to inform future interventions focusing on responsive feeding (McNally, 2018). This may also lead to improved mealtime interactions and experiences between parents and infants (Jansen et al., 2018). With this in mind, a self-directed online resource has been developed for use with parents and/ or professionals (McNally, 2018).

1.6 Development of a Self-directed Responsive Feeding Online Resource

McNally (2018) developed a resource for parents to learn about infant feeding cues and responsive feeding. Known as Mealtime Mindreading, this involved written information for parents about different aspects of general infant feeding behaviour and used video clips collated from one mother and her infant over time to illustrate different feeding cues. Designed using Articulate Presenter version 13, it included 64 slides with information on the nature and challenges of responsive feeding, issues affecting infant feeding behaviour, and hunger and satiation cues in infants between 6 and 14 months. Six months is the WHO recommended age for introducing CF, and 14 months was chosen due to the increased likelihood of infants feeding independently once past this age. Feeding cues information was organised into three different age groups (6-8 months, 9-11 months and 12-14 months). This is based on typical feeding and communication milestones within these age groups (McNally, 2018). The Mealtime Mindreading resource was the first known self-directed responsive feeding resource to be developed. Additionally, it was the first to be based upon mind-mindedness concepts.

During feasibility testing, the Mealtime Mindreading resource was hosted online over an 8-week period, using Articulate Online software. A sample of 30 parents and 4 childcare/nutrition professionals evaluated the online version of the resource for acceptability and satisfaction. The resource was found to be acceptable for both parental and professional use, as well as increasing perceived knowledge of feeding cues. The videos within the resource were reported to be useful and helped to improve parents' understanding of their infants' behaviour during mealtimes (Hetherington & McNally, 2020). "As such, observational learning may be a particularly helpful tool for developing awareness of infant feeding cues and promoting attunement to these" (Hetherington & McNally, 2020, p. 49).

Satisfaction with the Mealtime Mindreading resource was inversely correlated with parents' reported level of concern regarding their infants' eating. This indicates that perhaps more specialist resources would be of use for parents reporting feeding concerns (Hetherington & McNally, 2020). Qualitative feedback on the resource suggested including additional content regarding feeding difficulties, such as fussiness and worries about portion sizes (McNally, 2018). Strategies or advice around these issues may be helpful to be included in future interventions (Hetherington & McNally, 2020). Further recommendations for future piloting of the resource included more robust measures of learning, for example using pre- and post-measures, exploring the ability of the resource to elicit behavioural change, and recruitment of a more diverse sample (McNally, 2018).

1.7 The Current Study

The current study will utilise the online self-directed responsive feeding Mealtime Mindreading resource, developed by McNally (2018). Keeping in mind the recommendations from McNally's research, the current study will use an observational approach, with pre- and post-measures, to explore potential behavioural change. Information regarding fussy eating will be added to the Mealtime Mindreading resource, based on research by Haycraft, Witcomb, and Farrow (2016). Information regarding using food to soothe will also be added.

The aims of the current study are to:

1) Examine whether use of the Mealtime Mindreading resource will affect parents' ability to recognise and respond to infant satiety cues. The following cues will be explored:
    - Behavioural: arching back/ turning head away/ pushing spoon away
    - Affective: crying/ fussing/ agitation
    - Distraction: playing with / grabbing spoon or bowl
    - Rate of acceptance: late acceptance/ enforced acceptance/ refusal

2) Assess parent's engagement with, and acceptability of, the Mealtime Mindreading resource.

It is hypothesised that, due to parents becoming more able to recognise and respond to their infants' satiety cues, fewer satiety cues will be displayed after parental engagement with the Mealtime Mindreading resource.

2.0 Method

2.1 Design

A within-participants, repeated measures study was used to investigate parental response to satiety cues during mealtimes before and after access to a responsive feeding online resource. The design is based on an initial feasibility assessment rather than a trial with control group allocation.

2.2 Participants

Inclusion criteria for the study were participants being parents, over the age of 18 years, and with healthy developing infants aged between 6 and 18 months. Infants needed to be either spoon fed or fed using a combination of spoon feeding and baby-led weaning (BLW). Participants were required to have an email address to access the study materials. Due to the infant feeding resource being hosted as a YouTube video, participants were required to be able to access the internet either via their mobile phone, tablet, or computer. Participants were required to be fluent in English. Due to time constraints and accessibility, participants were required to live in an area which was geographically accessible for me to travel to by car. Accordingly, the study advert invited participants living in the North East of England and Yorkshire regions.

Exclusion criteria included parents who were only using a BLW approach. Initially, infants with identified medical conditions, or known feeding problems, were excluded from the study. However, due to difficulties with recruitment, one participant had begun weaning early due to their infant having a reflux condition, participating when their infant was 4 months old. Two infants in the study were dairy intolerant. Due to having a different growth trajectory, infants who were born prematurely were also excluded.

Initially, 20 parent-infant dyads were recruited. However, Covid-19 restrictions came into place during March 2020, and before completion of data collection. Prior to these restrictions, both home visits (1 and 2) had been completed with 16 participants. One further participant had verbally agreed to participate but no further steps had taken place.

Visit 1 had taken place for a further three participants. Of these, one participant decided not to further participate other than completing the debrief questionnaire. The other two participants agreed to record a second mealtime with their infants themselves and send the recordings remotely. Unfortunately, one of these recordings had not captured the full mealtime, although part of the recording was still able to be analysed. Information regarding the amount of food consumed was not gathered from the other participant. In total, full data was collected was for 17 participants, with partial data completed for a further two participants.

Although mothers and fathers were invited to take part in the study, only mothers came forward to participate. Due to this, from here on in, I will refer to 'mothers' rather than 'parents'. Table 1 summarises participant characteristics for the mothers, and Table 2 shows infant characteristics.

Age (n=19)	**Ethnicity**	**Education Level**	**Employment**	**Number of Children[1]**
28-38 years (mean= 31.3, SD= 2.79)	'White British' (n= 18) 'British' (n=1)	GCSEs (n=1) A-levels or equivalent (n=2) Undergraduate degree (n=8) Postgraduate degree (n=8)	Healthcare (n=7) Public sector (n=6) Other roles involved banking, customer service, events, data support, owning a cafe/ shop (n=6)	1 (n=17) 2 (n=2)

Table 1. Participant characteristics (mothers).

[1] Including infant taking part in the current study.

Table 2. Participant characteristics (infants).

Age (n=19)	**Gender**	**Average Weeks of Gestation**	**Average Birth Weight**
4-14 months (mean= 8.8, SD= 2.87)	Male (n= 12) Female (n=7)	39.9 (SD= 1.49)	7lbs 7oz (SD= 0.92)

Regarding early feeding behaviours, 9 mothers breastfed, 5 formula-fed, and 5 used a combination of breast-feeding and formula. Of those who breastfed, 43% stopped prior to their infant reaching 6 months of age, and 50% continued following the 6-month stage. One participant did not record their duration of breastfeeding. The average age at which

mothers introduced solid foods was 5 months (SD= 0.81). Ten mothers reported initially using spoon-feeding with finger foods offered at a later stage, eight offered a mixture of spoon-feeding and finger foods from the beginning of the weaning process, and one mother had solely spoon-fed their infant. When asked if they would describe their infant as a 'fussy eater', 12 responded 'no', six 'sometimes', and one 'yes'. All participants described their infant as eating 'about the right amount most of the time'.

Ethical approval was granted by the School of Psychology Research Ethics Committee on 30th November 2018 (Ref: PSC-526). See Appendix A.

2.3 Recruitment

Recruitment took place via social networking (Facebook); social media (e.g. Mumsnet, Net Mums, Mumbler), flyers sent to nurseries, parents' groups, and through informal and academic contacts. Face-face recruitment took place at a family-focused location (Eureka science museum). Permission was sought to post links to study information on social media sites via emails or Facebook messenger, accompanied by the study flyer, participant information sheet and consent form.

2.4 Intervention

The study utilised an adapted version of the self-directed online Mealtime Mindreading resource for parents to learn about infant feeding cues and responsive feeding, initially developed by McNally (2018). The resource included written information alongside video clips collated from one mother and her infant over time to illustrate different hunger and satiety cues.

As in the original study, it was planned for the resource to be hosted via an online platform for access by participants in the current study. Due to financial constraints this was not feasible. Consequently, a Microsoft PowerPoint version of the resource was converted into a video format and accessed by participants via YouTube. This meant that some of the features from the original version of the resource, e.g. navigation buttons, were no longer

available. However, participants were able to run the video at their own pace, for example pausing, rewinding and fast forwarding it. Hosting the resource via YouTube also allowed for analytics to be captured to track usage of the resource. Each participant received a weblink to access the YouTube video. To maintain security, the video could only be accessed by those who had received a weblink.

The original resource was not age specific and large in size, therefore it was split into three separate videos, based on age ranges: 6-8 months; 9-11 months; 12 months onwards. A selection of the slides were common to all three videos, screenshots of which can be found in Appendix B. Figure 1 is a screenshot of a slide near the beginning of each video to highlight what areas the resource covered.

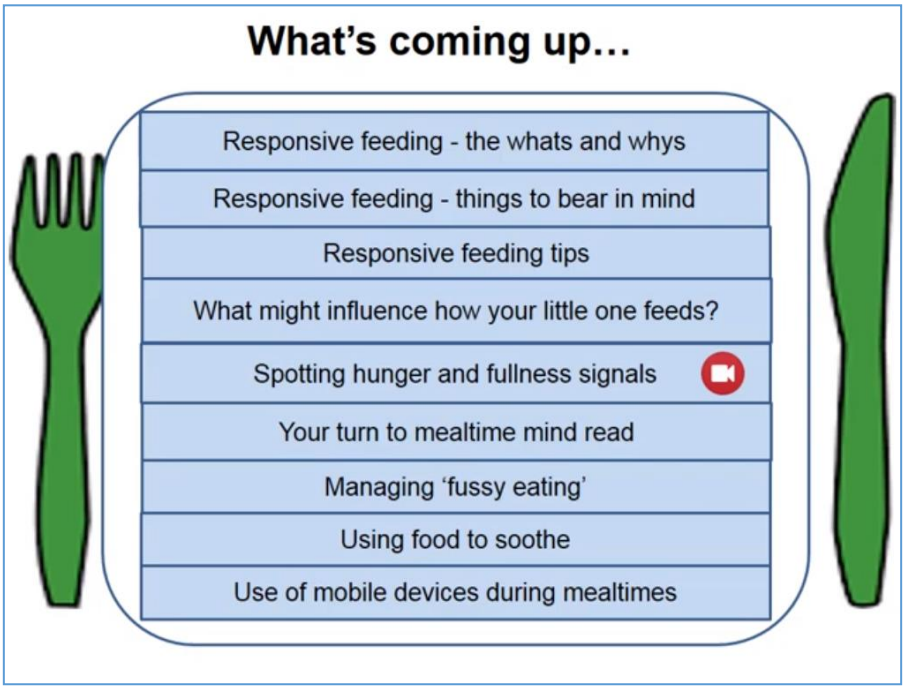

Figure 1. 'What's coming up' slide included in the resource.

The resource for the three age ranges included video clips of the mother and infant when the infant was aged within the corresponding age range, reflecting real life examples of the cues. Screenshots of these sections within the 6-8 month version of the resource video can also be found in Appendix B.

The original version of the Mealtime Mindreading resource (McNally, 2018) included a knowledge test to be completed at the end. This was removed from the current study due to being more focused on mothers' confidence and sensitivity to recognising and responsively responding to satiety cues. Such information was gathered within the initial and debrief questionnaires, as well as from the mealtime observations.

Based on feedback from McNally's (2018) study, an additional slide was added to the original Mealtime Mindreading resource to include information regarding feeding difficulties, such as food fussiness and worries about portion sizes. This included a weblink to signpost mothers to the Child Feeding Guide website (Haycraft, Witcomb & Farrow, 2016), a resource developed in 2012 by academic psychologists in the UK "to provide effective, evidence-based support to parents, caregivers, and professionals around feeding children".

Previous research has suggested a negative relationship with responsive feeding and using food as a way of regulating an infant's emotional state (Savage et al., 2018). Using food as a way of soothing infants can also be associated with childhood obesity (Jansen et al., 2019; Stifter & Moding, 2018) . A slide (Figure 2) was added into the resource to provide information on the potential negative implications of 'using food to soothe'.

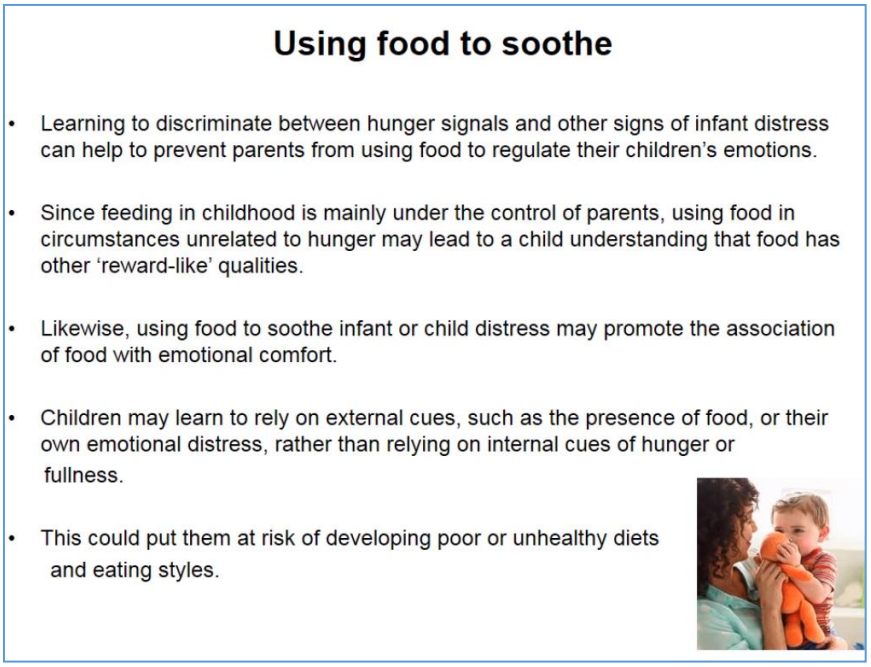

Figure 2. 'Using food to soothe' slide included in the resource.

Research has also commented on the negative impact upon parent-child interactions of using mobile devices during mealtimes (Gramm, Vollmer, Harpel, McDaniel, & Schumacher, 2020; Kildare & Middlemiss, 2017; Radesky et al., 2018). A slide was added into the resource to reflect information on this (Figure 3).

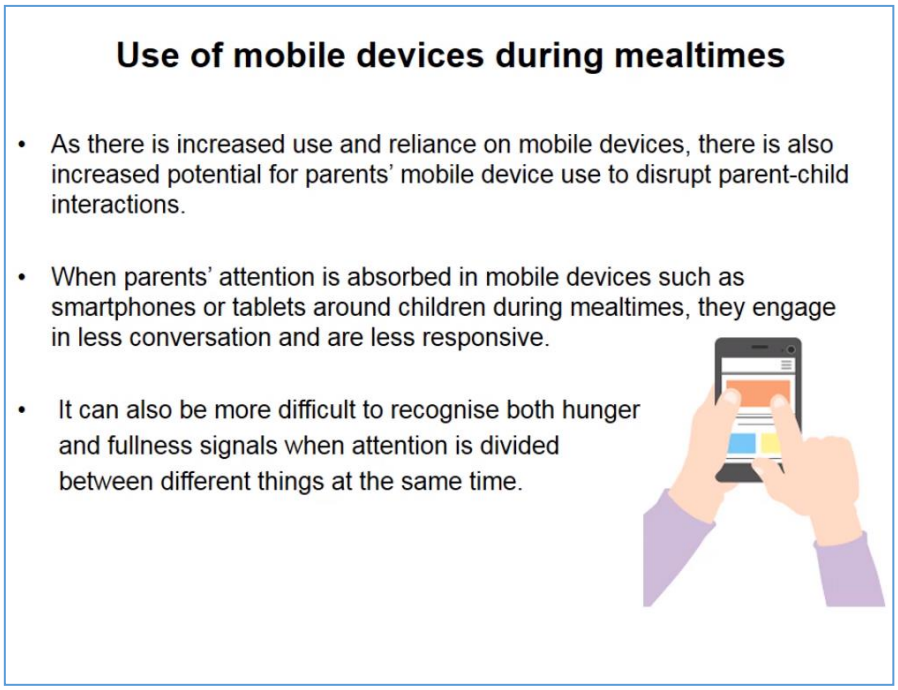

Figure 3. 'Use of mobile devices during mealtimes' slide included in the resource.

