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Spoon-feeding or self-feeding?

The infant's first experience of solid food

by

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Canterbury Christ Church University

**Thesis submitted for the
Degree of Doctor of Philosophy**

2015

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Acknowledgements

I should like to acknowledge a number of people for their help and support with this work. First and foremost, my heartfelt thanks go to my supervisor, Dr. Sally Robinson, who rescued me when I was floundering, demonstrated clearly that she believed I had something valuable to say and provided the sort of detailed feedback I so desperately needed. I also appreciate enormously the support, comments and suggestions provided by my second supervisor, Professor Sacha Powell, who also joined this venture late in the proceedings, and the support and encouragement of Professor Margaret Andrews, who stayed on as chair of my supervisory panel well beyond the call of duty.

I should like to register my gratitude to the late Professor Susan Holmes, who helped me get off the ground and saw me through the early stages of my research. My thanks, too, to Dr. Alison Smith and Professor Annmarie Ruston, who worked to stop me falling by the wayside in the middle years, and to Dr. Douglas MacInnes, who kept me in his sights throughout the various supervisory changes.

I am very appreciative of the parents who agreed, on behalf of themselves and their infants, to take part in the study. I thank them for their time, and for inviting me into their homes. Without their participation, there would be no findings to report.

I have valued enormously the support of my fellow students and the interest of lecturers and other staff within the Graduate School, as well as the thoughtful feedback and questions offered by my colleague and friend, Tracey Murkett. Finally, I should like to thank my husband for his understanding when I burned the midnight oil, and both him and the rest of my family for their tolerance of my mood swings.

Abstract

Since 2002, the minimum recommended age worldwide for the introduction of solid foods has been six months, an age when most infants are able to bring food to their mouth and chew it, without assistance. Despite this, the practice of spoon feeding with purées remains prevalent and most research to date has examined the introduction of solid foods from the adult's perspective rather than the infant's. As a result, factors that may impact on the food preferences of infants, such as the appearance, smell and haptic qualities of food, have not been investigated, nor has the routine use of puréed foods been challenged. Similarly, while differences have been well documented between the processes of breastfeeding and bottle feeding, the possibility that there may be pertinent differences between spoon feeding and self-feeding has not been explored. Overall, the introduction of solid foods has been researched in nutritional terms, rather than in relation to the infant's experience and his wider learning and development. This study appears to be the first to explore the introduction of solid food from the infant's perspective.

Ten infants were offered a single food, both as a graspable piece and as a spoon-fed purée. The experience was audio/video-recorded and analysed in depth using a combination of quantitative and qualitative methods. Two interviews were conducted with the mother of each infant, during which they were asked to eat the same food, in the same formats, as their infant, and to comment on the audio/video-recording.

The findings indicate that spoon feeding and self-feeding are two contrasting experiences. Self-feeding was seen to be characterised by exploratory behaviour, while spoon feeding showed more evidence of avoidant behaviour by the infant and controlling behaviour by the mother. Possible implications for parental and professional guidance and for future research are discussed.

Introduction

This thesis concerns the introduction of solid foods to the diet of infants – a topic that has been, and continues to be, of interest to researchers, health professionals and parents, for a variety of reasons.

About infant feeding

The current worldwide recommendation is that infants should be exclusively breastfed for the first six months of life and then introduced gradually to a nutritious diet composed of a variety of foods (WHO, 2002; DH, 2003). This transition, which is known as weaning, is recognised as a crucial period for the development of food preferences and has rightly prompted a great deal of debate, since what infants and young children eat makes a difference to their health and wellbeing, both during childhood (Oddy *et al*, 2003; Ip *et al*, 2007; Quigley *et al*, 2007; Duijts *et al*, 2010; Li *et al*, 2014a) and in later life (Rich-Edwards *et al*, 2004; Owen *et al*, 2005; Horta *et al*, 2007). However, the majority of the research in this area has focused on the foods to be offered (e.g., Forestell and Mennella, 2007; Brown *et al*, 2010) and the timing of their introduction (e.g., Borresen, 1995; Cattaneo *et al*, 2011) – that is, the *what* and the *when*; the practical side of *how* they should be introduced has received much less attention. In particular, the potential impact on infants of being spoon fed with puréed food versus feeding themselves with graspable pieces has not been explored. This study aims to address this gap through an examination of the responses of infants during their first encounter with solid food, presented in two formats and by two means.

There exists a wealth of evidence concerning what constitutes an optimal diet in both infancy and childhood (PAHO, 2003). However, there is also an extensive literature surrounding the difficulties associated with persuading young children to eat healthy foods (e.g., Maier *et al*, 2007; Barends *et al*, 2013; Blissett and Fogel, 2013; Caton *et al*, 2014). Current guidance issued by the Departments of Health in the UK, where this study is situated, suggests that the importance of what children eat is recognised by health professionals and politicians (DH, 2011; HPA, 2011; NHS Health Scotland, 2014). However, as will be shown, both the research on children's eating and the resulting guidance have tended to consider the issue from the point of view of the caregiver, not that of the infant, focusing on overcoming difficulties rather than on understanding them. In particular, the possibility that the infant's first, subjective experience of solid food may influence his¹ response to eating, both immediately and subsequently, appears not to have been considered.

¹ Throughout this thesis, for the purposes of clarity, infants in general are referred to as 'he', in order to distinguish them from their mothers, who are necessarily 'she'.

Over the last 40 years our understanding of infant development and the parent-infant bond has progressed from the early work of researchers such as Ainsworth *et al* (1978), Donaldson (1978) and Bowlby (1988), to the latest discoveries in the field of neuroscience (Barrett and Fleming, 2011). We know that, from birth, feeding provides a key arena for the nurturing of parent-infant attachment (Else-Quest *et al*, 2003) and for the development of the infant's sense of self (Thompson *et al*, 2011); it is about nourishment in the fullest sense – intellectual and emotional as well as physical (Sunderland, 2007). In spite of this, the introduction of solid foods has tended to be viewed almost exclusively in relation to the infant's nutritional needs, with the possible significance of this milestone for his wider development overlooked. We do not know, for example, whether the appearance, smell and haptic qualities of food – some of which have been studied in relation to older children and animals (Zeinstra *et al*, 2010; Ueno and Matsuzawa, 2005) – may be of importance to the infant, nor has the routine use of puréed foods for children who can chew been challenged. Similarly, while a difference has been identified between breastfeeding and bottle feeding in relation to who controls the process (Li *et al*, 2010; Brown *et al*, 2011), the possibility that a similar difference exists between self-feeding and spoon feeding has not been explored, nor the potential impact of such a difference on food acceptance and refusal considered.