Participants received a link to the appropriate video based on their infant's age at the time of the home visit 1. Each of the videos lasted approximately 15 minutes in total. A narration for each of the videos was recorded by Kate Austin, a Senior Lecturer in Nutrition at Leeds Beckett University. Kate also appeared within the original Mealtime Mindreading resource video clips with her infant to illustrate each of the hunger and fullness cues at each of the ages and stages highlighted.

2.5 Measures

2.5.1 Mealtime Video Recordings

Two visits to the family's homes were arranged during a usual mealtime (either lunch or evening meal), which were required to be the same for each visit. Filming in the participant's home environment was decided upon due to allowing for naturalistic

observation. Mothers were asked not to provide their infant with a meal, and preferably not any foods, within an approximate 2-hour period before filming began to ensure that their child was hungry and ready to eat. Prior to arrival for filming, mothers were asked about the current state of their infant (illness, sleep, appetite etc.) to decide whether filming needed to be rescheduled. During the study, a total of four visits were rescheduled due to infant illness.

The video-camera was set up upon arrival. Mothers were asked to seat their infant in a highchair or on a booster seat at the table according to their usual practice. Due to one infant being four months old, she was seated in a walker and her mother sat on the floor opposite her during feeding. Mothers were instructed to feed their infant as they usually would and to avoid interaction with me. It had been requested that this be a warm savoury option followed by a dessert such as yoghurt, which the infant would be familiar with. Both options were required to be spoon fed as much as possible. Any finger foods were asked to be offered at the end of the entire meal.

The camera was positioned so both the mother and infant were in view, as illustrated in Figures 4 and 5. Details of the meal were captured by photography and the bowls weighed to gain a sense of how much was offered and, when the meal was over, how much remained in the bowls. Meal items were recorded in a meal diary with details of which foods/beverages were offered and the nutritional composition of the foods (from packaging or from nutritional tables). Recording ended when the mother reported that the mealtime was completed. Mothers were asked to provide verbal feedback rating how typical the observed mealtime had been for their infant. Mothers reported that the mealtimes were typical, other than the infant seeming distracted by me and the video-camera at times.

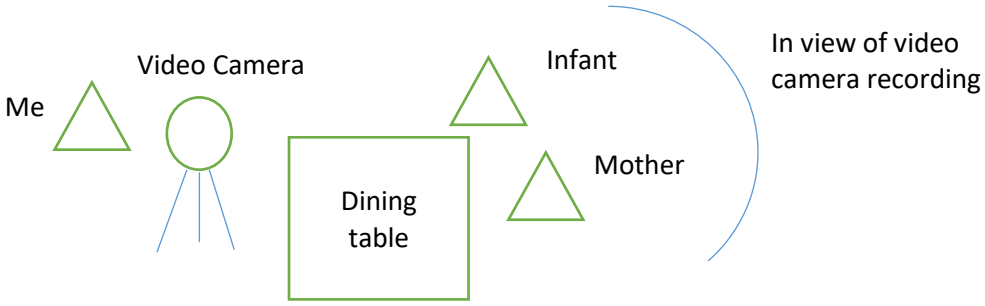

Figure 4. Illustrative set up of mealtime recording.

Figure 5. Screenshot of a mealtime recording for one of the participants within the study (written consent gained to include image).

During the initial recording visit (visit 1), parents were sent a link to access the resource online via a YouTube link. The age-range within the resource depended on the age of the infant on the day the first recording took place.

Mothers were instructed to view the full video of the resource a minimum of 2-3 times, without a maximum limit, during the study. Approximately one week after receiving the resource, I contacted the mother via text message or email to check-in, and prompt use of the resource. Mothers were advised to contact me if they encountered any difficulties accessing the resource. A final mealtime recording (visit 2) was carried out within a 4-week period after visit 1. The procedure was identical to that in visit 1.

2.5.2 Questionnaire Assessments

An online initial questionnaire gathered information about the mother and their infant. This included maternal age, gender, ethnicity, marital status, highest academic qualification, occupation, postcode, number of children, and ease of recognising hunger and fullness in their infant. Infant age, gender, birthweight, and weeks of gestation at birth were recorded. Mothers also completed information on feeding their infant, including whether they were breastfed, age at which solid foods were introduced, and approach to weaning (spoon feeding, spoon feeding with finger foods offered at a later stage, or spoon feeding and finger foods offered from the beginning of weaning). The initial questionnaire was completed prior to visit 1.

Following visit 2, participants completed an online debrief questionnaire. This was based on an adapted version of the User Satisfaction Questionnaire used by McNally (2018). There were 19 items with answers on a 5-point Likert scale. Open ended questions were used to offer a space for participants to expand upon each of their answers and to gather written opinion. These asked what participants liked, what they would change, what they learned, and if they would recommend the resource to others. A full list of the questions can be found in Appendix C. Both the initial and debrief questionnaires were hosted online by Qualtrics and accessed via email links.

2.6 Procedure

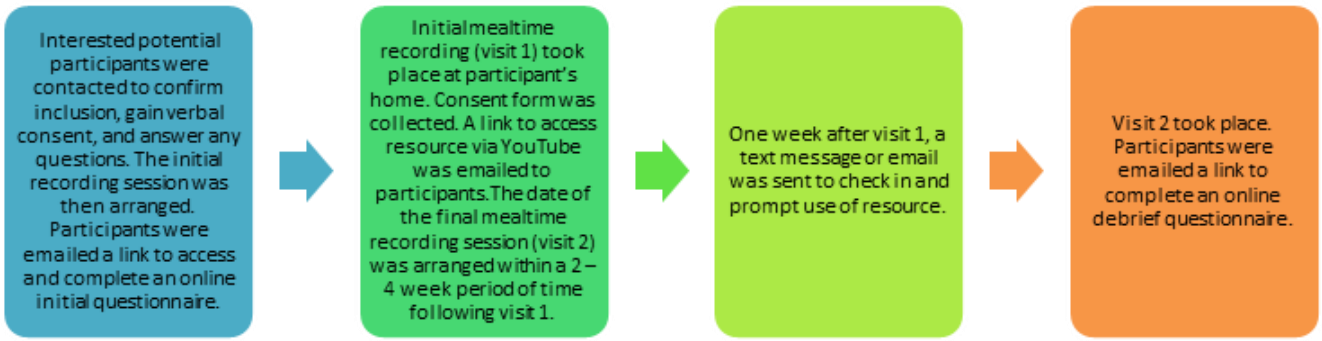

Figure 6. Timeline of procedure.

Participants received full information regarding the study via a participant information sheet (Appendix D). As highlighted in Figure 6, following an initial telephone call, text message, email or Facebook Messenger communication with me, participants were emailed a consent form (Appendix E). They were advised of the right to withdraw both verbally and on the consent form. Initially, verbal consent was gained and the initial recording visit was arranged. The completed and signed consent form was collected at visit 1.

Before visit 1 took place, participants were emailed a link to access and complete the initial questionnaire online. The initial mealtime recording took place in the participant's home. A link was then emailed to the participant to access the resource via YouTube. The option of participants being shown the resource on my laptop was offered and any questions about the study were answered. The second recording visit was then arranged. An interim telephone call or text message aimed to prompt use of the resource between visits. Approximately two weeks (maximum 4 weeks) later, a second recording of a mealtime was completed. Participants were then emailed a link to access and complete the online debrief questionnaire. Participants were offered a copy of the videos taken during the study.

2.7 Analysis

2.7.1 Coding

As in Hetherington et al. (2016), a VLC media player was used to playback the mealtime video recordings due to accessibility and available features, e.g. adjusting brightness if video quality was poor, and watching the video in slow motion.

The Feeding Infants: Behaviour and Facial Expression Coding System (FIBFECS; Hetherington et al., 2016) is a validated tool, developed to provide training to code behaviours and facial expressions related to infant feeding behaviours. As I was initially unfamiliar with coding infant feeding cues, before coding the current data, I was required to achieve a certain level of reliability (0.7) as part of the online FIBFECS coding certification. Only the behavioural section of the coding certification test was completed due to the aims

of the current study. Dr Chandani Nekitsing, whom was involved in the development of the FIBFECS, scored the certification test. A high level of reliability was achieved regarding rate of acceptance (0.91), and behavioural cues (0.82).

For the current study, the FIBFECS was adjusted to fit with the study aims. This included coding more than just the initial nine spoonfuls of the meal, and only coding behavioural cues (rather than also coding facial expressions).

Satiety cues included within the current study were based upon those reported within previous research (Hetherington et al., 2016; Hodges et al., 2013; Hodges et al., 2016; McNally, 2018; Nekitsing et al., 2016). Following discussions in supervision, behavioural cues (turning head away, pushing spoon away, arching back), affective cues (getting fussy, agitated, crying), and distraction cues (becoming distracted or playful) were coded within the current study. The satiety cues and their descriptions for coding are described in Table 3.

Table 3. Satiety cues and descriptions for coding based upon the FIBFECS training documents (Hetherington et al., 2016).

Satiety Cues	Description for Coding	Example Image
Behavioural		
Pushing spoon or hand holding the spoon away	After the infant sees the spoon offered, they push the spoon away from them as to avoid being fed. They may express this behaviour with their hands or arms. The motion must occur prior to intake.	
Turning head away	After the infant sees the spoon offered, they turn their head in another direction.	
Arching back or pulling body away	After the infant sees the spoon offered, they create distance between themselves and the spoon offered in order to avoid it. They may move their body backward to the back or the side of the highchair, or arch their back by curving their spine and/or moving forward the pelvis/ abdomen.	
Affective		
Gets fussy, agitated, or cries	After the infant sees the spoon offered, they get fussy and begin to cry if the feeding persists. Fussiness can be detected by a “cry face”, face turning red, shaking head (side to side), low pitched vocalisation.	
Distraction		
Becoming distracted or playful	After the infant sees the spoon offered, the infant seems more interested in playing rather than accepting the food. The infant may try to grab the spoon/ food/ cup and shake it, slam it on the table, or throw it away.	

Due to exploring satiety cues, which tend to be present at the latter part of a mealtime, coding began from one minute into the mealtime recording. Each spoonful was coded as yes/no (1/0) to identify if a cue was present or not. A total frequency score for each cue was given at the end of the mealtime recording. Satiety cues were coded in response to a spoonful of food being offered. Only cues which occurred after the infant had noticed the spoon were scored. If the infant showed more than one cue in response to the same spoonful, only the first cue shown was coded. This was due to the aims of the study exploring the point in the meal when infants begin showing signs of satiety, as well as mothers' response to these, rather than in-depth analysis of all satiety cues shown by the infant.

The number of spoonfuls offered by each mother was recorded, as well as the time at which each spoonful was offered. During coding, if the infant was observed to use the spoon to feed themselves, this was not included in the spoon count unless the mother was also touching the spoon. This was because the study was specifically exploring responsiveness regarding the infant being spoon-fed by the mother. If the mother offered a spoonful and the infant refused to accept this, but the mother continued to offer the same spoonful again, this was not counted as a new spoonful. A new spoonful was only counted when the spoon had entered and left the bowl again. This allowed for exploration of satiety and responsiveness to each separate spoonful. For each spoonful, the infants' mouth movement (rate of acceptance) was coded, using the descriptions in Table 4. 'Responsive withdrawal' was developed or the current study.

Table 4. Mouth movements (rate of acceptance) coding descriptions based upon information within the FIBFECS training documents (Hetherington et al., 2016).

Mouth Movements (Rate of Acceptance)	Description for Coding	Example Image
Early acceptance (EA)	The infant readily accepts the spoonful. The infant opens their mouth when the spoon is situated at a good distance (minimum 5cm) from their face and the spoon is still moving towards them. The infant opens their mouth in anticipation of the arrival of the spoon.	
Late acceptance (LA)	The infant takes time to accept the spoonful. The movement of the spoon approaching ends and the parent is waiting for the infant to open their mouth (with the spoon relatively near to their mouth). The infant does not open their mouth until the spoon (in motion) is close to their mouth (maximum 5cm) but not touching the lips/ mouth.	
Enforced acceptance (EN)	The parent insists the infant takes the spoonful. The infant opens their mouth only when the spoon touches their lips. The infant may have their mouth open prior to the spoon being offered, keeping it open, and the parent decides to put the spoonful into their mouth even though the infant displays no mouth movements for acceptance. The infant's neutral face should be taken into consideration (e.g. some infants have their mouths open often/ permanently when food is not offered).	
Refusal (R)	The infant does not taste or eat any food offered on the spoon. The infant closes their mouth in reaction to the spoon offered. The closure may occur when the spoon is approaching, close to their mouth or touches their lips. The infant may also display no mouth movement in reaction to the spoon either by keeping their mouth closed, or open, and the parent withdraws the spoon as the child has shown no clear sign of acceptance.	
Responsive Withdrawal (W)	The mother prepares a spoonful, but it is clear that they are responding to their infant's communication of satiety (may or may not include the infant showing one of the satiety cues being coded). The mother withdraws the spoon without continuing to try and feed the infant the spoonful.	
Non Visible (NV)	Behaviour is not visible due to an obstruction. The behaviour can be coded using judgement if it is not quite visible but it is obvious.	

To explore the point at which mothers responded to satiety cues, the number of spoonfuls offered after the first satiety cue was recorded, as well as after the first refusal. Within the resource, three refusals from the infant is suggested to indicate satiety. Therefore, the number of spoonfuls offered following three refusals by the infant was also recorded.

Due to exploratory gaze being identified as a potential early satiety cue (McNally et al., 2019) the infants gaze at each spoonful was recorded as being directed towards either their mother (1), food (2), or away (3; e.g. if the infant was looking around the room). Gaze was recorded at three time points during the meal to explore gaze at the beginning, middle and end. The total mealtime was divided by 2 to indicate the midpoint of the meal (time point 2). Time point 2 was divided by 2 to get time point 1. Time point 1 was added to time point 2 to indicate time point 3. If time point 2 fell between savoury and dessert courses, it was rounded to the nearest point at which a spoonful was offered by the mother, e.g. going forward to when the infant was beginning the dessert course.

To capture additional data, including some descriptive data from the mealtimes, elements were taken from the Simple Feeding Element Scale (SFES, as described in Shloim, 2014). The SFES includes 10 elements in relation to mother-infant feeding interactions. Each element is coded as either Less Ideal (1), Average (2), or More Ideal (3). The following elements were deemed unnecessary for the current study: child participation (removed due to the current study not encouraging self-feeding), caregiver avoids feeding while distracted (distraction cue and response coded separately), caregiver avoids feeding while disengaging (disengagement cues were not specifically explored within the current study), qualitative aspects of verbal communication (eating commands and negative comments were not being explored within the current study and the exploration of one form of verbal communication was deemed suitable to gain a sense of the tone of the mealtime) and, fruits, vegetables and/ or breast-milk included in the meal (nutritional content of meals was not being specifically explored within the current study and was not related to the tone of the mealtime).