In 1985, Lipsitt *et al* called for more research into the social exchanges that take place between mothers and infants during early solid feeding. They noted that “[h]ow what is offered is probably as important as what is offered” (p.486) and pointed to the work of Papaioannou (1983) as a step in the right direction. Dettwyler (1989) made a similar plea, highlighting issues of control over eating and the use of hands versus utensils as factors worth exploring. Unfortunately, little of the research undertaken since then, whether into infant nutrition or within the discipline of developmental psychology, appears to have taken up these suggestions. Kime (2008) notes that the recent increase in research into childhood obesity has led to “a dietary focus on what children eat, not on how they eat” (p.320). This is particularly true of the weaning period, with Van Dijk and colleagues asserting that the literature lacks “a good description of the changes in feeding behaviors” that occur during the “crucial transition” that marks the beginning of solid feeding (Van Dijk *et al*, 2012, p.226). Vereijken *et al* (2011) state that “feeding is a neglected area within Developmental Psychology” (p.841). This may be because, as Penn (2005) suggests, psychologists tend to work in ‘silos’, not taking into account what is happening outside their speciality. More recently, Shutts and colleagues have noted that food is “a domain that has received limited attention from those interested in the development of social cognition” (Shutts *et al*, 2013, p.419), while Hodges *et al* (2013) acknowledge that the dynamics and practicalities of the feeding interaction around the time solid foods are first introduced remain poorly studied. Birch and Doub (2014) assert that “there is no consistent, evidence-based guidance for

caregivers who are feeding infants and toddlers” (p.723S) and that “the evidence base with regard to how and what children learn about food and eating behavior during these first [two] years is limited” (ibid.). The result is that there is still “limited information available on the maternal feeding practices of infants” (Morawska et al, 2014, p.523).

Dykes and Flacking (2010) have highlighted the need to focus on relationships in order to encourage and support mothers to breastfeed; it seems appropriate to regard the beginning of the move away from breastfeeding in the same light, and to view the infant’s first encounter with solid foods as a lived experience for him, in the context of his evolving relationship with his caregivers. The current study is the first to consider the introduction of solid food from the perspective of the infant, and to compare infants’ responses to the same food offered in two different formats and by two different methods. It therefore represents a new direction in the field of research into the feeding of babies and young children and offers an important original contribution to our existing knowledge.

About the researcher

The roots of this thesis lie in my years as a health visitor, when I witnessed much concern, confusion and distress, among both parents and infants, during the early months of solid feeding. At that time, the recommendation was to introduce solid foods from four months, meaning that spoon feeding and purées were an inevitable part of the process. Commonly, the problems I saw began to manifest themselves when the infant was between six and eight months old, and were characterised by the infant crying and pushing away the spoon. Allowing the infant to feed himself, using his hands, appeared to provide a solution to these problems; however, it did not offer a way to prevent them since solid feeding was almost always already in progress by the time the infant developed the ability to pick pieces of food. The change, in 2002, in the recommended minimum age for solid foods from four months to six months made self-feeding possible from the start.

A small study, conducted for my Master’s degree (Rapley, 2003), suggested that, where it is facilitated, self-feeding manifests itself spontaneously as infants reach six months. This led to the identification of an approach known as ‘baby-led weaning’ (BLW), the popularity of which spread rapidly amongst parents. Many reported how much their infant appeared to enjoy feeding himself; however, a recurrent question, especially from those sceptical about the approach, was: *“What’s wrong with spoon feeding?”*. In pondering this question I found myself moving from a position of viewing spoon feeding as unnecessary, to consideration of the possibility that it may have negative consequences. I also found myself wanting to understand the infant’s experience and to document his side of the story. The burning question became: *“If infants don’t need to be spoon fed, does it matter if they are?”*

This thesis, then, stems from a desire to understand the impact, if any, on infants of the manner in which they are introduced to solid food. While I have attempted, throughout the design and process of the study, to set aside my own motives for initiating it, they are nevertheless present in the background. This is inevitable, since research does not happen without a reason, and all researchers are human beings. As Newman *et al* (2003) assert:

“Researchers’ lenses are their autobiographies, who they are, their lives – all of the factors about them, including their values, beliefs, experiences, age, and gender as well as their social, psychological and spiritual development.”

Newman *et al*, 2003, p.174)

My own lens consists of experiential knowledge as a professional and as a parent, coupled with the findings of my previous research studies. These have created in me a reluctance to accede to the notion that ‘feeding problems’ should be accepted as a normal and inevitable part of later infancy and toddlerhood, and a wish to uncover what lies behind them.

About the study

The study that forms the basis of this thesis focuses on the interaction between the infant and his first solid food and, to a lesser extent, on the interaction between the infant and his or her caregiver during feeding. It is not concerned with wider aspects of the parent-infant or other social relationships, with cultural aspects of food or infant feeding, with the choices infants might make between foods, nor with the relative or actual nutritional value of those foods. Indeed, in order to minimise the potentially confounding impact of the variability of meals and mealtimes conducted within family settings, the study infants’ first encounter with solid food takes place in isolation, with the single food predetermined and the infant the only person to whom it is offered. It is, however, worth noting that this is the manner in which many infants are offered their first solid food.

The thesis begins with a review of the academic literature, which exposes large gaps in our knowledge about the feeding of infants in the weaning period. In view of the lack of existing research in this area, a broad-based research question is chosen. From this, three objectives for the study are devised and two methods of data collection selected to meet them. The analysis of the data reveals some striking differences between spoon feeding with a purée and self-feeding with a piece of food, from which several themes emerge. Comparison of these findings with the literature leads to a re-evaluation of the principles and practice surrounding the introduction of solid foods that may have far-reaching implications for our understanding of children’s development in relation to eating, and their attitudes to, and relationships with, food.

Chapter 1 – Feeding the developing infant

This chapter provides a background and rationale for the study. It begins with a review of why what humans eat matters and outlines the variety of influences on our eating choices. The role of the senses is considered, together with some of the physiological rewards that eating provides. This is followed by a discussion of the importance of good nutrition in infancy, beginning with breastfeeding and continuing with the introduction of complementary foods. The innate ability of the infant to feed himself at the breast is described. An account is then given of the normally developing infant at six months: his relationship with his main caregiver, his physical abilities and skills, especially in relation to feeding, and his drive to learn about the world around him.

Existing knowledge is presented concerning the development of food preferences and the phenomena of 'picky' eating and food refusal. The known influences on infants' and young children's eating are considered, including the issue of control during feeding. The argument is put forward that, although infants of this age are equipped with the skills necessary for feeding themselves with graspable foods, there is nevertheless an assumption that they need to be given puréed food, by spoon. Some potential challenges for the infant of this method are discussed; the academic literature is critiqued in relation to the attention paid to the feeding method in the investigation of children's mealtime behaviour and the evidence for the self-feeding approach known as 'baby-led weaning' is examined. Finally, the right of the infant to be considered an autonomous agent is argued, and the adult-orientated focus of many existing studies highlighted. The chapter ends with the presentation of the research question.

1.1 What and why we eat

What we eat plays a part in determining our life-long health. Food provides the body with the nutrients it requires for effective functioning; this includes the operation and repair of all body organs and, for infants, children and adolescents, the growth and development of those organs (Pocock *et al*, 2013). While the infant is in utero, what his mother eats influences his wellbeing and growth (Pocock *et al*, 2013; Langley-Evans, 2015); once he is born, it is what *he* eats that matters, both during infancy and in later life (Robinson and Fall, 2012). To attain the optimal level of health, within the constraints of our genetically inherited predisposition to disease and the impact of our environment and lifestyle, all of us – infants, children and adults – need to eat the best possible combination of nutrients, in the right proportions (Brown *et al*, 2010; Langley-Evans, 2015).

Figure 1.1 Early determinants of health in later childhood and adulthood

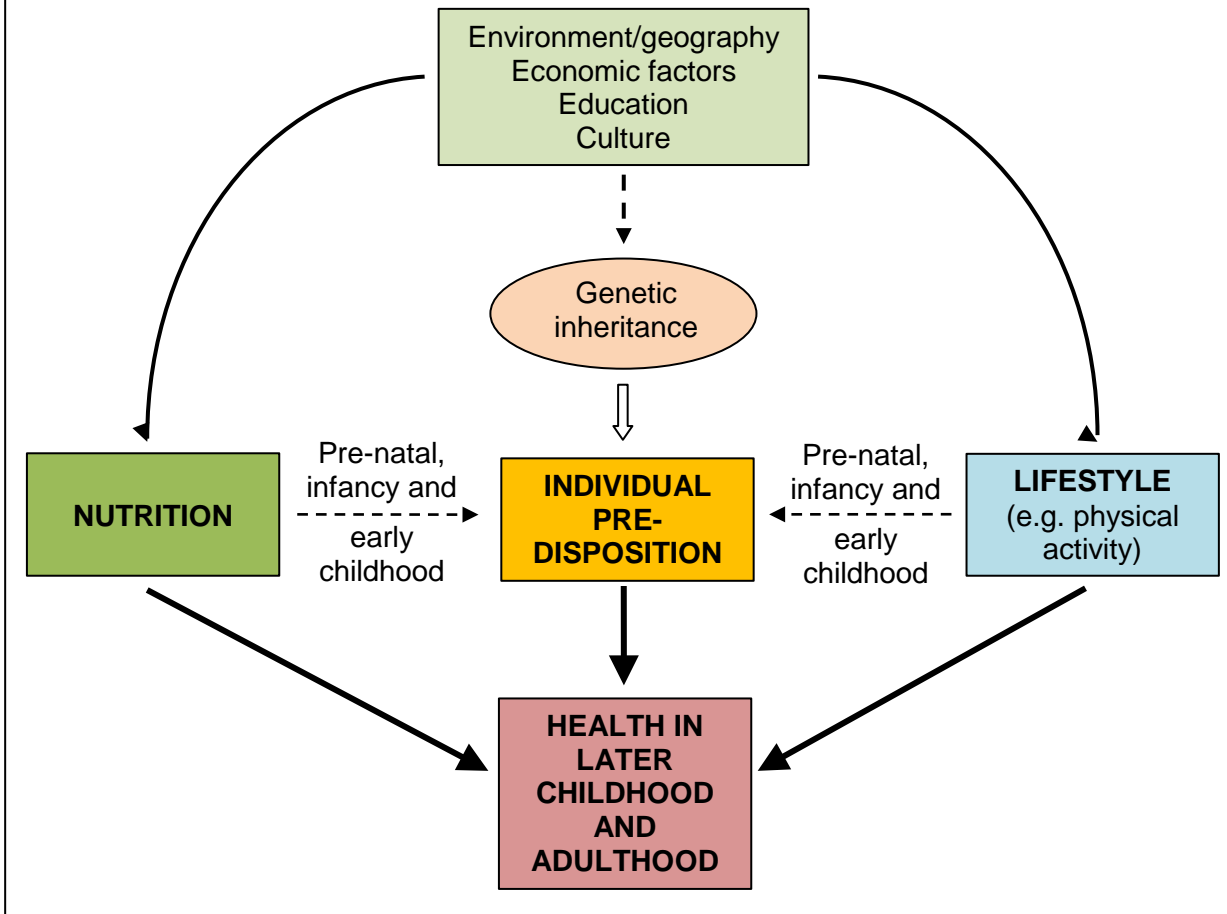


Figure 1.1 illustrates the array of factors that may combine to determine the health of the individual infant or young child in later life. Some conditions are inherited, for instance, cystic fibrosis (Kerem *et al*, 1989); others, such as asbestosis, are caused by environmental or working conditions (Mossman and Churg, 1998). Certain diseases, for example, scurvy, can be clearly linked to poor nutrition (Carpenter, 1988) while others appear to be ‘programmed’ as a result of early nutrition (Lucas, 1998). Yet others may have an inherited component but be triggered by later dietary or lifestyle factors; diabetes is thought to be one such disease (Adeghate *et al*, 2006). Additionally, both nutritional and environmental factors may, over the course of generations, alter the genetic inheritance (Faith *et al*, 2004a). Thus, however complex and multi-faceted may be the relationship between diet and disease (Mera, 1994; McKay and Mathers, 2011; Robinson *et al*, 2012; Leech, 2014), it is clear that *what* we eat plays an important role in determining our health. What is less clear is *why* we choose to eat what we do.