Five elements were used to explore the mealtime recordings within the current study (Table 5). Within the setting element, infants were often distracted by the camera. Instead of coding this, it was commented on, but then the setting was coded in relation to other distractions such as the TV, radio, or other background noises.

Table 5. Elements from the Simple Feeding Element Scale (SFES, as described in Shloim, 2014) used within the current study.

Element	Less Ideal	Average	More Ideal
Setting	TV, toys, other distractions (books etc.)	TV on but infant facing away/ not interested or engaged, distraction turned off/ taken away less than halfway through mealtime	No distractions, just the mealtime
Positioning	Side-by-side (eye contact difficult), eating alone, lying down	Perpendicular, perpendicular on lap	Face-to-face
Mood/ Atmosphere	Annoyed/ irritated with infant, ignoring infant	Somewhat bored with activity	Enjoying interaction
Pacing	Offering food while infant is still chewing 3 times or more	Offering food while infant is still chewing up to twice	Waiting until infant finishes chewing before offering food
Quantitative aspects of verbal communication	One or more episodes of at least one minute in duration with no vocalisation from carer AND not responding to child's vocalisations on two or more occasions	One or more episodes of at least one minute in duration with no vocalisations from carer OR not responding to child's vocalisations on two or more occasions	Conversation during the meal and responding to infant's vocalisations

2.7.2 Inter-observer Reliability

Dr Chandani Nekitsing (Research Fellow, University of York) and Shihui Yu (Psychology MSc Student, University of Leeds) assisted with inter-observer reliability (IOR) checks. Chandani and Shihui had no prior involvement or knowledge of the current study. As previously mentioned, Chandani was involved in the development of the FIBFECS coding scheme (Hetherington et al. 2016) and could therefore be considered an expert in this research field. Shihui had limited previous experience in this field but had achieved a high level of reliability when completing the online FIBFECS certification test prior to the current coding.

Alongside the coding framework I had developed for the current study, mealtime recordings from two participants (four recordings in total) were randomly selected for coding. Two-way mixed consistency, average-measures intraclass correlation coefficients (ICC) were used to assess the degree that coders provided consistency in their ratings (Hallgren, 2012). The ICC for the frequency of satiety cues shown within the mealtimes was in the excellent range (0.94), indicating a high degree of consistency between the coders. The ICC was good for the type of satiety cues shown (0.79) and the rate of acceptance by the infant (0.83).

A moderate level of IOR was found for infant gaze (0.51). This seemed to be partly due to different time points being selected between the coders. Following clarification with the independent coders, gaze was re-coded and the ICC increased to 0.68. A good level of IOR (0.72) was found for the items included from the Simple Feeding Element Scale (SFES, as described in Shloim, 2014).

2.7.3 Statistical Analysis

Before data analysis began, all variables were screened for normality, missing data or outliers. Due to two participants not completing visit 2, they were removed from further within-participant statistical analyses. Although the data did contain outliers, a decision was made to include these within the analyses given the negligible impact upon variable means.

Results of the Shapiro-Wilk test indicated that the data were not normally distributed, nor were they overly skewed. Accordingly, the decision was taken to use parametric methods for data analysis. An alpha level of 0.05 was set for all statistical tests. Statistics were performed using IBM SPSS (V26, NY, USA). Significance values were adjusted by the Bonferroni correction. Effect sizes were calculated and reported.

Paired-samples t-tests (two-tailed) were used to compare the duration of mealtimes between visits 1 and 2, to check that mealtimes were similar lengths. To explore whether age had an impact upon mealtime duration, a one-way between-groups analysis of variance (ANOVA) was conducted based on age group (6-8 months, 9-11 months, 12+ months). An independent-samples t-test was used to explore the impact of time of day (lunch or evening) upon mealtime duration.

Pearson's correlations were used to assess the stability of infant food intake within the savoury, dessert, and total mealtimes at visits 1 and 2. A one-way between-groups ANOVA was used to explore the impact of age upon amount of food consumed at visits 1 and 2, since older infants are likely to eat more than younger infants.

Paired-samples t-tests were used to assess within-participant differences in the average frequencies of satiety cues shown by infants between visits 1 and 2. The same analysis was used to explore differences in the categories of satiety cues (behavioural, affective, distraction) observed between visits 1 and 2. The rate of acceptance was also explored using these tests, as well as the number of spoonfuls offered from the point at which the first satiety cue was shown. These tests were applied to investigate any impact of the resource use on observed cues at mealtimes.

Chi-square goodness-of-fit tests were used to detect any significant associations between whether infants consumed all of the food offered, satiety cues shown and refusals between visits 1 and 2 for both the savoury and dessert courses. This was to examine mothers' responsiveness to satiety in relation to also wanting the infant to consume all of the food offered.

To detect any significant associations between gaze (mother, food, away) at the three time points (1= at 0.25, 2= at 0.5 and 3= at 0.75 of the total mealtime duration), a chi-square goodness-of-fit test was used.

Pearson's correlation was used to compare elements from the SFES across visits: setting, positioning, mood/atmosphere, pacing, quantitative aspects of verbal communication.

Common themes from qualitative responses to the open-ended debrief questionnaire items were explored and entered into an online wordcloud generator; and descriptive statistics applied to ratings of the resource.

3.0 Results

3.1 Mealtime Descriptions

3.1.1 Mealtime Duration

Overall, 14 participants chose the mealtime recordings to take place at lunchtime, and five opted for their infant's evening mealtime. The average duration of mealtimes for each age group can be found in Table 6. No statistically significant differences were found between the duration of mealtimes between visits 1 and 2 by either age group or time of meal.

Table 6. Average mealtime durations.

Age Group (months)[1]	**Mealtime Duration (minutes)**			
	Visit 1		**Visit 2**	
	M	**SD**	**M**	**SD**
6-8 (n=9)	13.39	4.17	12.11	3.37
9-11 (n=4)	13.13	5.94	10.00	2.63
12+ (n=4)	17.25	5.37	16.50	8.56

[1] Two participants were excluded from analysis due to visit 2 mealtime recordings either not taking place (pp17) or not being fully completed (pp19).

3.1.2 Food Offered

To control for food preferences, mothers were asked to provide their infant with the same meal for both visits 1 and 2. Eleven mothers followed this request. For participants who offered a different meal option, these altered slightly in variety, but were the same food type. Figure 7 shows an example of a homemade and a pouch option offered during the mealtime. Table 7 offers a description of the savoury and dessert options offered to infants during visit 1. An asterix indicates that this meal option was different during visit 2, details of which can be found in Appendix F.

Figure 7. Example of a homemade lunch option (pp4) and a pouch lunch option (pp15) offered during the study for infants within the 6-8 month age range.

Table 7. Savoury and dessert meal descriptions for each participant during visit 1.

Participant No.	Savoury Description	Dessert Description
1	Scrambled egg and baked beans	Strawberry fromage frais tube x2
2	Homemade soup - lentil, carrot, potato, onion, garlic, cheese	Natural full fat yoghurt & apple & strawberry pouch
3	Pasta Bolognese pouch, pasta, cheese	Strawberry fromage frais pot x2
4	Ella's Kitchen spaghetti bolognese pouch	Ella's Kitchen strawberry yoghurt pouch
5	Homemade sweet potato and lentils	Homemade apple and blueberry puree
6	Ella's Kitchen chicken casserole with rice pouch	Ella's Kitchen banana and vanilla bread pudding pot
7	Homemade roast beef, potato, carrot, turnip, green beans, gravy*	Rice pudding pot*
8	Ella's Kitchen chicken roast dinner pouch*	Cow & Gate apple, apricot and strawberry pot*
9	Homemade orzo pasta with chopped tomato and mascarpone sauce, onion, peas, garlic, grated cheese	Strawberry fromage frais pot & half of a mashed banana
10[1]	Homemade soup - tomato, carrot, basil, whole milk*	Homemade banana and avocado*
11[2]	Ella's Kitchen sweet potato pouch	Ella's Kitchen banana pouch
12	Homemade spaghetti bolognese and cheese	Petits Filous strawberry pot
13	Homemade vegetable curry: chickpeas, beans, broccoli, beans, tinned tomatoes, coconut milk, spices, potato	Natural greek yoghurt & fresh blueberries
14	Homemade carrot, swede, onion, leek, red lentils	Petits Filous apricot pot*
15	Ella's Kitchen peppers, sweet potato and apple pouch*	Ella's Kitchen mango yoghurt pouch*
16	Homemade chicken curry: chicken, rice, onion, pepper, cashew nuts, natural yoghurt, tomato puree, mushrooms, sultanas, spices*	Little yeos strawberry yoghurt pot & fresh blueberries
17[3]	Homemade broccoli, chickpeas, sweet potato, butternut squash, carrot, parsnip, leek, courgette, veg stock, turmeric	Petits Filous raspberry pot
18	Homemade: broccoli, cauliflower, carrots. Pouch: Ella's Kitchen pumpkin, broccoli and sweetcorn*	Apple and pear custard pot
19	Homemade beef brisket, mashed potato, green beans, cabbage, peas*	Fromage frais strawberry pot x2 & fresh blueberries*

[1]Infant diagnosed as dairy intolerant between visits 1 and 2
[2]Infant dairy intolerant
[3]Visit 2 did not take place.

3.1.3 Food Consumed

The average amount of food consumed during mealtimes for each age group can be found in Table 8. Results from a Pearson correlation found a strong positive correlation between the amount consumed within the savoury (r = 0.77, p = < 0.01), dessert (r = *0*.64, p = < 0.01), and total meal (r = 0.78, p = < 0.01) between visits 1 and 2 for each participant. This indicates that infants' intake was similar across visits.

Table 8. Amount consumed within each age group at visit 1 and 2.

Age Group (months)	**Amount of Food Consumed (g)**											
	Visit 1						**Visit 2**					
	Savoury		**Dessert**		**Meal Total**		**Savoury**		**Dessert**		**Meal Total**	
	M	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**
6-8 (n=8)[1]	35.5	21.3	35.3	21.7	70.8	43.0	45.6	25.5	34.4	21.0	80.0	46.5
9-11 (n=5)	82.6	30.4	59.6	30.8	142.2	61.2	69.4	44.2	74.6	26.5	144.0	70.6
12+ (n=4)	148.0	49.8	57.0	19.9	205.0	69.7	209.8	58.6	62.5	36.4	272.3	95.0

[1] Two participants were excluded from analysis due to visit 2 not taking place for one participant (pp17), and for bowls not being weighed at visit 2 for another participant (pp13).

A main effect of age group was found for intake in visit 1 (F(2, 14) = 7.3, p = < 0.01), with a medium effect size (r = 0.51). As expected, post hoc comparisons revealed that intake was significantly less in the 6-8 month compared to the 12+ month groups (p = < 0.01). A similar result was found for visit 2 (F(2, 14) = 21.8, p = < 0.01), with a large effect size (r = 0.76). For visit 2 group differences were found for the 6-8 month and 12+ month group, and the 9-11 month group and the 12+ month group (p = < 0.01). As expected, these findings indicate that older infants typically consumed more than younger infants (Table 8).

3.2 Recognising and Responding to Infants' Satiety Cues

3.2.1 Frequency of Satiety Cues

Figure 8 highlights a trend for fewer satiety cues observed within mealtimes at visit 2 compared with visit 1. The average frequency of satiety cues within a mealtime declined between visit 1 (M= 7.5, SD = 6.7) and visit 2 (M= 5.1, SD = 5.5), t(16) = 1.67, p= 0.11. Within

the savoury meal, the average frequency of satiety cues reduced from 4.3 (SD = 4.6) to 2.7 (SD = 2.8), *t*(16) = 1.61, p= 0.13. During the dessert, the average frequency of satiety cues reduced from 3.2 (SD = 2.8) to 2.4 (SD = 2.9), *t*(16) = 2.41, p= 0.29. No statistically significant differences in the frequency of cues were found between visits 1 and 2. It is of note that the removal of participant 4, an identified outlier, did not significantly impact the results. The decision was therefore made not to remove it from the results.

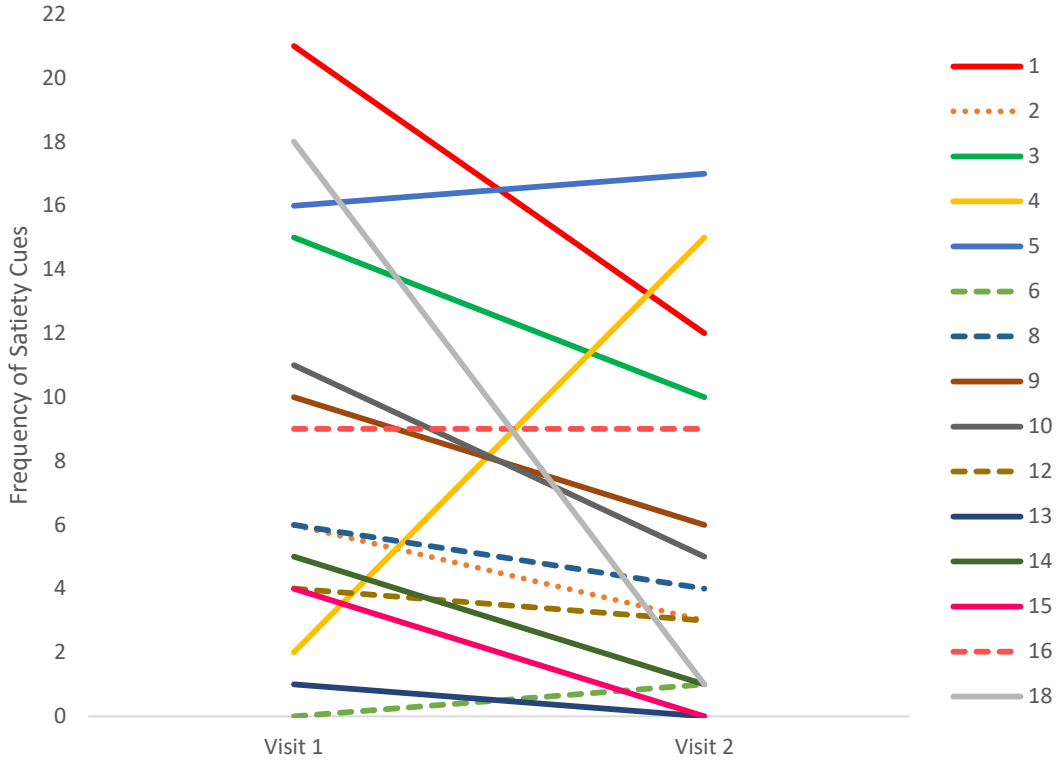

Figure 8. Frequency of infant satiety cues within visit 1 and 2 for each participant. [1] [2]
[1]Participants 17 and 19 were excluded from the analysis due to incomplete data for visit 2. Participants 7 and 11 were removed due to the infant not showing any satiety cues during visit 1 or 2.
[2]Infant 4 is a clear outlier in this Figure. There were specific circumstances of family bereavement between visits 1 and 2 which may have impacted upon mealtime interactions.

3.2.2 Category of Satiety Cues

Different cue categories are shown in Table 9. Behavioural cues were most frequently shown by infants, both as the first cue shown and the final cue at which mothers stopped offering further spoonfuls. Infants turning their head away from the spoon (THA) was the most frequently recorded cue, observed in most infants (87% ; n=14). Apart from pushing the spoon away (PSA), the mean frequency of all satiety cue categories declined

between visits 1 and 2. The PSA cue was found to have increased in frequency within five of the infants at visit 2, whereas none had shown this cue within visit 1.

A decrease in distraction cues was observed between visit 1 (M= 2.24, SD= 3.75) and visit 2 (M= 0.82, SD= 1.33), t (16) = 2.14, $p < 0.05$. The mean decrease in distraction cues was 1.41 with a 95% confidence interval ranging from 0.02 to 2.81. The eta squared statistic (0.22) indicated a small effect size. No other statistically significant reductions were found within the cue categories.