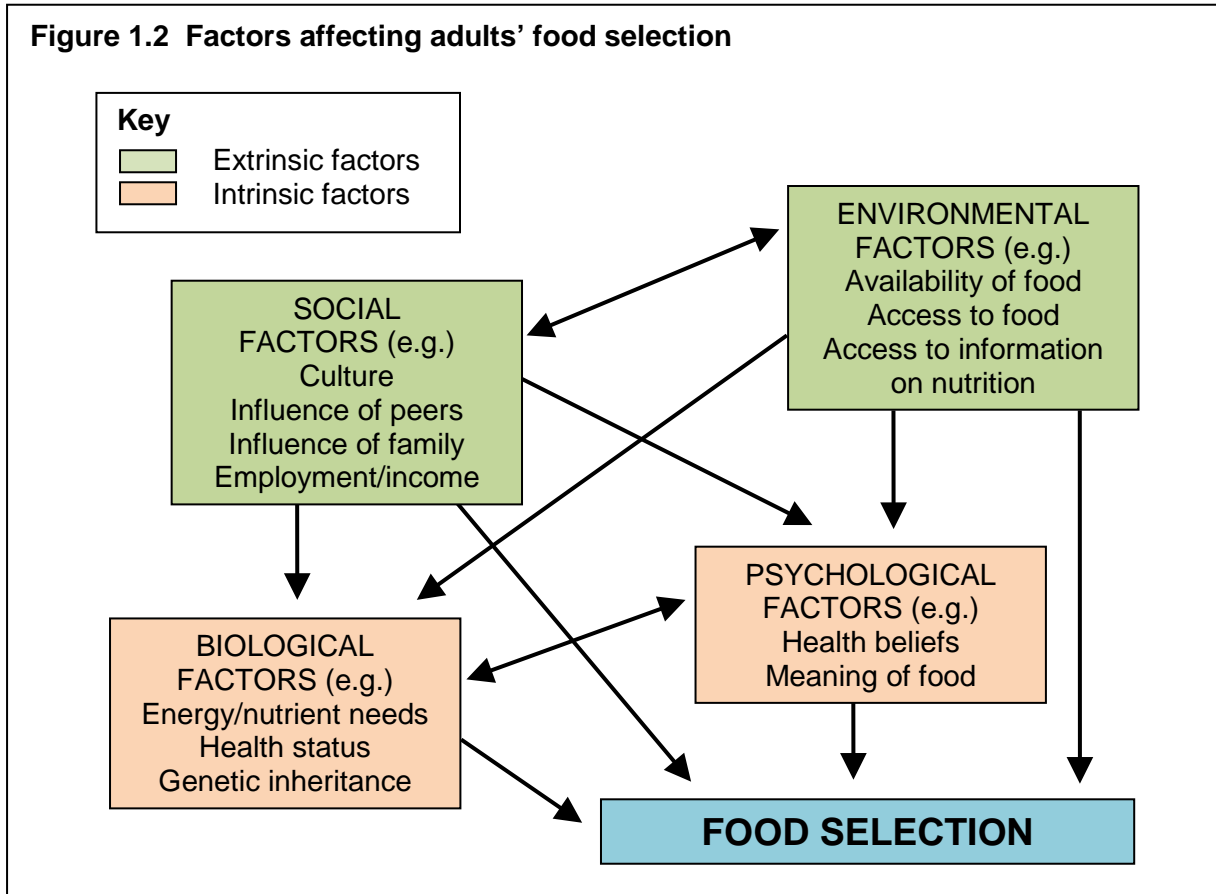


Figure 1.2 illustrates the various factors that affect the selection of foods by adults. Eating choices are dictated by more than simple instinct or the knowledge of what constitutes a healthy diet (Becker and Maiman, 1975; Chinn *et al*, 1999). For example, extrinsic factors, such as the availability of food, as determined by geographical location or level of income, and intrinsic factors, such as the individual's beliefs about food or his genetic make-up, all have a part to play (Wansink and Deshpande, 1994; Pollard *et al*, 2002; Desmet and Schifferstein, 2008; Renner *et al*, 2012). According to the individual's culture, particular foods may play an important role in celebrations of meaningful occasions and life changes (Fieldhouse, 1995).

For infants and children these same factors apply but their situation is one step removed, since their eating choices are, in large part, decided for them by their caregivers, especially their parents (Dubois *et al*, 2013; van Ansem *et al*, 2014). While there is some evidence that infants of six months and older may be able to select a healthy diet for themselves (Davis, 1928; Westenhoefer, 2001), they can do this only if they are presented with nutritious foods from which to choose. Young children tend to be offered foods that their mothers enjoy (Mennella *et al*, 2005; Howard *et al*, 2012; Tan and Holub, 2012) and are unlikely to be offered those that their parents do not themselves eat (Skinner *et al*, 2002a; Anzman *et al*, 2010). This has the potential to affect their health while they are young and to set the scene

for later illness and disease (Singhal *et al*, 2010). In addition, dietary patterns have been shown to be established in early childhood (Ashcroft *et al*, 2008) and to track into later childhood and adulthood (Mikkilä *et al*, 2005; Venter and Harris, 2009; Grimm *et al*, 2014), thereby affecting the individual's ongoing food choices and further impacting on his long-term health.

Food selection does not automatically determine food intake at any one meal, which may be mediated by a variety of additional factors (Spence *et al*, 2013). For example, humans are influenced by the various attributes of food and are motivated to eat by the rewards it offers. Some consider eating to be "*one of life's greatest pleasures*" (Drewnowski, 1997, p.243). Westenhoefer and Pudel (1993) found that the term 'eating' was associated with pleasure twice as frequently as was 'nutrition' and have suggested (Westenhoefer and Pudel, 1990) that an over-emphasis on the consumption of nutrients, rather than on the wider concept of the experience and significance of eating, may be one reason why dietary advice is not always well received or acted upon.

The areas of the brain that respond to smell and taste are closely related to those that deal with emotion, and share pathways with those concerned with touch and vision (Rolls, 2005). Rolls (2005) suggests that pleasant or unpleasant feelings generated by the appearance, texture, temperature, smell and taste of food may combine to create a liking or disliking for that food. Sounds produced by the action of eating foods of different textures have been found to alter perceptions of sweetness and saltiness and to have the capacity to enhance an individual's enjoyment of those foods (Spence and Shankar, 2010; Woods *et al*, 2010b; Spence, 2012). Pleasurable feelings associated with eating are not merely hedonistic; many also have a physiological element. Moberg (2003) has described how sensations of pleasure and relaxation stimulate the release of oxytocin into the bloodstream. This hormone acts not only in the brain, enhancing positive emotions, but also on the individual's gut, increasing the effectiveness of the digestive process. The flipside of this is that stress can be a trigger for overeating, even in children (Michels *et al*, 2012).

The ambience of the eating environment also has a part to play, with factors such as lighting, noise and the presence of other people affecting both the individual's enjoyment of a meal and the amount of food consumed (Wansink, 2004; Wansink *et al*, 2007; Shimizu *et al*, 2010; Woods *et al*, 2010b). Adults can be prompted to eat, and to continue eating, by the size of the portion they are given, and by the food choices of others (Rolls *et al*, 2002; Wansink *et al*, 2005; Steenhuis and Verneer, 2009). The impact on infants of the eating environment appears not to have been studied but portion size has been shown to be influential in children as young as four years (Rolls *et al*, 2000; Mrdjenovic and Levitsky, 2005; Smith *et al*, 2013). Kral and Hetherington (2014) found sufficient evidence to suggest

that this is a learned response, while Fox and colleagues point to its being the result of “*interference with natural self-regulation*” (Fox *et al*, 2006, p.S81).

1.2 Nutrition in infancy

How human infants are fed in the early months of their lives has been shown to have a lasting, possibly life-long impact on their health, both physical (Howie *et al*, 1990; Oddy *et al*, 2003; Rich-Edwards *et al*, 2004; Owen *et al*, 2005; Horta *et al*, 2007; Ip *et al*, 2007; Quigley *et al*, 2007; Duijts *et al*, 2010; Li *et al*, 2014a) and mental (Oddy *et al*, 2009), and on the health of their mothers (Ip *et al*, 2007). However, examination of the academic literature concerning nutrition in infancy is hampered by inconsistencies in the terminology used. The Oxford English Dictionary defines infancy as “*the earliest period of life ... now most usually applied to a child in arms, a babe; but often extended to include any child under seven years*” (OED, 2014a). In practice, while babies under six months are almost invariably referred to as infants, many researchers also use this term to refer to children up to two years old, with Brown and Harris (2012) applying it up to 26 months of age. Conversely, Hodges *et al* (2013) refer even to newborns as ‘children’. The World Health Organization discusses ‘infant and young child feeding’ without defining where one ends and the other begins. The term ‘toddler’ is equally problematic: a toddler can be as young as 12 months (Fox *et al*, 2006) or as old as three years (Carruth *et al*, 1998), making it also an infant or young child, or both. This inconsistency makes direct comparison between study findings difficult. My own use of the word ‘infant’ in this thesis refers to children no older than two years.

1.2.1 Milk feeding

The ideal first food is the infant’s own mother’s breastmilk (WHO/UNICEF, 2003), which provides not only all the necessary nutrients in a form appropriate to an immature digestive system but also growth factors and biological ‘triggers’ that stimulate the endocrine and immune systems (Lawrence and Lawrence, 2005). In addition, breastmilk contains immunoglobulins (antibodies) that provide protection against a wide range of infections – both those the mother has contracted in the past and those she encounters on a day-to-day basis (Prameela and Mohamed, 2010). It also varies in flavour according to the mother’s diet and is thought to prepare infants for the later introduction of other foods (Mennella, 1995; Mennella *et al*, 2001; Cooke and Fildes, 2011; Trabulsi and Mennella, 2012).

Breastmilk is all that the majority of infants need for the first six months of their lives (Butte *et al*, 2002; Kramer and Kakuma, 2012) and continued breastfeeding is recommended alongside other foods for at least the first two years (WHO/UNICEF, 2003). However, the most recent infant feeding survey in the UK (McAndrew *et al*, 2012) showed that 18% of

infants do not receive any breastmilk and a further 26% are breastfed, partially or exclusively, for less than six weeks. Infant formula is currently the best available alternative to breastmilk but, while it is an effective replacement for the majority of the nutritive components, it cannot supply the anti-infective and ‘trigger’ factors that play such an important protective role (Lawrence and Lawrence, 2005).

Not only is breastmilk the ideal food, *breastfeeding* is the ideal mode of delivery. The action of breastfeeding has been shown to have beneficial physical effects independent of the milk itself – for example, on the health of the middle ear (Aniansson *et al*, 1994) and on jaw development and dentition (Palmer, 1998; Corruccini, 1999; Neiva *et al*, 2003; Viggiano *et al*, 2004; Peres *et al*, 2007). Sucking on a bottle teat does not exercise the muscles of the jaw, tongue and palate in the same manner as suckling at the breast (Woolridge, 1986; Palmer, 1998). Thus, in the same way that infant formula is a less-than-perfect *breastmilk* substitute, so bottle feeding is a non-ideal *breastfeeding* substitute.

Not breastfeeding, or breastfeeding for a short period only, has been shown to increase the risk that the infant will develop a number of illnesses in childhood, including otitis media (Aniansson *et al*, 1994), gastroenteritis (Quigley *et al*, 2007; Ladomenou *et al*, 2010), childhood leukaemia (Kwan *et al*, 2004), diabetes (Alves *et al*, 2011), lower respiratory tract infections (Bachrach *et al*, 2003), asthma (Dogaru *et al*, 2014), atopic dermatitis (Greer *et al*, 2008) and food allergies (Grimshaw *et al*, 2013). Overall, the risk of hospitalisation for the treatment of infections is increased in infants who are not breastfed (Paricio Talayero *et al*, 2006). There is also evidence that cognitive development may be reduced (Belfort *et al*, 2013; Victora *et al*, 2015) and the risk of sudden infant death increased (Vennemann *et al*, 2009). While the specific role of feeding method in infancy in relation to the development of cardiovascular disease (CVD) in later life (Parikh *et al*, 2009) has not been satisfactorily established, several studies have indicated that not breastfeeding increases the risk of obesity – itself a risk factor for CVD (van Gaal *et al*, 2006) – in childhood, adolescence and adulthood (Gillman *et al*, 2001; Arenz *et al*, 2004; Harder *et al*, 2005; Owen *et al*, 2005; Shields *et al*, 2006; Horta *et al*, 2007; Cathal and Layte, 2012; Weng *et al*, 2012).

1.2.2 The newborn as self-feeder

In English, the verb ‘to feed’ has two meanings, according to whether it is used transitively or intransitively. The Oxford English Dictionary (OED, 2010a) gives as the transitive definition, “*To give food to; to supply with food; to provide food for; to suckle (young); to put food into the mouth of; to supply with nourishment; to nourish, cause to grow, support, sustain*”. A transitive verb requires a subject, or doer, and a direct or indirect object, the person who is done to. Thus, in the statement, “The mother is feeding her baby”, the mother is understood to be ‘doing’ feeding to the baby. The intransitive definition of ‘to feed’ is: “*To*

take food; to eat” (OED, 2010a), as in, “The baby is feeding”. In this case the baby is the doer, or agent, not the one done to. As will be shown, this distinction is an important one.

Like the young of other mammals, human infants appear to be ‘programmed’ to seek the breast immediately they are born (Widström *et al*, 2011). Within about an hour of birth, provided he is not prevented from doing so by the actions of those present in the delivery room, the healthy, full-term infant will embark on a sequence of behaviours, such as bobbing his head and pressing his feet into his mother’s body, that result in his attaching to the breast and suckling (Righard and Alade, 1990; Porter, 2004; Colson *et al*, 2008; Cantrill *et al*, 2014; Moore *et al*, 2014). It seems likely, however, that this spontaneous behaviour:

“... *has nothing to do with nutrition at all. Rather, it is an innate neural program that the newborn must express in order for it to ensure all its basic biological needs.*”
(Bergman, 2010, Foreword)

The mother’s role during breastfeeding is to support her infant to feed by holding him in a way that enables him to attach and suckle (Mohrbacher, 2010). The infant is the active partner (Crow *et al*, 1980). He scoops up the breast, holds it in his mouth, and uses his jaw and tongue to strip the milk (Woolridge, 1986; Geddes *et al*, 2008). Infants commonly use their whole bodies, and especially their hands, to help them locate the breast and control their posture as they approach it (Colson *et al*, 2008; Genna and Barak, 2010) and they signal satiety by releasing the breast (Dewey and Lönnerdal, 1986). Yet, in spite of the fact that it is not possible to force an infant to breastfeed, while mammalian infants are generally described as *feeding from* their mothers, human infants are – in a subtle denial of their capacity for agency – more usually referred to as *being fed by* their mother.

From the first breastfeed onwards, demand feeding, that is allowing the infant to feed whenever he wants, for as long as he wants, ensures ongoing milk production sufficient to supply the normal, healthy, full-term infant’s needs for both food and fluid (De Carvalho *et al*, 1983; Dewey *et al*, 1991; Brown and Arnott, 2014). Provided his mother’s ability to produce milk is not impaired and his feeding at the breast is effective, allowing the infant’s appetite to direct feeding is the most effective way to ensure he is adequately nourished (De Carvalho *et al*, 1983; Woolridge *et al*, 1990; Wilde *et al*, 1995).