Table 9. Average frequency of satiety cues within each category.

Cue Category	**Frequency (n = 17)** [1]			
	Visit 1		**Visit 2**	
	M	**SD**	**M**	**SD**
Behavioural Cues	4.10	4.37	3.65	4.10
Turning Head Away (THA)	3.29	3.84	2.35	2.64
Pushing Spoon Away (PSA)	0.35	0.79	1.24	2.22
Arching Back (AB)	0.41	0.78	0.06	0.24
Affective Cues	1.29	1.93	0.65	1.12
Distraction Cues	2.24	3.75	0.82	1.33

[1] Two participants were excluded from analysis due to visit 2 mealtime recording not being fully completed.

3.2.3 Rate of Acceptance

Rate of acceptance by the infant was also used to explore infant satiation. Table 10 highlights the average rate of acceptance response per spoonful following a satiety cue being shown by an infant.

Table 10. Rate of acceptance per spoonful offered following first satiety cue being shown by infants.

Rate of Acceptance	Frequency (n = 17)[1]											
	Visit 1						Visit 2					
	Savoury		Dessert		Meal Total		Savoury		Dessert		Meal Total	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Early Acceptance (EA)	1.18	2.10	1.12	2.50	2.29	4.30	0.18	0.39	0.35	1.00	0.53	1.18
Late Acceptance (LA)	2.88	4.64	2.24	2.99	5.12	7.23	0.76	1.79	1.24	2.31	2.0	2.96
Enforced Acceptance (EN)	1.59	3.95	1.47	2.63	3.06	5.76	1.0	2.6	1.29	2.8	2.29	5.37
Refusal (R)	1.41	2.09	0.65	1.0	2.06	2.95	0.88	1.27	0.65	1.17	1.53	2.0
Responsive Withdrawal (RW)	0.76	1.44	0.82	1.38	1.59	2.15	0.94	1.4	0.35	0.79	1.29	1.99

[1] Two participants were excluded from analysis due to visit 2 mealtime recording not being fully completed.

A reduction was found across all rates of acceptance between visits 1 and 2. Results of a paired samples t-test found a statistically significant decrease in rates of early acceptance (EA) between visits 1 and 2 for only the savoury part of the mealtime, t (16) = 2.20, $p < 0.05$. The mean decrease in EA was 1.0 with a 95% confidence interval ranging from 0.04 to 1.96. The eta squared statistic (0.23) indicated a small effect size.

A trend was observed for a decrease in the use of enforced acceptance (EN) during mealtimes between visits 1 (M= 3.06, SD= 5.76) and 2 (M= 2.29, SD= 5.37), and fewer refusals (R) shown within the mealtime from visit 1 (M= 2.06, SD= 2.95) to visit 2 (M= 1.53, SD= 2). Taken together, this trend may indicate an increase in mothers' responsiveness to satiety cues.

Within the Mealtime Mindreading resource, three refusals by the infant was highlighted as a clear sign of satiation. During the savoury part of visit 1, three mothers had continued to offer their infant spoonfuls after three refusals. By visit 2, only one mother offered their infant spoonfuls after three refusals, and this had reduced from four spoonfuls to one spoonful. During dessert at visit 1, no infants refused three spoonfuls of dessert. One infant did during visit 2, in response to which their mother offered a further two spoonfuls.

Coding for responsiveness from mothers was made particularly difficult if infants either did not show any satiety cues or did not refuse any spoonfuls. Table 11 shows the frequencies of participants for which these behaviours occurred.

Table 11. Behaviours observed during mealtime recordings.

	Frequency of Participants (n=17)[1]			
	Visit 1		**Visit 2**	
	Savoury	**Dessert**	**Savoury**	**Dessert**
No spoonfuls were refused by infant	12	9	10	7
No satiety cues were shown by infant	5	7	3	7

[1] Two participants were excluded from analysis due to visit 2 mealtime recording not being fully completed.

Mothers continuing to feed infants until the bowls are empty, despite satiety cues being shown, can indicate a non-responsive feeding style. As shown in Figure 9, at the end of the savoury meal in visit 1, eight bowls were empty. Of these, three infants had shown satiety cues prior to the end of the meal, but none had also refused any spoonfuls. Within visit 2, five bowls were empty. Of these, two infants had shown satiety cues as well as refusal of spoonfuls. Similar to the savoury meal, at the end of the dessert in visit 1, eight bowls were empty. Of these, two infants had shown satiety cues prior to the end of the meal, and one had also refused spoonfuls. Within visit 2, five bowls were empty. Of these, two infants had shown satiety cues and one had refused spoonfuls. Although there was a trend of fewer bowls left empty at the end of meals during visit 2, it was not a statistically significant association between this and the number of satiety cues or refusals shown. This may indicate no change in maternal responsiveness for feeding until the bowl is clear between visits 1 and 2.

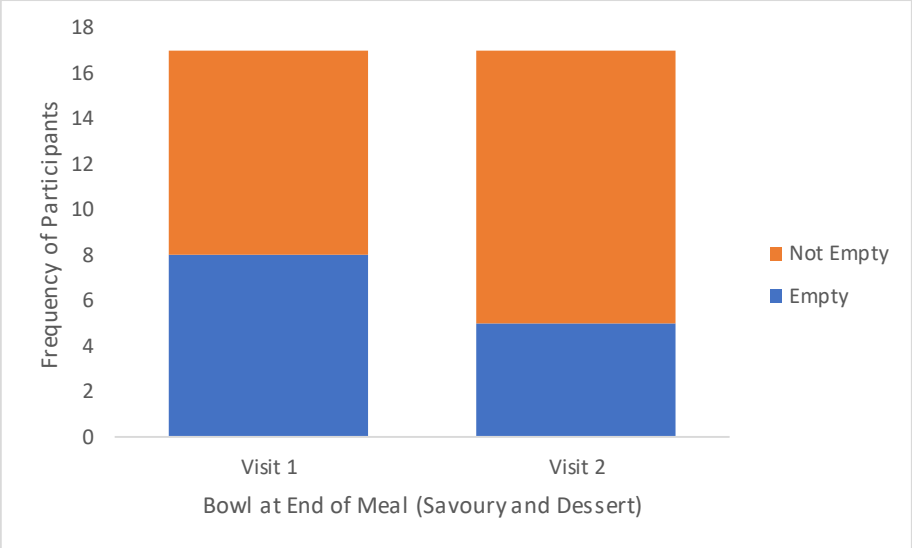

Figure 9. Frequency of bowls left empty at the end of each meal at Visit 1 and 2.[1]

[1] The same frequencies were observed within the savoury and dessert parts of the meal within both visits.

3.2.4 Spoonfuls Offered Following First Satiety Cue

Maternal responsiveness was explored using the number of spoonfuls offered following the point at which infants began to show satiety cues. Figure 10 shows this for each participant during the savoury part of the meal, and Figure 11 shows the same for the dessert. Table 12 highlights a trend for fewer spoonfuls offered between visits 1 and 2 after the first satiety cue is shown. No statistically significant differences were found.

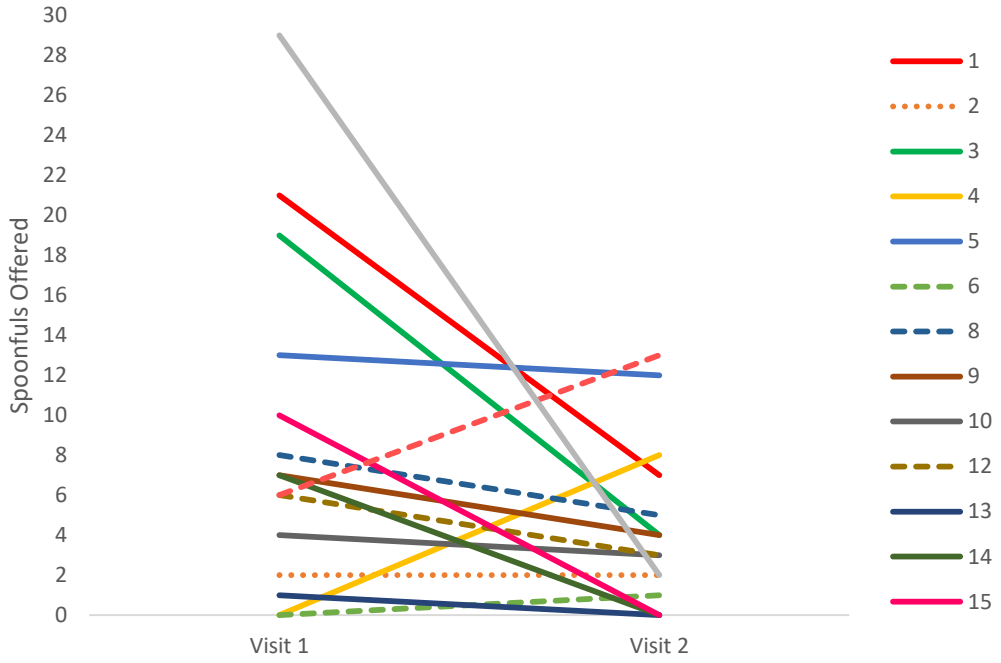

Figure 10. Number of spoonfuls offered to infants following the first satiety cue for each participant during the savoury part of the meal.[1]

[1]Participants 17 and 19 were excluded from the analysis due to incomplete data for visit 2. Participants 7 and 11 were removed due to the infant not showing any satiety cues during the savoury part of the meal.

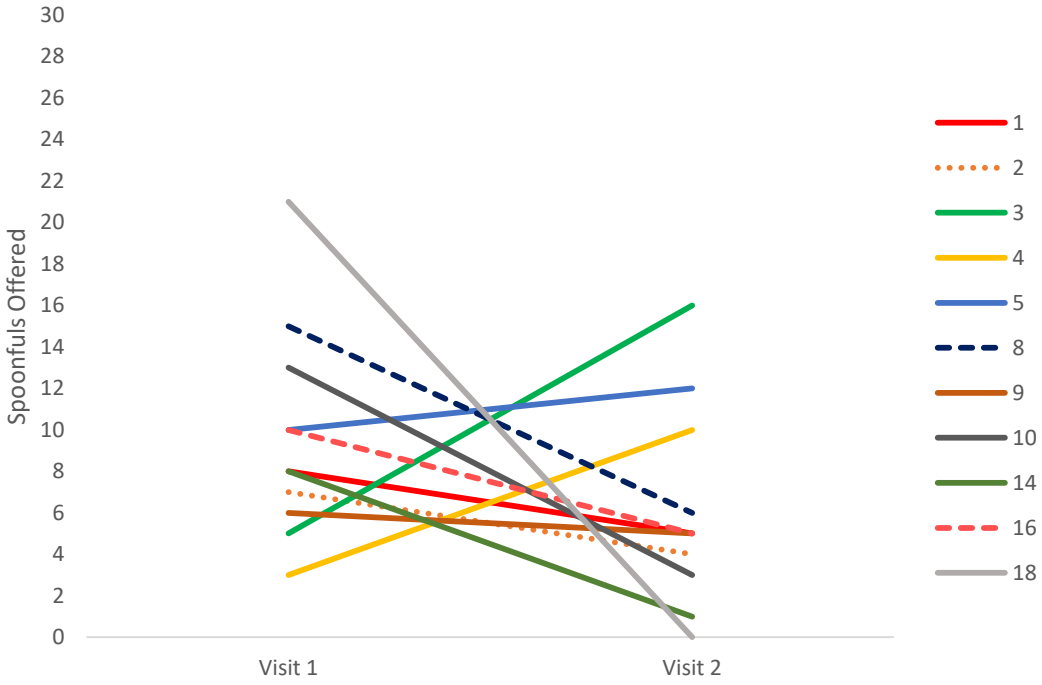

Figure 11. Number of spoonfuls offered to infants following the first satiety cue for each participant during the dessert.[1]

[1]Participants 17 and 19 were excluded from the analysis due to incomplete data for visit 2. Participants 6, 7, 11, 12, 13 and 15 were removed due to the infant not showing any satiety cues during the dessert.

Table 12. Average number of spoonfuls offered following satiety cue.

	Spoonfuls Offered (n=17)[1]											
	Visit 1						Visit 2					
	Savoury		Dessert		Meal Total		Savoury		Dessert		Meal Total	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Prior to first satiety cue	18.5	9.6	11.4	7.8	29.9	17.4	18.5	9.6	11.8	6.8	30.3	16.4
From first satiety cue	7.8	8.4	6.2	6.2	14.0	14.6	3.8	4.1	3.9	4.8	7.7	8.9

[1] Two participants were excluded from analysis due to visit 2 mealtime recording not being fully completed.

In summary, the frequency of satiety cues, alongside rate of acceptance, was used to explore the expression of satiety within infants. The number of spoonfuls offered, as well as responsive withdrawal, was used to explore mothers' responsiveness to these satiety cues. To capture data on a more subtle satiety cue, infant gaze was recorded at the beginning, middle and end of the mealtime.

3.2.5 Infant Gaze

Infant gaze was captured across three time points during each mealtime (1= at 0.25, 2= at 0.5 and 3= at 0.75 of the total mealtime duration). The direction of gaze (towards mother, food or away) were expected to change as a function of the course of the meal. During visit 1, a significant difference in the direction of infant gaze was found at time point 2, χ^2 (2, n= 17) = 6.12, p= < 0.05. As highlighted in Figure 12, looking away seemed to be more prevalent at time points 2 and 3 within visit 1 than the other types of gaze.

During visit 2, a significant difference in the direction of infant gaze was found at time point 1, χ^2 (2, n= 17) = 7.18, p= < 0.05, and time point 2, χ^2 (2, n= 17) = 6.12, p= < 0.05. In comparison to the other variables, looking away seemed to be more prevalent at time point 1, and looking at food seemed to be more prevalent at time points 2 and 3. However, the pattern of infant gaze differed across the course of a meal within visit 1 and 2, again highlighting the complexity in capturing infants' satiety cues.

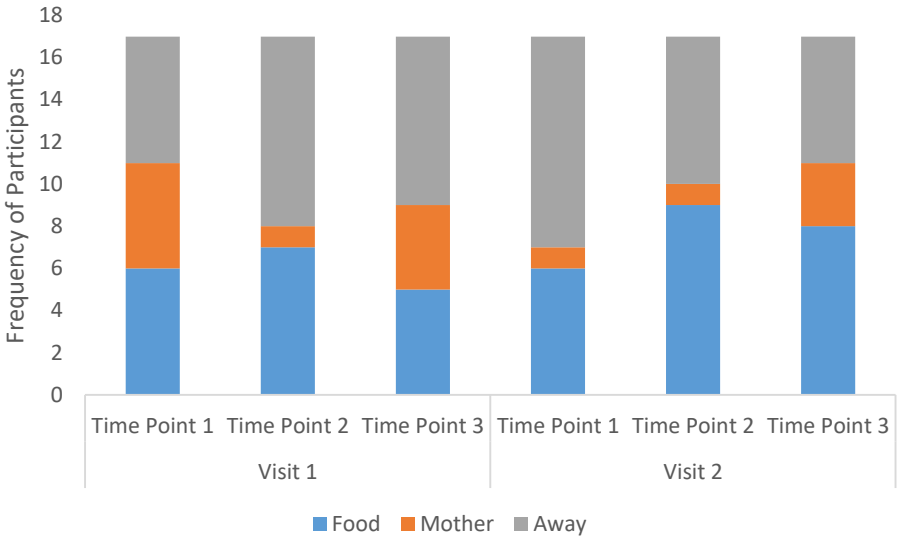

Figure 12. Direction of infant gaze across the mealtimes; at food, mother, or away (n= 17).[1]
[1]Two participants were excluded from analysis due to visit 2 mealtime recording not being fully completed.