1.2.3 The introduction of solid foods

At some point during the first year, exclusive breastfeeding (or formula feeding) gives way to a diet that should, ideally, consist of nutritious foods appropriate to the culture of parents and child (WHO, 2005; Skinner *et al*, 2008). The terms ‘weaning’ and ‘complementary feeding’ are both used in relation to this transition but they are not fully interchangeable, nor equally understood throughout the world. In the UK, in the context of infant feeding

'weaning' is generally taken to mean the first few months of solid feeding, whether the infant is breastfed or bottle-fed (DH, 2011); in the USA, and in many developing countries, 'weaning' means the cessation of breastfeeding, which may occur before or after the introduction of solid foods. The term 'complementary feeding' is favoured by international agencies to describe the overlap of solid foods with breastfeeding, acting as a reminder that the first solid foods are intended to add to, or *complement*, breastmilk, rather than replace it (WHO, 2002). Sellen and Smay (2001) have defined weaning as, "*the process of transition of the infant from exclusive breastfeeding to exclusive reliance on foods other than breastmilk*" (p.49). On this account, weaning begins with the infant's first mouthful of anything other than breastmilk – including infant formula – and ends with his last breastfeed. A pragmatic definition, that can be applied equally to breastfed infants and to those fed exclusively or partially on formula, is:

Weaning is the process by which the infant moves from full reliance on breastmilk or infant formula to full reliance on other foods.

This definition is adopted for the purposes of this thesis. However, for reasons that will be explained, all the infants in the current study had in fact been exclusively, or almost exclusively, breastfed prior to taking part in the research.

The age at which weaning starts varies across time and cultures, from less than one month old to as late as two years (Dettwyler, 1987; Bentley *et al*, 1991; Jarosz, 1993), while the age of cessation of breastfeeding is more variable still (van Esterik, 2002). In the absence of robust evidence-based guidance the introduction of solid foods was, until recently, largely directed by doctors, based on their own observations, or determined by the parents' family and cultural norms. In the USA and UK, in the early part of the 20th century, infants commonly received no foods other than milk until they were nine months or a year old (Liddiard, 1934; ACON, 1958). In the middle years of the century fashion swung the opposite way, with babies being introduced to sieved foods from as young as a few days, and usually by six weeks (ACON, 1958; Oates, 1973). In 1963, Dr. Benjamin Spock, a popular writer on infant care, stated in his advice to mothers, "*There's no set age when it's important to start solid food. [...] Nowadays doctors customarily recommend the first solid food sometime between 1 and 4 months.*" (Spock, 1963, p.126)

By the mid-1960s, there was a general consensus amongst health professionals that three months was a reasonable age for weaning to commence (Gunther, 1971). In 1976, the UK Ministry of Agriculture, Fisheries and Food stated that solid feeding should not begin before four months of age and that a variety of foods should be introduced from 'about six months onwards' (MAFF, 1976). In 1994 the Committee on the Medical Aspects of Nutrition (COMA) confirmed that the introduction of other foods should take place between four and six

months (DH, 1994). Subsequent research has shown that breastmilk alone provides adequate nutrition for the majority of infants for about the first six months of life (Krebs, 2000; Butte *et al*, 2002), and that the physical health benefits of breastfeeding for both mother and infant are greatest when it is practised exclusively during this period (Kramer and Kakuma, 2012). Giving other foods to breastfeeding infants younger than this not only introduces substances, such as complex carbohydrates, for which their body may not be physiologically ready (Walker, 2001), it also reduces their intake of breastmilk (Heinig *et al*, 1993), thereby diluting its protective effects.

Early introduction of solid foods has been linked in several studies to childhood obesity (Wilson *et al*, 1998; Sloan *et al*, 2008; Brophy *et al*, 2009; Griffiths *et al*, 2009; Schack-Nielsen *et al*, 2010), although, in a review of these and other studies, Moorcroft *et al* (2011) found no clear association between the two, highlighting methodological issues such as different definitions of 'early' versus 'late' and the use of different outcome measures as problematic. More recently, Huh *et al* (2011) found an increased obesity risk for formula-fed infants who receive solid foods early, but not for breastfed infants. Hendricks *et al* (2006) and Kuo *et al* (2011) have suggested that the apparent protective effect of breastfeeding against overweight may be through its link with a later introduction of solid foods, while Weng *et al* (2012) considered that there was sufficient evidence for a moderately protective role in relation to obesity for both breastfeeding and the later introduction of solid foods. The work of Moss and Yeaton (2014) points to an additional, combined effect.

In line with the information available at the time, the World Health Organization recommended, in 2002, that infants should be exclusively breastfed for the first six months of life (WHO, 2002). This recommendation was adopted by the Departments of Health for England and Wales and Northern Ireland in 2003, and by the Scottish parliament in 2009, and remains the current recommendation throughout the UK (DH, 2011; HPA, 2011; NHS Health Scotland, 2014). Although this stance has been challenged (Agostini *et al*, 2008; Quigley *et al*, 2009; Fewtrell *et al*, 2010; Fewtrell, 2011), this has been largely on the basis that the introduction of solid foods from 17 weeks has not been shown to be actively harmful. The authors of these papers have in turn been criticised for their lack of scientific rigour and for their focus on the risk of specific diseases, rather than on developmental readiness for solid foods and the overall goal of optimal health and development (Cattaneo *et al*, 2011). Cochrane considers that the weight of current evidence refutes the need for the majority of infants to be offered foods other than breastmilk prior to six months of age (Kramer and Kakuma, 2012). The current study proceeded on this basis.

So far, in the UK, the recommendation to defer solid foods until six months has not been reliably followed, which Hoddinott and colleagues suggest may be for a variety of reasons:

“The introduction of solids is often an intuitive process and is triggered by the meanings attached to changes in the baby’s behaviour and to parental priorities. The meaning of food is not just about or even about health and nutrient value, but includes comfort, entertainment, pleasure, a desire to demonstrate developmental progress, to be ‘advanced’ and fit the desired social network, norm for infant growth and development.”

(Hoddinott *et al*, 2010, Summary, p.v)

Factors such as advice from respected family members and the influence of commercial baby food companies are also known to outweigh the ‘official’ recommendations when parents are making decisions about weaning (Anderson *et al*, 2001; McDougall, 2003; Alder *et al*, 2004; Wright *et al*, 2004; Arden, 2010; Schwartz *et al*, 2013; Moore *et al*, 2014). In the UK, 30% of mothers have already started their infants on solid foods by the time they are four months old, and 75% have done so by five months, even though they may be aware that this is not recommended (McAndrew *et al*, 2012). In the USA, 40% of mothers currently introduce solid foods before four months (Clayton *et al*, 2013), although there is a tendency for breastfed infants to receive solid foods later than those fed on formula (Grummer-Strawn *et al*, 2008).

1.2.4 Nutrition in infancy – summary

Human breastmilk provides the best nutrition for human infants. Breastmilk contains the nutrients required for optimal growth and offers protection against a variety of diseases, sometimes into adulthood, while the action of feeding at the breast confers additional health benefits. The healthy, term infant is capable of feeding himself at his mother’s breast and of stimulating her to produce milk sufficient for his needs through reliance on his own appetite. The current worldwide recommendation is for breastfeeding to be exclusive for the first six months and for solid foods to be added to the infant’s diet from then onwards, although in practice many infants currently receive their first non-milk foods well before this age.

1.3 The infant at six months

The six-month-old infant is not the same as a newborn. He has a growing sense of who he is and the relationship with his caregivers has evolved. He also has many more capabilities than he did at birth, which allow him to pursue more active interaction with his caregivers, and with the world around him.

1.3.1 The infant as an individual

By six months, the infant is an able and social person. He has a ‘sense of a core self’ (Stern, 1985), such that he recognises others as separate beings. Provided he has received warm,

responsive parenting, he will have established the basis of a secure attachment with his main caregiver – usually his mother (Bowlby, 1988). This is the person whose face, voice, touch, taste and smell he has learned to trust (Erikson, 1998). This relationship manifests itself as a two-way ‘attunement’, or synchrony, in which the infant seeks out his mother’s face and attempts actively to engage with her (Tronick *et al*, 1978; Feldman, 2007). When he signals a change in his emotional state, she, in turn, responds by adjusting her engagement with him (Schoore, 2001). By six months he is beginning actively to look to her for cues as to how to respond in new situations (Vaillant-Molina and Bahrack, 2012). This ‘intersubjectivity’ (Trevarthen and Aitken, 2001) represents a physiological as well as a psychological connection. It stimulates the release of oxytocin in both participants, which induces a feeling of well-being, counteracts the effects of cortisol, and facilitates the development of the maternal-infant bond (Esol, 2010; Atzil *et al*, 2011). It is particularly important for the regulation of stress in the infant (Schoore, 2001) and directly influences the structure of his brain, determining which neural pathways are ‘pruned’ and which reinforced (Gerhardt, 2004).

Feeding, and especially breastfeeding (Else-Quest *et al*, 2003), is at the core of the developing relationship between mother and infant. The physical closeness and sensual nature of feeding, together with the rise in the level of oxytocin in his bloodstream, means that the act of feeding helps to establish an association in the infant’s brain between food, nurturing and love (Sunderland, 2007). Breastfeeding also appears to provide some protection for the mother against postnatal depression (Ip *et al*, 2007), a condition that has been shown to interfere with maternal-infant bonding (Moehler *et al*, 2006). The introduction of the first solid foods signals the eventual end of this physiological connection and represents a new experience for the infant in relation to his interaction with his mother during feeding, as well as with the food itself.

1.3.2 Physical development

During the first six months the infant’s physical abilities advance significantly. Gross and fine motor skills develop in tandem, with control beginning centrally and moving towards the extremities (Smitsman, 2004). By about three months, the infant can wave his arms symmetrically while lying on his back, bring them together into the midline over his chest or chin, and clasp and unclasp them (Sheridan, 1973). However, he is unable to do this with the same degree of skill when in a vertical position because his ability to support his head and spine is still poor. Stability of the head and trunk is a pre-requisite for accurate reaching and grasping because the infant needs to be able to hold his head and neck steady in order to maintain his gaze on the target object (Rochat, 1992). He also needs to be able to use his trunk as a counter-balance to the movement of his arms, thereby permitting effective two-

handed reaching and handling (Rochat and Goubet, 1995; Thelen and Spencer, 1998; Spencer *et al*, 2000). Control over the upper trunk is normally gained by about four months and of the lower trunk by six to seven months (Gallahue and Ozmun, 2002; Smitsman, 2004). Most infants of six months are able to sit with sufficient stability to enable accurate reaching and the use of both hands together (Sheridan, 1973; van der Fits *et al*, 1999; Adolph and Berger, 2011). Perone *et al* (2008) have pointed out that this makes this age ideal for studying the relationship between activity and objects in the world of an infant; it also coincides with the age currently recommended for the introduction of solid foods, making it equally ideal for studying how infants approach food.

By six months the infant can grasp small objects purposefully, using his whole hand. This is commonly termed a 'palmar' grasp but is more accurately defined as an 'ulnar' grasp, since the fingers close together against the palm (Keenan and Evans, 2009). He can adapt his grasp according to the dimensions of the object (Newell *et al*, 1989). He takes most things to his mouth, to move against his lips, lick, and suck (Sheridan, 1973). However, until about nine months he is not able to release an object from his fist voluntarily, or drop or throw it purposefully, nor use his thumb and forefinger in a 'pincer' grip to pick up small objects or crumbs (Gallahue and Ozmun, 2002). At six months, then, most infants can pick up reasonably sized pieces of food and, provided they are not fully enclosed in their fist, use their mouth to explore them (Wright *et al*, 2011).

At birth, the infant's senses of hearing, touch and taste are already well developed (DeCasper and Fifer, 1980; Muir, 2002; Ganchrow and Mennella, 2003), and his sense of smell is acute (MacFarlane, 1975; Varendi *et al*, 1994; Varendi and Porter, 2001; Porter, 2004). Vision is the only sense that he has not able to make use of in utero, which may explain why it is less well developed than the others when he is born. However, by six months the infant's vision is nearing adult acuity (Slater *et al*, 2002); depth perception and colour vision are well established and he can discriminate between different shapes and patterns (Gallahue and Ozmun, 2002; Kellman and Arterberry, 2006; Keenan and Evans, 2009). Infants of this age have been shown to use memories of the visual appearance of objects to make accurate predictions about how best to grasp them (Savelsbergh *et al*, 1997; Denison *et al*, 2013).

Self-feeding skills

In parallel with his manipulatory skills, the six-month-old infant has developed a range of oral motor skills that allow him to manage foods that require chewing (Wickenden, 2000; Naylor, 2001). In addition, there have been changes, since birth, to the structures in his head and neck; crucially, the position of his larynx is now lower, giving more space within the oral cavity (Delaney and Arvedson, 2008). He is able to 'munch' food with an up-and-down

movement of the lower jaw and is beginning to use his tongue in a lateral manner, enabling him to move food to the sides of his mouth for chewing (Naylor, 2001). He has lost the innate tongue protrusion (or 'tongue thrust') reflex, which spontaneously pushes non-liquids out of the mouth. However, the area on his tongue where the gag reflex is triggered is still around the mid-section, having only just begun to move to its one-year (and near-adult) position in the posterior third. This means that gagging will happen readily if food, or a spoon, is pushed beyond this point (Naylor, 2001).

The ability to make chewing movements is independent of the eruption of teeth. Although the first teeth commonly appear at around six months, these are incisors or 'front' teeth, which are used for biting, not chewing. Premolars and molars, also known as 'cheek' teeth or 'double' teeth, do not normally begin to appear until after the first birthday (Carruth and Skinner, 2002). In the absence of teeth, anecdotal evidence suggests that gums are effective for chewing all but the toughest foods. Rudimentary biting and chewing skills are normally present by six months, whether or not the infant has had experience with semi-solid foods by then (Naylor, 2001). However, he needs the opportunity to practise these skills if he is to become truly proficient in them (Illingworth and Lister, 1964; Archambault *et al*, 1990; Naylor, 2001; Northstone *et al*, 2001; Delaney, 2010). My own clinical experience as a health visitor suggests that many parents believe puréed foods to be necessary prior to the eruption of the first teeth because they require little or no chewing. Carruth and Skinner (2002) echo this belief when they refer to a link between the eruption of teeth and the ability to manage "*firmer*" foods. However, their own findings do not support this connection. For the children in their study, the mean age for being able to chew firmer foods was ten and a half months, while that for the eruption of the first molar, or chewing tooth, was 15 months. By 20 months, all the children were reportedly able to chew and swallow firmer foods, even though some still had no cheek teeth.