3.2.6 Simple Feeding Element Scale (SFES)

During the data collection and analysis phases of my research project, I became increasingly aware of the complex mother-infant interactions during mealtimes. Maternal responsiveness was particularly difficult to report upon and gathering frequency data alone was not capturing some important information regarding the mealtime experience. To capture a richer understanding of the mealtime experience, I decided to use some elements from the SFES to comment on the mealtime setting (including distractions), positioning, mood and atmosphere, pace, and the amount of verbal communication between the mother and infant. SFES ratings for each participant can be found in Appendix G.

As expected, total scores from the SFES at visit 1 and 2 for each participant were strongly correlated (r= 0.82). Figure 13 highlights that in both visits 1 and 2, participants were rated within the 'average' and 'more ideal' categories for the majority of SFES elements. Regarding setting, four mothers had the tv, and four the radio, on during the mealtimes which could be distracting for the infant. It was difficult to code positioning, as some mothers sat differently to usual due to the position of the camera. However, approximately half of the mothers within both visits sat face-to-face with their infant during the mealtime. The mood and atmosphere of the mealtime was sometimes influenced by

infants seeming sleepy. Mothers appeared to respond to this by being less energetic or talkative during the mealtime. Mothers typically scored within the average range for pacing due to offering some spoonfuls whilst their infant was still chewing.

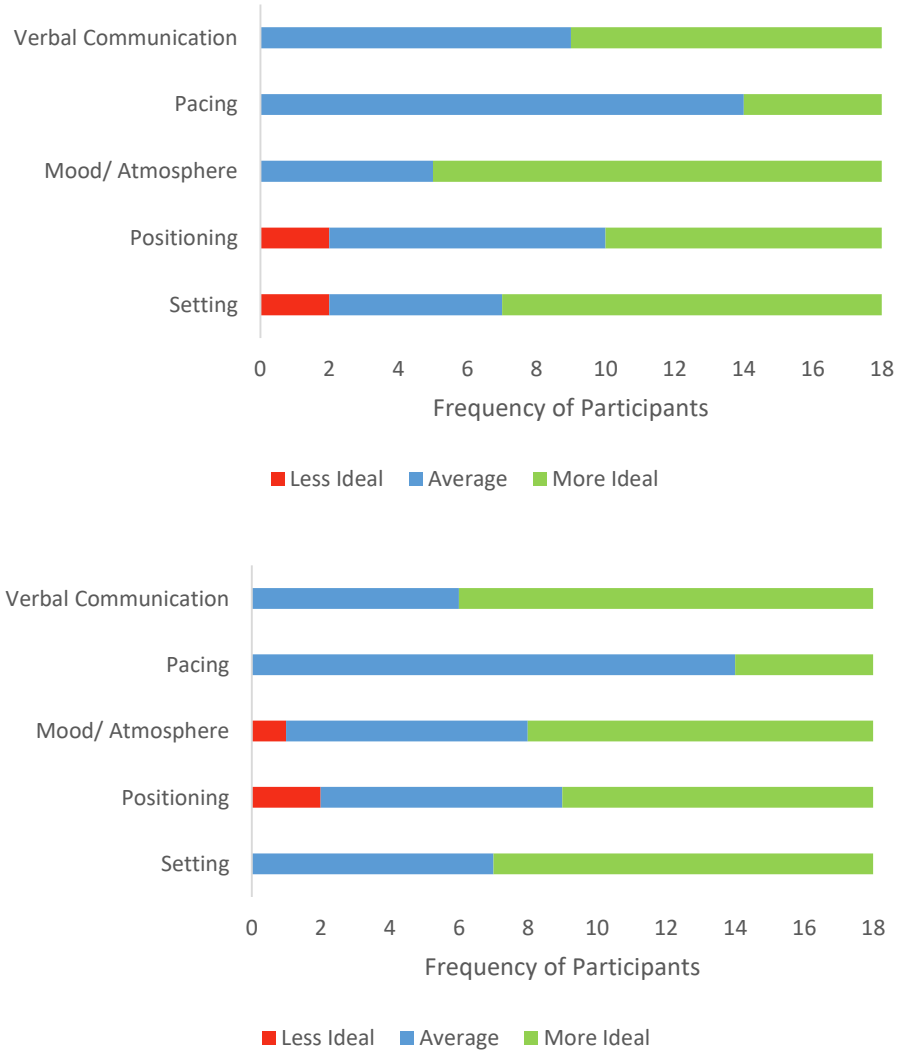

Figure 13. Simple Feeding Element Scale (SFES) scores for each participant Visit 1 (top) Visit 2 (bottom).[1]

[1] One participant was excluded from analysis due to visit 2 not taking place.

3.3 Mother's Engagement With, and Acceptability of, the Mealtime Mindreading Resource

3.3.1 Engagement with the Mealtime Mindreading Resource

Engagement with the resource was captured using the analytics section of YouTube to record the number of times each video was watched within the timeframe each participant had access to the YouTube video. To be able to capture this data, initially one

participant at a time had access to each resource. Due to time constraints at the end of the data collection phase, there was overlap between five participants who all had access to the 6-8 month resource. During the time these five participants had access, the 6-8 month YouTube video was accessed on 28 occasions. However, it was not possible to separate the number of times each of these participants accessed the YouTube video. These participants have been removed from Table 13 and Figure 14.

The average viewing duration in Table 13 indicates that participants did not typically watch the full resource video at one time, as the average full length of each video was 15 minutes. On average, participants accessed the resource on two different days between visits 1 and 2, usually via their mobile phone. Figure 14 shows the frequency in which each participant accessed the resource (M= 3.14, SD= 1.77).

Table 13. Participants' engagement with the Mealtime Mindreading resource within each age group.

Age Group (months)[1]	**Average Viewing Duration (minutes)**	**Average Frequency of Days Viewed Upon**	**Device Type**
6-8 (n=5)	3.58	2.00	Mobile phone; tablet; computer
9-11 (n=5)	4.58	2.00	Mobile phone
12+ (n=4)	4.40	2.25	Mobile phone

[1]Five participants excluded from analysis.

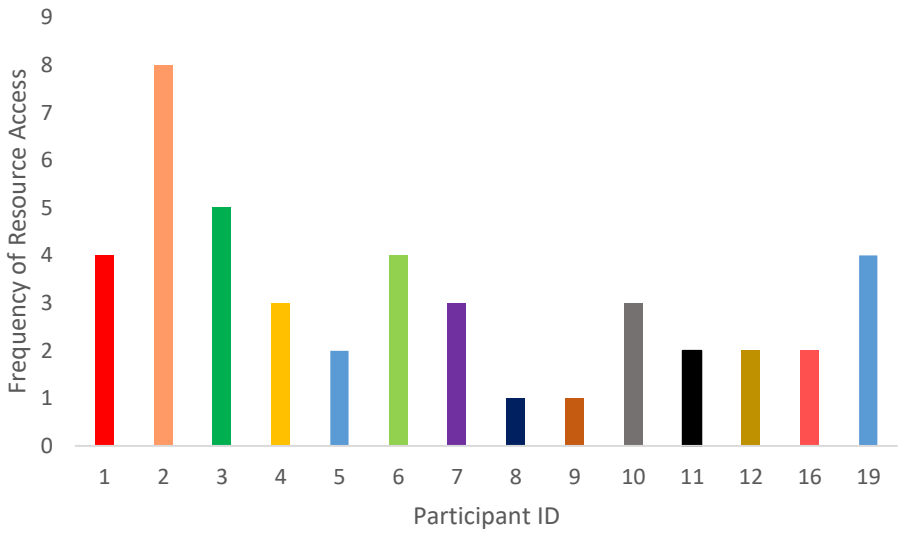

Figure 14. Number of times each participant accessed the resource between visits 1 and 2.

3.3.2 Acceptability of the Mealtime Mindreading Resource

Following participation in the study, all participants were sent a link to access an online debrief questionnaire hosted by Qualtrics. Fourteen participants fully completed the debrief questionnaire. A further three participants partially completed the questionnaire but did not respond to prompts to fully complete the questionnaire. Two participants did not begin or complete any of the debrief questionnaire. The questions included in the debrief questionnaire, along with responses to each, can be found in Appendix C.

Overall, participants provided positive feedback in relation to the acceptability of the Mealtime Mindreading resource. There were no 'strongly disagree' responses throughout the questionnaire. Table 14 highlights questions which received the most variable responses. Even within these questions, other than question 15, the average response was 'agree'.

Table 14. Debrief questions which received most variation in responses.

Question Number	Question	n	M[1]	SD
3	The material was presented in an interesting way	17	4.0	0.7
8	The feeding resource increased my knowledge about my little one's hunger signals	16	4.3	0.9
9	The feeding resource increased my confidence in recognising my little one's hunger signals	16	4.1	1.0
12	The feeding resource increased my knowledge about issues which affect my little one's eating behaviour	16	4.1	0.9
15	The length of the feeding resource was appropriate	14	3.8	0.9
17	I enjoyed looking at the feeding resource	14	4.1	0.7

[1]Responses were coded as 1= strongly disagree, 2= disagree, 3= neither agree nor disagree, 4= agree, 5= strongly agree.

The results suggested that participants found the resource to have clear objectives and to be well organised (n=17, M= 4.7, SD= 0.5). The ideas within the resource were found to be clearly presented, easy to understand, and helpful (n=16, M= 4.4, SD= 0.5). The video clips were seen as helpful in illustrating both hunger (n=16, M= 4.7, SD= 0.5) and fullness cues (n=16, M= 4.6, SD= 0.5). Participants felt there were enough examples and illustrations used within the resource (n=17, M= 4.4, SD= 0.6). Participants felt they were able to apply

learning from the resource to feeding their infant (n=16, M= 4.4, SD= 0.6). Participants reported that the resource had helped to increase their knowledge about (n= 16, M= 4.8, SD= 0.4), and confidence in recognising (n=16, M= 4.6, SD= 0.6), their infant's satiety cues. Participants would recommend the resource to others (n=14, M= 4.6, SD= 0.5), and overall were satisfied with the resource (n=14, M= 4.5, SD= 0.6).

Within the initial questionnaire, two questions asked about the ease with which they recognised when their infant was hungry and full. Regarding fullness, four mothers said they disagreed, and one neither agreed nor disagreed, with the statement about finding it easy to recognise. Of these four mothers who had completed the debrief questionnaire, all said that they strongly agreed that the feeding resource had improved their knowledge and confidence in recognising fullness cues. Three of the mothers said they strongly agreed with the statement that they could apply learning from the feeding resource when feeding their infant.

Further to these results, qualitative feedback was gathered using free-text boxes. Figure 15 highlights positive themes identified within the data. In particular, participants commented on an improvement in their knowledge and confidence in recognising satiety cues. Two mothers commented that they had not previously recognised the infant playing or trying to feed them as potential satiety cues. Three mothers commented on the usefulness of the 'three refusals' information as being a helpful indicator of satiation. Five mothers suggested that the Mealtime Mindreading resource may be useful for mothers at the beginning of their infants weaning journey, particularly for first time mothers.

Figure 15. Wordcloud of positive themes from the debrief questionnaire.

Themes which were identified to improve the acceptability of the Mealtime Mindreading resource included:

- Presenting information in a more interesting way
- More visual examples and video clips
- Information on mixed spoon feeding/ baby-led weaning approaches
- Highlighting individual differences and a wider variety of feeding cues
- More information on issues which can affect infants eating behaviour
- Decreasing the size of the resource
- Attaching a written document with summarised information to refer to.

4.0 Discussion

The aim of this study was to examine whether use of a self-directed online (Mealtime Mindreading) resource would affect mothers' ability to recognise and respond to infant satiety cues. Behavioural, affective and distraction cues, as well as rates of acceptance, were explored. It was hypothesised that fewer satiety cues would be observed when mothers responded to their infants after seeing and using the resource. The second aim of this study was to assess mother's engagement with, and the acceptability of, the Mealtime Mindreading resource. The key findings from these aims will be summarised before being considered in the context of existing literature.

4.1 Summary of Key Findings

1. A statistically significant decrease was found in distraction cues from visit 1 to visit 2. Within this study, distraction cues comprised the infant either becoming playful with, or trying to grab, the bowl or spoon. No other statistically significant reductions were found with the category (i.e. behavioural or affective) of cues observed.
2. A trend for fewer satiety cues within mealtimes at visit 2 compared with visit 1 was observed. However, this failed to reach statistical significance.
3. Behavioural cues were most frequently shown by infants, particularly turning their head away from the spoon. Other than for the pushing spoon away (PSA) behavioural cue, a trend of fewer satiety cues across the cue categories (behavioural, affective, distraction) was observed within mealtimes at visit 2.
4. Regarding rate of acceptance, a trend of fewer enforced acceptance and refusal responses were observed within mealtimes at visit 2. Other than for early acceptance, no significant differences were found for rate of acceptance.
5. Mothers did engage with the Mealtime Mindreading resource between visits 1 and 2, although this was perhaps not as frequently as would have been anticipated.
6. Responses within the debrief questionnaire seemed to suggest that the Mealtime Mindreading resource was an acceptable method of informing mothers about satiety cues and responsive feeding.

4.2 Findings in the Context of Existing Literature

The frequency of satiety cues, alongside rates of acceptance, were used to explore the expression of satiety within infants. The number of spoonfuls offered, as well as frequencies of responsive withdrawal, were used to explore mothers' responsiveness to these satiety cues.

A reduction in distraction cues was found by visit 2 with a small effect size. Interestingly, two mothers specifically commented in the debrief questionnaire that they had not previously recognised their infant playing or trying to feed them (the mother) as potential satiety cues. When deciding when to begin or end a feed, mothers have reported being guided by the prominence, intensity, and specificity of their infants' cues (Hodges et al., 2016). There is a possibility that mothers learned from the Mealtime Mindreading resource to recognise and respond to distraction cues more frequently during visit 2.

A trend was observed for fewer satiety cues expressed at visit 2 compared to visit 1. A possible explanation for this might be that mothers were becoming more responsive to subtle satiety cues, and stopping to offer as many spoonfuls within visit 2. Alternatively, perhaps mothers were more aware of gross behavioural cues, and once the infant showed their first satiety cue of this kind, mothers were more responsive by not continuing to offer the infant further spoonfuls. This is in accord with the finding of a trend of fewer spoonfuls being offered after an initial satiety cue was shown by the infant in visit 2. Such findings should be interpreted tentatively as they were not statistically supported.

It is important to note that only spoonfuls offered by mothers were coded within the current study. If infants fed themselves any of the food, this was not included in the frequency data. Infants' fine and gross motor skills develop at a fast pace, during which time they begin to learn to feed themselves and become more active in the feeding process (Bibbings, 2017). Even within the few weeks between visits 1 and 2, infants will have matured. This may have involved infants being more adept at indicating satiety and managing their eating, possibly leaving mothers not needing to offer as many spoonfuls (Hetherington, 2020).

Other than for the PSA behavioural cue, a trend of fewer satiety cues across the cue categories (behavioural, affective, distraction) was observed within mealtimes at visit 2. Gross behavioural cues were most frequently shown by infants, particularly turning their head away (THA) from the spoon. The PSA behavioural cue was found to have increased in frequency within five of the infants at visit 2, of which none had shown this cue within visit 1. All five infants had shown other satiety cues prior to the PSA cue.

The above findings perhaps indicate that the PSA cue is a gross behavioural cue used within the later stages of a mealtime at a point when the infant is clearly communicating satiation (Hodges et al., 2016). Within the current study it appears that, on average, having access to the Mealtime Mindreading resource did not necessarily improve mothers' responsiveness in relation to the PSA cue. However, it is also important to note that the PSA cue was not as frequently used by infants.

Although the differences were not statistically significant, the trend of fewer enforced acceptance and refusal responses observed within mealtimes at visit 2 could potentially indicate an increase in mothers' responsiveness to satiety cues. It might also have been expected to see an increase in the average number of responsive withdrawals (RW) shown at visit 2. This was not apparent within the results. Results did show that, even after the infant had begun showing satiety cues, they also displayed a range of rates of acceptance, including early acceptance (EA). This can be confusing for mothers as early acceptance of spoonfuls is often associated with hunger. As meals progress, we would typically expect to observe a decline in appetite cues (Hetherington, 2020).

Previous research has also found infants to display a mixture of both hunger and satiety cues, even during the later stages of a meal (Price et al., 2012). These results further highlight how complex and confusing it can be for mothers to navigate through the feeding process. Additionally, although they were not coded until one minute into the meal, sometimes infants showed apparent satiety cues from very early on. Some infants simultaneously showed approach behavioural cues (such as leaning forward, which were not coded within the current study), which can indicate hunger (Hetherington et al., 2016), as well as showing an early rate of acceptance. Given the complexity involved during feeding

interactions, it is perhaps not surprising that parents have been found to have difficulty in responding to cues appropriately (Hetherington & McNally, 2020). Interestingly, a statistically significant reduction in rates of EA was found in visit 2. This could indicate that infants were displaying less confusion regarding their levels of satiety during visit 2; perhaps an expression of being slightly older and further developed.

Infant gaze was explored at three time points across mealtimes. Previously, McNally et al. (2019) found that over the course of mealtimes, infants' gaze significantly shifted from focusing on food (suggested to be linked to hunger), towards exploratory gaze behaviours (perhaps linked to satiation). During visit 1, a statistically significant difference in the direction of infant gaze was found at time point 1. However, the infant looking away from food or their mother seemed to be more common later in the mealtimes. During visit 2, a statistically significant difference in the direction of gaze was found at time points 1 and 2. Looking away was more prevalent at the beginning of the mealtime, with the infant more focused on food at the end of the mealtime. These findings suggest that, although there were some changes in the frequency of gaze shift across mealtimes, they were not consistent between visits 1 and 2, and do not indicate a clear pattern of infant gaze during mealtimes. McNally et al. (2019, p. 360) noted that "the likelihood of observing gaze aversion is dependent on maternal responsiveness". Increased maternal responsiveness may mean infants have less needs to communicate satiety via a 'strong' cue such as gaze aversion (McNally et al., 2019). Alternatively, perhaps mothers within the current sample already used a responsive feeding approach, therefore not requiring learning from a resource to increase responsiveness.

Level of engagement with a responsive feeding resource can be associated with increased knowledge following intervention (Ledoux et al., 2018). Within the current study, all mothers accessed the Mealtime Mindreading resource at least once (maximum four times) between visits 1 and 2. Although mothers engaged with the Mealtime Mindreading resource between visits 1 and 2, this was not as frequently as would have been anticipated. Due to accessing the resource an average of twice, it was difficult to explore if level of engagement with the resource had any impact upon mothers' ability to recognise or respond to their infants' satiety cues.

Feedback from the debrief questionnaire highlighted some of the factors which may have influenced the acceptability of the resource. This included, for example, presenting the information in a more interesting way, and reducing the size of the resource due to the video being too long. Such factors are likely to have also influenced mothers' level of engagement with the Mealtime Mindreading resource between visits 1 and 2. Participants also offered positive feedback about the resource, particularly in relation to learning, the positive impact of the video clips, and the layout. Overall, participants did engage with the resource and reported to find it an acceptable method of learning about responsive feeding. This fits with previous suggestions that video-based interventions can be effective and valuable learning tools in relation to responsive feeding practices (Hetherington & McNally, 2020; Ledoux et al., 2018).

4.3 Strengths and Limitations

The current study had a number of strengths and limitations to consider.

4.3.1 Strengths

A strength of the current study was that the mealtime recordings took place within participants' own home environments, allowing for naturalistic observations and increasing external validity. It is likely that the presence of a stranger with a camera was unsettling for the infant to some degree, but this would be less so than travelling to a research facility and being fed in an unknown and clinical environment.

Another strength of the study was that participants were able to access the Mealtime Mindreading resource from their own home, at a time convenient for them. This seems to confirm the suggestion that self-directed parenting programmes can be cost-effective and accessible alternatives to face-to-face options (Metzler et al., 2012).

The study gathered data using a range of methods to explore satiety cues and responsiveness. This included event sampling to explore behavioural, affective and distraction cues, as well as time sampling to explore infant gaze. The Simple Feeding Element Scale (SFES, as described in Shloim, 2014) was utilised to gain a sense of the tone of

the meal, including the setting, positioning, mood, pacing and verbal communication between the mother and infant. Using this variety of methods offered a more detailed understanding of each participant's mealtime experience.

4.3.2 Limitations

There were several limitations to be considered within the current study. Firstly, having the mealtime recording take place within the home environment could also be considered a limitation. This was due to the potential influence of confounding variables, such as distractions during the mealtime. Findings from the SFES showed that 44% (n=8) of participants had either the television or radio on during the mealtime. It was also difficult to code positioning, due to mothers sometimes having to sit differently to accommodate for the camera being set up within their kitchen/ dining room. It is unclear if these had any impact upon the mealtime experience. Another potential confounder was that seven of the mothers did not offer exactly the same food at visit 1 and 2. The impact of food preference and liking could therefore not be controlled for within these infants. If there had been more time, it may have been useful to explore facial expressions in relation to liking/ wanting in infants using the FIBFECS tool (Hetherington et al., 2016)

Due to time constraints, there were limits on the depth of analysis of the mealtime recordings. Although gaze was explored at time points across the mealtime, and based upon previous research by McNally et al. (2019) in relation to the Infant Gaze at Mealtime (IGM) coding scheme, findings may have been enhanced by fully adhering to the tool. Within the current study, during inter-observer reliability checks, some differences were initially observed between coders. However, the ICC for gaze was found to be 0.68, and therefore was at a good level.

The SFES was used as to gain a sense of the tone of the meal, including the setting, positioning, mood, pacing and quantity of verbal communication between the mother and infant. A decision was made not to use the full tool and five elements (child participation, caregiver avoids feeding while distracted, caregiver avoids feeding while disengaging, and qualitative aspects of verbal communication) were deemed unnecessary for the current

study and therefore not coded. Results within the current study should therefore be interpreted with caution and be used only as an indicator of the general tone of the mealtimes.

The sample size within the current study was small (n=19). Due to covid-19 restrictions coming into place prior to the end of data collection, one participant did not complete visit 2, and for two other participants the mealtime for visit 2 was recorded by themselves and sent remotely, one of which had not recorded the entire mealtime. This further reduced the numbers included in data analysis. Due to small sample size, some analyses were unable to be completed, for example, the influence of mother and infant characteristics on outcomes. The sample was also homogenous, particularly in relation to parental gender, age, ethnicity, employment status, and geographical location.

A final potential limitation of the current study was that there was a relatively short period of time (2-4 weeks) between visits 1 and 2, mainly due to time constraints for the study completion. More time may have been necessary to capture the impact of any behavioural changes, but this had to be set against the developmental maturation of infants which would have influenced outcomes. Allowing more time may also have offered mother's further opportunities to access, and potentially engage with, the Mealtime Mindreading resource.

4.4 Clinical Implications

The introduction of this thesis highlighted the complex decision-making processes parents face regarding feeding their infant. Findings from the current study have potential clinical implications for the use of such a responsive feeding resource to be offered to mothers at the beginning of their weaning journey. This may be particularly useful for first time mothers to provide some support with recognising and responding to their infants' cues (Hetherington & McNally, 2020). Such a responsive feeding resource may also be of particular benefit for mothers who have been noted to be less responsive, or who are experiencing difficulties with feeding.

Mothers with indicators of an eating disorder (past or current) may encounter difficulties during feeding interactions with their infants, as well as experiencing feelings of dissatisfaction and uneasiness during feeding (Squires, Lalanne, Murday, Simoglou, & Vaivre-Douret, 2014). Martini, Taborelli, Schmidt, Treasure, and Micali (2019) also found that, compared to a control group, mothers with a history of a diagnosis of an eating disorder were less aware of infant hunger and satiety cues at eight weeks.

As mothers are required to be attuned to their infants during feeding, mothers' own attachment style is likely to influence their feeding practices (Messina, Reisz, Hazen, & Jacobvitz, 2019). Although not related to attunement, maternal unresolved trauma has been associated with non-responsive (controlling) feeding behaviours, particularly if feeding is experienced as distressing (Messina et al., 2019).

Haycraft (2020) has further examined maternal mental health symptoms in relation to controlling feeding practices (using food for emotional regulation or as a reward), and responsive feeding. Self-reported anxiety, depression and disordered eating behaviours (including restrained or emotional eating) were explored within a large UK community sample (n= 415). Symptoms of anxiety and depression were associated with controlling feeding practices. Regarding responsive feeding, higher symptoms of anxiety and depression related to lower use of role modelling and monitoring during mealtimes, and in offering children greater control over food and eating. Although offering children control and independence during feeding can be positive, it can also indicate that mothers who are experiencing mental health symptoms, particularly depression, may withdraw or be less involved during mealtimes. Mothers who expressed difficulties with their own relationship with food were found to be more involved in their child's eating behaviours, being controlling but also more responsive for some.

Mothers who experience postnatal depression have also been reported to sometimes have difficulties regarding the mother-infant attachment and feeding behaviours (Figueiredo, Costa, Pacheco, & Pais, 2009), including responsiveness (Heinisch et al., 2019). Given that between 6-13% of mothers may experience postnatal depression (Gaynes et al.,

2005; O'Hara & Swain, 1996 cited by Swami, Barron, Smith, & Furnham, 2020, pp. 217-218), interventions designed to support mothers during this time are warranted.

Together, the above results have clinical implications for healthcare services to be mindful of the potential impact of maternal mental health and difficult relationships with food, including at non-clinical levels (Haycraft, 2020), and attachment styles in relation to responsive feeding practices. This can potentially impact upon infants' ability to develop their internal regulation skills and be linked to emotional eating styles and weight gain within childhood.

Mothers who are experiencing feeding difficulties with their infant may therefore benefit from a more specialised and adapted responsive feeding educational resource (Hetherington & McNally, 2020). Hetherington and McNally (2020) suggest it is especially important to evaluate resources which are tailored to the needs of mothers and their infants. The development of a more tailored version of the Mealtime Mindreading resource could therefore be warranted. It may be beneficial to incorporate responsive feeding interventions within Perinatal, or Infant, Mental Health Services.

The Child Feeding Guide has been a successful resource for parents, caregivers and professionals in relation to common feeding difficulties (food refusal, unhealthy food preferences, pressurising children to eat, using food as a reward, and restriction of foods; Haycraft, Witcomb, & Farrow, 2017). This has involved having a website, an app, and offering training. The development of other online self-directed resources which are focused on infant feeding may also be beneficial.

Due to the relatively small proportion of mothers who breastfeed in the UK (Emmott et al., 2020), an option may involve developing a resource including the benefits of breastfeeding, with the potential to influence behavioural change. Breastfeeding can involve complex and emotional experiences for mothers (Buchholz, Dunn, Watkins, & Bunik, 2016). Additionally, any future resource could include support for breastfeeding mothers, as well as for mothers who are formula-feeding and may be experiencing feelings of shame and guilt (Williams, 2018).

Offering maternal support at any stage of the infant feeding process is likely to have a positive impact upon well-being and interactions within the mother-infant dyad. Interventions which help to promote and develop parental mind-mindedness have been encouraged in relation to sensitive and positive feeding behaviours (Farrow & Blissett, 2014).

If it is possible to develop responsive skills in one parenting domain, such as feeding, it may well be possible to also develop skills in other areas of parenting using a similar approach. Domains of responsive parenting include feeding, sleeping, soothing and play; all of which are highly interconnected (Pérez-Escamilla et al., 2017). There may be potential for the Mealtime Mindreading resource to be included within a wider responsive parenting intervention, such as in the INSIGHT trial (Paul et al., 2018; Paul et al., 2016; Savage et al., 2018).

4.5 Recommendations for Future Research

Infants display a diverse range of hunger and satiety cues (Shloim et al., 2018). These can be communicated via bodily movements, facial expressions and gaze (Hetherington & McNally, 2020). Within the current study, a more diverse range of satiety cues were signalled but not coded within the current framework. Such cues included, for example, infants putting something in the way of their mouth (e.g. their hands) to block the spoon, sucking their hands, kicking their legs, chewing their bib, banging the tray, and spitting food out. Infants also presented with a range of facial expressions which were not coded within the current study. Future research may therefore benefit from exploring a wider range of satiety cues, including other behavioural cues, facial expressions, gaze, and rate of acceptance in more depth following the involvement within a responsive feeding intervention.

The key findings from the current study highlight the complexity in exploring mother-infant mealtime interactions and capturing responsivity. The focus of analysis within the current study became mostly on infant's behaviour as the first stage in a complex interaction. The next step would be to explore mothers' responses to these behaviours, in a

more direct way. Following which, an exploration of the intricacies between infant and mothers' interactions during mealtimes would help to further understand the dynamic processes involved in responsive feeding. Perhaps using the conceptual model of Early Mother-Child Dyadic Pathways Influencing Childhood Obesity Risk (Bergmeier et al., 2020) would be helpful to explore parent-child relationships in relation to parent-child feeding interactions.

Previous research has recommended exploring the interaction of parental and child factors and their involvement in the development of feeding behaviours, appetite regulation and weight (Shloim et al., 2018). Ideally mother and infant characteristics which moderated or mediated any changes in responsivity would have been considered within the current study. Due to sample size, this was not possible. The potential impact of breast- or formula-feeding (Victora et al., 2016), infant gender, temperament, and developmental stage (Hetherington & McNally, 2020) would be useful to explore in future research. Maternal age, weight, education level, and number of children would also be useful to explore in relation to responsiveness (Hetherington & McNally, 2020). Recruitment of a more diverse sample would be beneficial (McNally, 2018). Accordingly, a much larger sample would be required. The INSIGHT responsive parenting randomised clinical trial (Paul et al., 2018) included 279 mother-child dyads (responsive parenting group, 140; control group, 139). As such, substantial research resource and funding would be required to scale up the current study.

Much of the research regarding feeding practices has focused on mothers. Although not necessarily excluded from research, feeding practices between fathers and infants is less frequently explored (Bibbings, 2017). In a qualitative study exclusively exploring father experiences, Khandpur, Charles, Blaine, Blake, and Davison (2016) concluded that fathers demonstrate similar feeding practices to mothers. It is clear that fathers should continue to be included within future research exploring parental feeding practices, and barriers towards recruitment of fathers should be explored.

Future research may benefit from further exploring the use of food pouches in comparison to homemade options. Within the current study, 37% (n= 7) used pouches

within the savoury part of the meal. Previous research has suggested that parents may be unaware of the nutritional content of pouches due to the way in which they are marketed (Moding et al., 2019). It may be useful to include such information within any future infant feeding educational resource.

Although there was not scope within the current study, it would be useful to expand research on the impact of using a BLW weaning approach on responsiveness in future research. McNally et al. (2020) found that, in comparison to mothers using a BLW approach, mothers who spoon-fed recognised a greater number of feeding cues, but they were perhaps less inclined to follow these or ended up misinterpreting them. Gathering further qualitative data relating to mothers' decision-making processes during infant feeding may be helpful in further understanding why mothers do not follow up on certain cues, or the way in which they may misinterpret them.

With the above in mind, it may have been useful to watch the mealtime recordings from the current study back with the participants to gather such qualitative data. This may have helped to understand some of the unexpected outcomes within the results, for example why some mothers continued to offer spoonfuls even after satiety cues had been shown by the infant, as well as the infant refusing the spoonfuls. Gaining feedback on such issues may help to further understand the function of this, for example, if mothers wanted the infant to finish the food being offered, or whether they had not been aware of the satiety cues shown. Future research regarding responsive feeding observations would be recommended to include this method of feedback. Interestingly, video-feedback methods have also been used in previous studies to develop mind-mindedness in mothers (Schacht et al. (2017), and could be further investigated in relation to responsive feeding behaviours.

Additional information was added to the Mealtime Mindreading resource based upon feedback from McNally (2018). This included using food to soothe and food fussiness. It would be useful to gain specific feedback on how participants received this information, and to explore any impact upon maternal responsiveness. As part of the INSIGHT trial, Adams et al. (2019) suggested that finding alternative methods of soothing infants, rather than feeding first, "has the potential to improve infants' self-regulation and weight gain

trajectory" (p.1). Within their study, mothers who perceived their infant as having a more fussy temperament were more likely to utilise food to soothe strategies.

It would also be beneficial to add further information regarding screen time into the Mealtime Mindreading resource, and gaining feedback from parents regarding usefulness. As part of the INSIGHT responsive parenting intervention designed for obesity prevention, Adams et al. (2018) reported reduced screen time and television exposure following intervention, but no increase in parent-child interactive play. Future research, examining the parent-child relationship and mobile technology use over time, is recommended; particularly exploring the impact of parental and infant characteristics within these interactions (Radesky et al., 2018).

As infants' preverbal and emerging language develops, infants are able to learn to use "baby sign language" to indicate hunger and satiation. As a pilot study within the INSIGHT responsive parenting clinical trial, Paul et al. (2019) found infants within the intervention group to be significantly more likely to use the sign for "all done" than controls. Future research may therefore benefit from incorporating information regarding signing into educative responsive feeding resources or interventions. Further exploration of signing may also enhance understanding of bidirectional parent-child communication (Paul et al., 2019).

4.6 Overview of Feasibility and Practical Implications

The design of the current study was based on an initial feasibility assessment. There would be practical implications to consider prior to any further research that considered intervention effectiveness. The main implication concerned recruitment. Recruitment began in March 2019 and ended in March 2020. Despite contacting various nurseries, parent groups, and family-focused locations, only one participant was recruited via such avenues. The majority of participants were recruited via responses to an advert posted on my personal Facebook page. Other potential participants did contact me, but either lived outside of the geographical area I was able to travel to, or did not respond after initial contact. These difficulties with recruitment were perhaps linked to the intrusive nature of

participants inviting a stranger into their home environment, as well as the exposing nature of being video-recorded. Within future research, factoring time to meet potential participants face-to-face prior to recruitment may be beneficial.

Recruitment was also affected by the inclusion criteria involving mothers being required to at least partially spoon-feed their infant. The increasing popularity of adopting a baby-led weaning approach limited the recruitment process and some mothers' involvement in the study.

Data collection was affected by being able to complete only one, or a maximum of two, home visits with the same day. Furthermore, due to capturing engagement with the Mealtime Mindreading resource via YouTube analytics, only one participant within each age range was completed at one time. This therefore impacted upon the timeframe of completing data collection. Ideally, the Mealtime Mindreading resource would be hosted via an online platform such as Articulate Online, as in McNally's (2018) original study. This would allow for increased interactivity with the resource, as well as allowing for more than one participant within an age group to be included simultaneously. However, financial implications would need to be considered.

4.7 Conclusion

The current study built upon recommendations from an initial pilot study involving the Mealtime Mindreading resource (McNally, 2018). Results from this initial feasibility assessment indicate that conducting a larger trial, using the Mealtime Mindreading resource, and exploring mother's recognition and responses to infant satiety cues, would be warranted. Ideally, this would include a larger, more diverse sample, and be conducted longitudinally. Further exploration of the role that complex dyadic parent-child factors play in the development of child eating and weight are warranted (Bergmeier et al., 2020). Such future research could contribute to wider public health interventions relating to the prevention of childhood obesity.

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List of Abbreviations

Arching Back Behavioural Cue (AB)

Baby-led Weaning (BLW)

Complementary Feeding (CF)

Early Acceptance (EA)

Enforced Acceptance (EN)

Intraclass Correlation Coefficient (ICC)

Late Acceptance (LA)

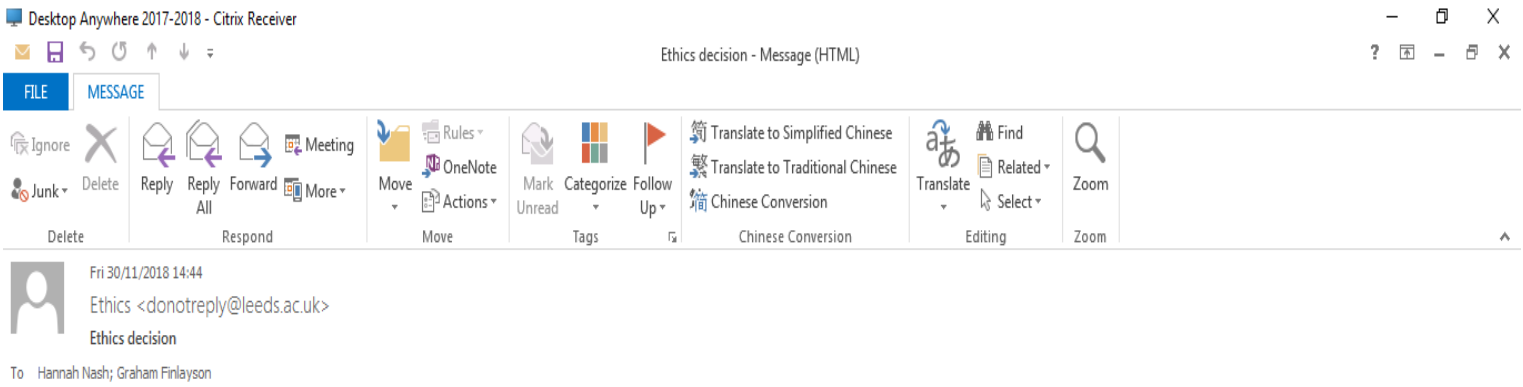
Pushing Spoon Away Behavioural Cue (PSA)

Turning Head Away Behavioural Cue (THA)

V1 (Visit 1)

V2 (Visit 2)

Appendix A
Ethical Approval



Fri 30/11/2018 14:44

Ethics <donotreply@leeds.ac.uk>

Ethics decision

To Hannah Nash; Graham Finlayson

Dear reviewers,

Below is a copy of the EC decision email sent to Graham Finlayson with regard to application PSC-526.

Dear Graham Finlayson,

Re your ethics application, The impact of a self-directed online resource for parents of infants to recognise and respond to satiety cues Mealtime Mind Reading: the feasibility and acceptability of an on-line resource to promote responsive feeding, ethics reference number: PSC-526.

I am pleased to inform you that the above research application has been reviewed by the School of Psychology Research Ethics Committee and has been approved.

Appendix B
Example Screenshots from the Mealtime Mindreading Resource (6-8 Months)

UNIVERSITY OF LEEDS

Ethical Approval ref no: PSC-526; Date approved: 30-Nov-2018

Welcome to the Mealtime Mind Reading Resource!

This project is being carried out by Sarah Atkinson, Psychologist in Clinical Training, (umsa@leeds.ac.uk); supervised by Professor Marion Hetherington (M.Hetherington@leeds.ac.uk) & Professor Andrew Hill (A.J.Hill@leeds.ac.uk).
Thank you to Dr Janet McNally for the original development of this resource, and to Kate Austin for narrating this resource.

Before you get started…

- We ask that you view **all** of the YouTube video showing the Mealtime Mind Reading Resource **at least 2 or 3 times per week** (without a maximum limit of viewings).
- You can **pause** the video to spend more time reading the information on the slides.
- You can also **rewind or fast-forward** the video by dragging the cursor (backwards or forwards) along the time line.

2

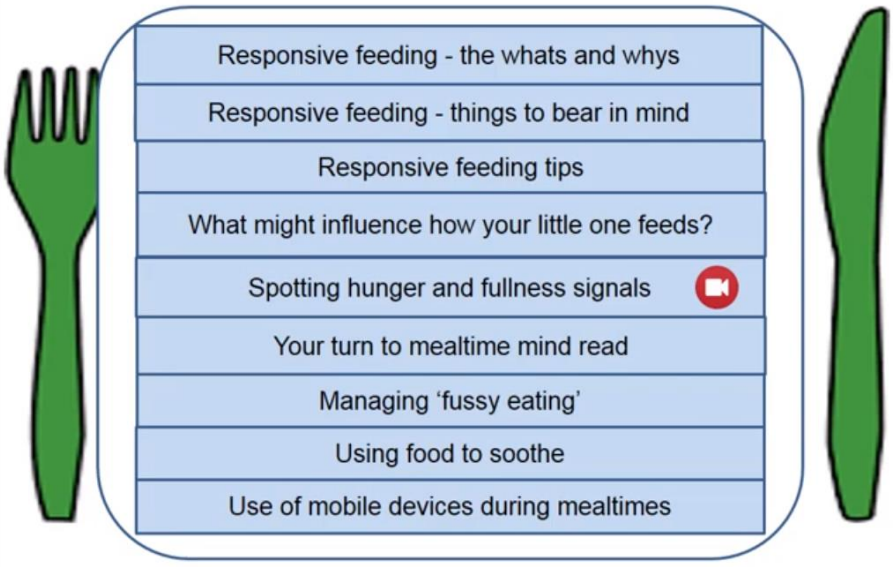
About this resource

This resource aims to help you to feed your little one 'responsively'. From it you will learn:

1. What responsive feeding is
2. How to spot hunger and fullness signals
3. How to feed responsively

Where you see the camera icon there will be upcoming video clips of different feeding behaviours.

What's coming up…



Responsive feeding – the whats and whys?

Responsive feeding is about recognising and following your little one's hunger and fullness signals – a bit like mind reading…!

Studies show that parents find it easy to know when their little one is hungry. They find it **more difficult to know when they are full**.

Following your little one's signals is important. If we continue to feed a little one who is full, they may:

(a) learn to overeat, which can lead to too much weight gain.

OR

(b) stop enjoying food, which can lead to inadequate weight gain.

Responsive feeding - things to bear in mind

Responsive feeding is good for babies but it can be hard to let your little one lead in managing their own appetite.

You might worry :

- That your little one won't sleep if they're not really full up
- That your little one is a poor eater
- About time pressures – being in a hurry
- About filling them up so you can drop breast feeds
- About using up all the food in the bowl
- Sometimes little ones also give mixed signals e.g. refusing food but then continuing to eat

These issues can lead us to pressure little ones to eat more than they want, but awareness of them can help us to avoid over feeding.

Responsive Feeding Tips

- Let your little one set the pace of eating and allow pauses in eating.
- Allow plenty of time for your little one to eat. Offer a little at first then build this up.
- Don't pressure your little one to eat - wait until next time if they're not interested.
- Don't worry if your little one doesn't eat a lot at one or two meals – what they eat over the course of a few days is more important.
- Let your little one 'tell' you if they want more or if they've had enough. **3 refusals** is usually a good sign that they are done with eating.

Get to know what shapes your little one's eating patterns and how they show hunger and fullness.

What might influence how your little one feeds?

Many factors can affect how your little one feeds.

Individual differences – 'Feeding Styles'

Little ones are all individuals and this also applies to their eating behaviour. Research has shown they have different characteristics in terms of how they approach feeding. These are known as '*feeding styles*'.

- Some enjoy food more than others – they get more pleasure from eating.
- Some 'respond' more to food than others –they have more of a drive to eat.
- Some are slow eaters while others are not – different children eat at different paces.
- Some respond more to feeling full than others
- Some are 'fussier' eaters while others are adventurous
- Some children seem to really enjoy drinking and fill up on drinks

Which of these describes your little one best

Type of food/likes and dislikes

The type of food that you give your little one may also affect how much they eat:

- Babies have a preference for sweet foods at birth.
- Liking for different flavours begins in the womb and continues through breast feeding from exposure to the flavours of foods that mum has eaten.
- Little ones' may show renewed engagement in eating when dessert is offered because of the 'new' sensations involved in eating a different food.
- Sometimes babies will return to eating savoury food after dessert again because the change of sensation renews appetite.
- Babies may reject new foods initially but repeated exposure helps them accept different flavours and textures.
- Your little one's facial expression is a good indicator of what they do and don't like, although pulling a face at the start of eating can just indicate surprise (e.g. at texture or flavour) even with familiar food.

Day to day factors

It is normal for your little one's appetite to vary from day to day. It is often better to assess their intake over a week rather than by day. There are also other issues which can affect how much your little one eats:

Activity levels 

Teething 

Illness 

Distractions 

Spotting hunger and fullness

The best way to gauge your little one's hunger and fullness is to look at the overall pattern of behaviour.

- As they fill up, they are less focussed on eating and more on exploring, playing and socialising.
- They also show hunger and fullness through behaviours like reaching for food or turning away.

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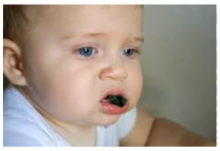


Hunger signs at 6, 7 & 8 months…

13

Looking:

- Your little one watches you preparing food or putting food out
- They look at food a lot including other people's!
- They look around when settled into eating
- They look at you or the spoon to show they want the next mouthful
- They look at you as a sign of acceptance

6, 7 & 8 months - Hungry

Evie watches closely as the food is put out

Sound:

- They sound impatient –they fuss or cry when waiting for food
- They make panting sounds at the sight of food
- They may make 'Mmm' or 'num, num' sounds when eating
- They are generally quieter when they are busy eating

19

6, 7 & 8 months - Hungry

Evie is quiet when she is busy eating

Movement:

- They show excited arm or hand movements
- They lean towards food
- They reach for food
- They open their mouth for the spoon
- They grab the spoon or your hand when you offer food and pull it to their mouth

22

6, 7 & 8 months - Hungry

Evie opens her mouth without prompting

Other signs:

- They eat quickly, they chew their fingers, they play with the bowl, spoon or other items

Full or filling up signs at 6, 7 & 8 months…

26

Looking: 

- Your little one avoids looking at the spoon when you offer it
- They look over the side of the high chair
- They spend time exploring objects or leftover food with their eyes

6, 7 & 8 months – Filling up or full

Evie is more interested in exploring than eating. She can't keep her eyes off the bits left on the tray.

Sound

- They make more sound to you or themselves
- They may cry or sound agitated towards the end of the meal

29

6, 7 & 8 months – Filling up or full

Evie starts to sound fed up when she is done with eating

Movement:

- Your little one pulls away from food
- They push the spoon away
- They get restless or make rocking movements in the high chair
- They rub their face or eyes
- They grab the spoon to stop you feeding
- They put their hand in the bowl to explore the food

32

6, 7 & 8 months- Full or filling up

Evie tells mum she doesn't want any more by pushing the spoon away

Other signs:

- They slowdown their eating, keep their mouth shut or are slow to open it for food
- They play with the food, spoon, bowl or cup, hit the tray or bang things together
- They drop food
- They blow raspberries
- They become more sociable and start games e.g. They want to 'feed' you
- They mouth non-food items, chew the end of the spoon etc.

35

6, 7 & 8 months – Filling up or full

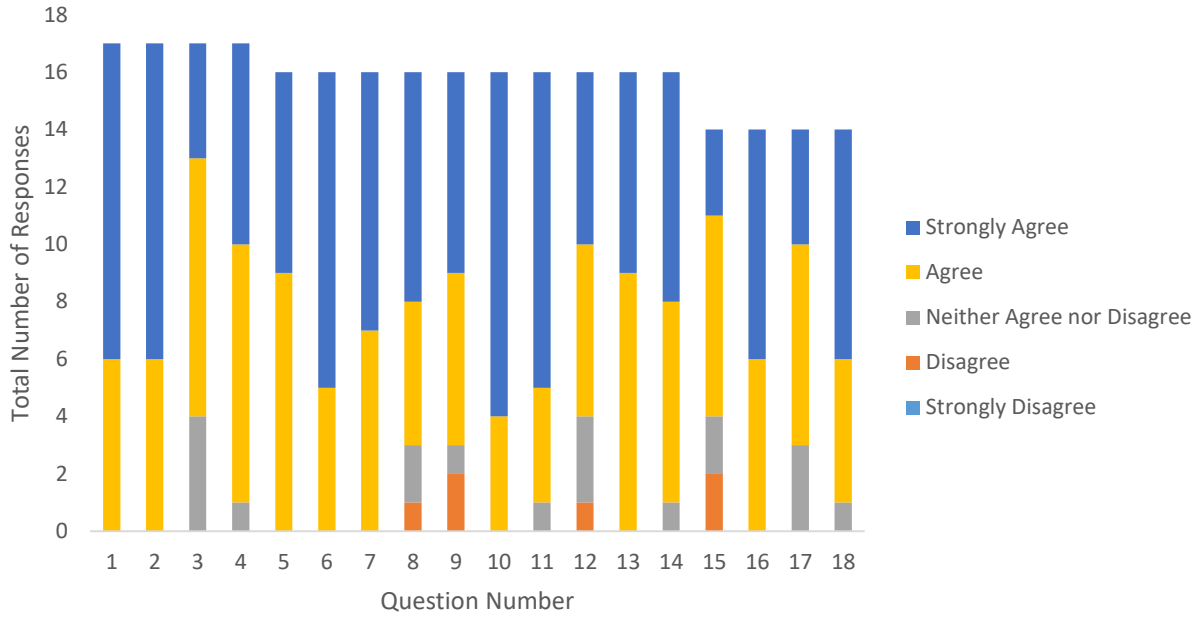
Evie keeps her mouth shut to show she doesn't want any more

Your turn at mealtime mindreading

- Now you've had a chance to look at our hunger and fullness signal videos you can practice spotting them yourself…
- Working out whether your little one is hungry or is filling up involves weighing up how many hunger signals and how many fullness signals they show.
- If you see more hunger signals , your little one probably still wants to eat but the more signs of fullness you see, the fuller they are.

Appendix C
Questions Included in the Debrief Questionnaire and Participant Responses

Question Number	Question
1	The objectives of the feeding resource were clear
2	The feeding resource was well organised
3	The material was presented in an interesting way
4	There were enough examples and illustrations
5	The ideas were clearly presented and easy to understand
6	The video clips were helpful in illustrating hunger signals
7	The video clips were helpful in illustrating fullness signals
8	The feeding resource increased my knowledge about my little one's hunger signals
9	The feeding resource increased my confidence in recognising my little one's hunger signals
10	The feeding resource increased my knowledge about my little one's fullness signals
11	The feeding resource increased my confidence in recognising my little one's fullness signals
12	The feeding resource increased my knowledge about issues which affect my little one's eating behaviour
13	I found the information in the feeding resource helpful
14	I could apply learning from the feeding resource when feeding my little one
15	The length of the feeding resource was appropriate
16	I would recommend the feeding resource to others
17	I enjoyed looking at the feeding resource
18	Overall, I was satisfied with the feeding resource



Appendix D
Participant Information Sheet

UNIVERSITY OF LEEDS

School of Psychology Research Ethics Committee Approval PSC-526

Date of approval 30/11/18

Researcher: Sarah Atkinson; umsa@leeds.ac.uk

You are invited to take part in a research study which involves the impact of using a responsive feeding resource for parents to recognise and respond to fullness signals. Please take time to read the following information carefully. If you would like to know more about the research or would like to participate, please email the lead researcher, Sarah Atkinson at umsa@leeds.ac.uk

What is the purpose of the study?

The purpose of the study is to explore the impact of viewing an online responsive feeding resource for parents to recognise and respond to fullness signals. The resource has been designed to help parents to spot and follow their baby's feeding signals during solid food meals. We are also interested in gaining feedback on parents' experiences of the resource.

Why have I been invited to take part?

You have been invited to take part as the parent of a baby between 6 and 18 months of age, who is currently being spoon fed. The feeding resource has been designed for parents of babies in this age group and so your feedback would be very helpful. To participate in the study you will need access internet and to able to watch a YouTube video. You will be sent a link to access this.

Although the video can be accessed via mobile phones, the resource was initially designed to be viewed using a larger screen, such as on a tablet or computer, and this would be preferable but not essential.

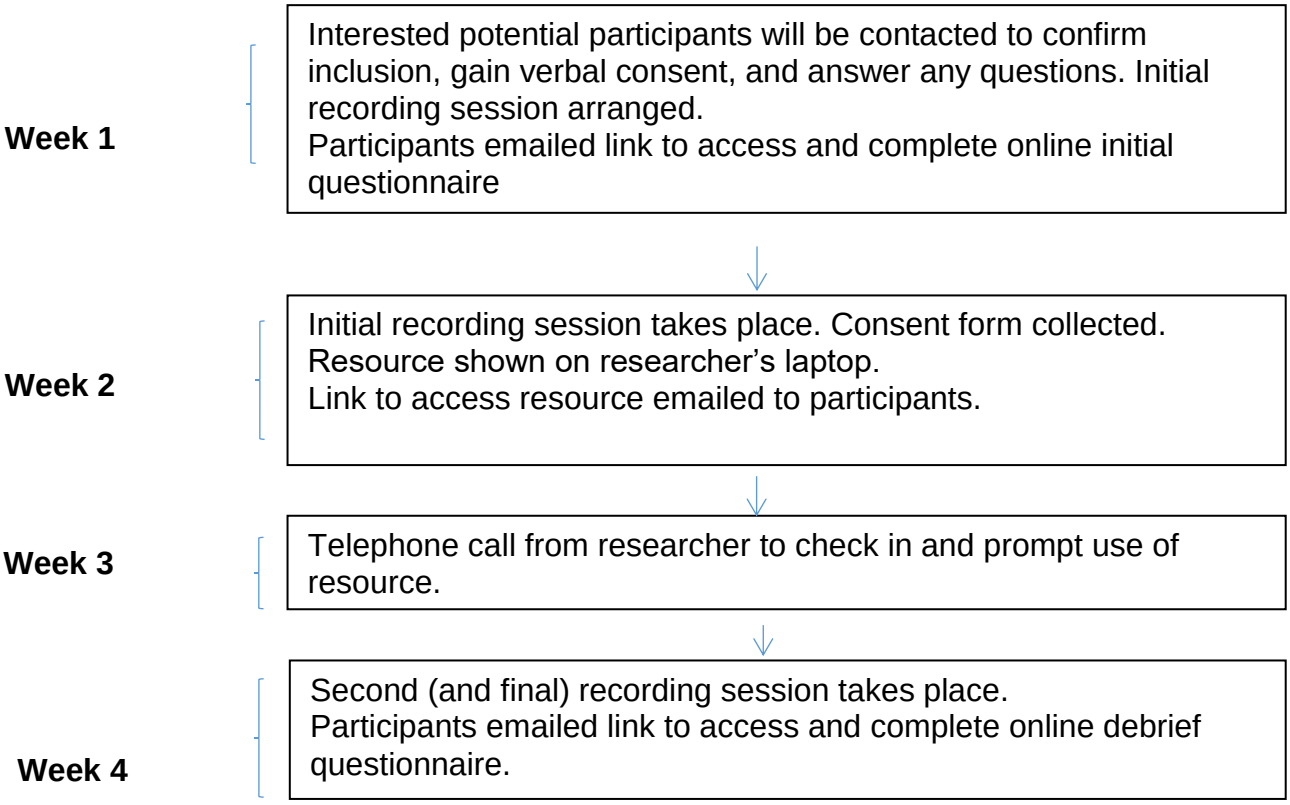
Do I have to take part in the research?

It is up to you to decide if you wish to take part or not – the information provided is designed to help with this decision. If you are interested after reading this, you will be asked to complete a consent form to show that you are happy to be involved.

What will happen if I decide to take part?

The study will involve two visits to your home address to video record a usual mealtime with your little one. This can be either lunch or dinner (your choice), but must be the same for both recordings. Although you will use your own food choices, you will be asked for the mealtime to include particular criteria, e.g. offering a warm savoury meal, followed by a dessert. These are to be served in bowls and fed using a spoon. The researcher will weigh the bowls before and after the meal, and take a note of the food offered and consumed. Further details of the mealtime criteria will be explored with you further if you choose to take part in the study or would like to know more before deciding to participate.

An online questionnaire will be completed to collect demographic information about you and your infant. After the first mealtime recording, you will receive a link to access the online resource via YouTube. You will be asked to view YouTube video a minimum of 2-3 times per week, without a maximum limit. Approximately one week after receiving the resource, the lead researcher will call you to check in, and answer any questions you may have. Approximately one week (maximum 2 weeks) later, a second recording of a meal time will be completed. An online debrief questionnaire will be completed after this final visit. Below is an approximate timeline of how participation in the study will look:



Recognition and response to infant satiety cues will then be explored within the mealtime recordings.

What are the potential risks and benefits of taking part in the study?

Taking part in the study is likely to be beneficial in developing your knowledge and understanding of your infant's feeding behaviours and their hunger and fullness signals. Your responses will also help us to learn more about what information helps parents to understand their infants' feeding behaviour and hunger and fullness signals.

There are no foreseeable risks involved in participating in this study other than the inconvenience associated with the time involved in taking part. You will be able to keep a copy of the meal time video recordings if you wish.

What will happen to my data if I take part? (How long will the data be kept for?)

All data will be stored in a password protected spreadsheet on a password protected computer. Data collected during the study will remain completely anonymous and securely stored for a period of 5 years. Data may be looked at by individuals from the University of

Leeds research team, collaborators on the research project and the University of Leeds for the purposes of research governance.

The mealtime video recordings will only be used for the purpose of the current study. They will not be shown to anyone outside of the research team unless you have provided explicit additional consent for this in relation to wider training or educational purposes. The videos will be stored on recordable DVDs and kept in a locked cabinet.

Will my taking part in the study be kept confidential?

Any information that is collected about you will be kept strictly confidential.

What will happen to the results of the study?

Results may be published for dissemination to scientific peers. However, confidentiality and anonymity will be maintained and it will not be possible to identify you.

What if I decide that I want to withdraw my data from the study?

You can withdraw your data from the study at any time up to March 31st 2020. To do this, please email the lead researcher, Sarah Atkinson, and request to withdraw your data (umsa@leeds.ac.uk).

What do I need to do now?

If you would like to take part in the study, please email the lead researcher, Sarah Atkinson (umsa@leeds.ac.uk) expressing your interest and provide a contact telephone number and/ or email address.

Who can I contact for further information?

If you have any questions regarding any aspect of our research please feel free to contact **Sarah Atkinson, Psychologist in Clinical Training** (email: umsa@leeds.ac.uk) or the study supervisor, **Professor Marion Hetherington** (0113 343 8472 email: m.hetherington@leeds.ac.uk).

Appendix E

UNIVERSITY OF LEEDS

Participant Consent Form

School of Psychology Research Ethics Committee Approval PSC-526

Date of approval 30/11/18

Researcher: Sarah Atkinson; umsa@leeds.ac.uk

	Yes	No
1. I confirm that I have read and understand the information sheet explaining the research project.	☐	☐
2. I agree for myself and my infant to take part in the research project which will involve Mealtime video recordings on two separate occasions at my home address.	☐	☐
3. I understand that my participation is voluntary and that I am free to withdraw at any time up to 31st March 2020 without giving a reason. In addition, should I not wish to answer any particular question(s), I am free to decline.	☐	☐
4. I understand that my data will be kept strictly confidential. I give permission for members of the research team to have access to my anonymised data. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the report or reports that result from the research.	☐	☐
5. I agree for the anonymised data collected from me to be used in future research.	☐	☐
6. I agree for my video recordings to be used in future research.	☐	☐
7. I confirm that I am 18 years of age or over.	☐	☐

Appendix F
Alternative Visit 2 Mealtime Descriptions

Particpant ID	Alternative Savoury Meal at Visit 2	Alternative Dessert at Visit 2
7	Homemade beef stew, carrot, onion, turnip, mushrooms	Raspberry rice pudding
8	Ella's Kitchen sweet potato and chicken pouch	Petits Filous raspberry pot
10	Homemade potato, sweet potato, chicken, gravy	Dairy free coconut yoghurt and mashed banana
14	N/A	Munch bunch banana and strawberry yoghurt pot
15	Ella's Kitchen sweet potato, pumpkin, apples and blueberries pouch	Ella's Kitchen berry yoghurt pouch
16	Homemade chicken, courgette, pepper, red onion, philadelphia cheese, red pesto, tagliatelle pasta	N/A
18	Same homemade option as v1. Pouch: Aldi beef casserole with vegetables	N/A
19	Unknown as mother recorded own mealtime and did not provide nutritional details.	Unknown as mother recorded own mealtime and did not provide nutritional details.

Appendix G
Simple Feeding Element Scale (SFES)

1 = Less Ideal
2 = Average
3 = More Ideal

PP ID	Setting		Positioning		Mood/ Atmosphere		Pacing		Verbal Communication		Notes
	V1	V2	V1	V2	V1	V2	V1	V2	V1	V2	
1	3	3	2	2	3	3	2	2	2	2	Infant a little distracted by dog at the beginning of V2.
2	3	3	1	1	3	1	2	2	2	2	Unsure if they always sit in this position (side by side) or if it was because of the positioning of the camera for the study. V2: disruption to meal at beginning due to temperature of food. Took a while to settle.
3	1	2	1	1	2	2	2	2	2	2	TV on in background. V1: Older sibling at home seeking attention. Mum sitting next to infant. V2: Sits him on her knee and on the table.
4	3	3	2	3	3	2	3	2	3	2	Radio on but not distracting. Some noise coming from building site outside of house but out of their control. Family bereavement between V1 and V2.
5	1	3	3	3	2	2	2	2	2	2	Older sibling present and wanting to be involved in the mealtime. TV on in background where infant could watch it and hear it. Infant distracted throughout mealtime during V1 and V2. V2: Mum uses squeaky toy to gain infants attention.
6	2	2	2	2	3	3	3	3	3	3	Radio on in background but infant not distracted by it. Mum sitting a little too high up. Infant a little sleepy. Has had cold recently.
7	3	3	3	3	3	2	2	2	2	2	V2: infant seemed more irritable, moving around in highchair a lot.

8	2	2	3	3	2	2	2	2	2	2	Infant difficult to settle. Noise in background. V2: offers toy to play with during mealtime
9	3	3	3	3	3	3	2	2	3	3	Pace a little fast. Infant had been unwell between visits.
10	2	2	3	3	2	2	2	3	3	2	Radio on but doesn't seem distracted by it. V1: Infant a little subdued. V2: Infant sleepy. V2: Mum's pace seems slower in response to infant not being as interested in the mealtime. V2: Mealtime quieter. Infant had been unwell between visits.
11	2	2	2	2	3	3	2	2	2	2	TV on in background. Mum positioned a little high up.
12	3	3	3	3	3	3	2	2	3	3	
13	3	3	2	2	3	3	2	2	3	3	Sitting different than usual due to camera.
14	3	3	2	2	2	2	2	2	2	2	Infant kept slipping down in highchair. Relaxed atmosphere but seemed a little quiet.
15	3	2	2	2	3	3	3	3	3	2	V1: Radio on in background but infant not distracted by it. V2: Offers toys to play with during mealtime. V2: Sitting in a different position to usual. V1: Infant a little sleepy. V2: Infant distractible. V2: Less conversation.
16	3	3	2	2	3	3	2	2	3	3	Usual family mealtime. Dad also present.
17	2	N/A	2	N/A	2	N/A	3	N/A	2	N/A	V1: Sits on Mum's knee during dessert following being distressed by teething.
18	2	2	3	3	3	3	2	2	2	2	TV on in background.
19	3	3	3	3	3	3	3	3	3	3	