Between six and nine months the infant becomes able to collect together a bolus of food on the tongue and move it deliberately to the back of the mouth for swallowing. At the same time, he develops the ability to swallow independently of the sucking movement (Naylor, 2001). According to Logemann (1998), swallowing is a conscious, sequenced event that relies on "*sensory recognition of food approaching the mouth*" (p.24). This suggests that the infant's swallowing abilities may be enhanced if he is able to use a variety of senses to anticipate the entry of food to his mouth.

Naylor and Morrow (2001) have noted that the development of oral motor skills keeps pace with the maturation of the infant's digestive and immune systems in what they have termed a "*convergence of maturation*". They suggest that visible outward signs are a good indicator of true developmental readiness for solid foods, since the ability to chew and swallow solid

foods appears at the point at which the infant is also becoming able to digest them and beginning, nutritionally, to require them. When the normal development of gross and fine motor skills and hand-eye coordination is added to the picture, the six-month-old infant can be seen to be well equipped to continue to feed himself as he transitions to solid foods (Rapley, 2003; Wright *et al*, 2011).

1.3.3 The drive to learn

The development of muscular control sufficient to enable precise, purposeful movements proceeds gradually, from birth onwards, partly as a result of simple physical maturation and partly through what appears to be the infant's innate desire to explore his environment (Gopnik *et al*, 1999; Gallahue and Ozmun, 2002). Schore (2001) suggests that this desire is fuelled by the developing relationship between infant and mother. The drive to learn is thought to be linked to basic survival instincts (Gallahue and Ozmun, 2002) but also to a simple 'need to know' (Gibson, 1988), with infants as young as two months having been shown to be capable of remembering objects and incidents (Rovee-Collier, 1999). Jean Piaget (1896-1980) believed that children are active participants in their own learning (Doherty and Hughes, 2009) but that motor development precedes skill acquisition (Sternberg, 2002). However, a more recent view is that the two go hand in hand, constituting a 'dynamic system', in which perception and action are inseparably linked (Thelen, 1989; Thelen *et al*, 1993; Thelen, 1995; Thelen and Spencer, 1998; Spencer *et al*, 2000; von Hofsten, 2004). On this account, the wish to act on the environment stimulates the infant to use and coordinate his muscles, which in turn strengthens his physical capacity and makes more sophisticated movements possible. For this to work, there has to be a task that requires doing; thus, the acquisition of reaching skills depends on there being something to be reached *for* (Lobo and Galloway, 2008). If the infant is not able to act on his environment and regulate his relationship with it, his learning will be restricted. Indeed, for infants under about nine months certain types of learning are possible *only* through direct action, since it is not until this age that they are able to transfer what they learn about action-effect relationships from watching others, to their own actions (Hauf and Auschersleben 2008; Gerson and Woodward, 2014). The opportunity to act purposefully on his environment would therefore appear to be crucial for the optimal further development of the infant of six months (Gibson, 1987; Palmer, 1989).

Ryan and Deci (2000) have said that motivation to act may be extrinsic, that is, stimulated by the promise of a separable outcome, or intrinsic, that is, prompted by the desire to engage in an activity for its own sake. It is not clear which of these predominates for infants. The 'survival' theory implies intrinsic motivation, namely, an innate drive to explore the environment, whereas a dynamic systems approach suggests that the presence of a task

acts extrinsically, as a call to the infant to act. Whatever may be the main driver, it remains the case that:

“The human organism is inherently active, and there is perhaps no place where this is more evident than in little children. They pick things up, shake them, smell them, taste them, throw them across the room, and keep asking “What’s this?” They are unendingly curious, and they want to see the effects of their actions.” (Deci and Ryan, 1985)

1.3.4 Learning through the senses

Learning can occur via any one of the five senses but it is enhanced if more than one sense is stimulated at the same time, since this allows connections to be made between modalities (Parma *et al*, 2011; Woods and Wilcox, 2013). Infants under six months old are already able to make links between, for example, the oral or manual feel of an object and its visual appearance (Meltzoff and Borton, 1979; Rochat, 1989). Manipulation of objects makes available still more information: it enables recognition of the object by its haptic qualities as well as by its visual features (Keenan and Evans, 2009); it allows it to be seen from more than one angle, so enhancing visual learning (Ruff, 1989) and facilitating appreciation of its three-dimensional nature (Soska and Johnson, 2008; Soska *et al*, 2010; Möhring and Frick, 2013); it provides information about temperature, texture, rigidity, size and weight, and allows sounds to be generated (Palmer, 1989; Bushnell and Boudreau, 1993; Bourgeois *et al*, 2005). Infants as young as five months are able to make connections between appearance, flavour and intra-oral texture, and to categorise objects in a rudimentary fashion (Younger and Fearing, 1999; Xu and Garcia, 2008; Bornstein and Mash, 2010; Wright *et al*, 2010; Brown and Lee, 2011a). It is therefore possible that the opportunity to examine food both visually and manually prior to tasting it has the potential to enhance subsequent visual recognition of that food.

Reaching and grasping also serve to transport objects to the nose, for smelling, and to the mouth, for oral exploration (Ruff, 1984; Palmer, 1989; Rochat, 1989). The mouth is more sensitive to touch and temperature than the fingers, and is the infant’s primary means of discriminating between textures as well as tastes. Oral investigation also provides information about the shapes of objects (Melzoff, 1999). Examination of an object with the mouth therefore gives the infant access to information that is similar to, but different from, that obtained through the hands. Oral exploration usually precedes manual exploration and occurs less as manual dexterity improves. This may reflect simple maturation (Spencer *et al*, 2000) or the fact that increasing trunk stability allows both hands to be used together (Rochat, 1989), or it may be an indication that orally acquired information is less important to the infant as he becomes more familiar with an object (Ruff, 1980).

The literature review revealed that oral investigation has tended to be described by writers on infant development mainly in terms of learning about objects, rather than as a precursor to self-feeding. This may be because in the industrialised world, where the majority of the studies of infant behaviour have been carried out (Penn, 2005), infants have usually been introduced to solid foods before they are able to sit sufficiently stably to handle objects, and therefore food, efficiently. As will be seen, the necessary use of spoon feeding in these circumstances further restricts the possibility for exploration of the food with the lips and tongue. Thus, the possible relationship between the oral exploration of objects and of food has rarely been considered. Rochat (1989) found it:

“interesting to note that at the time bimanual action appears to be reorganized with the emergence of fingering behavior (4 months), infants are often being introduced to solid food [...]. The haptic capacity of the mouth might progressively become more focused within the context of nutrition.”

(Rochat, 1989, p.882)

With the minimum age at which solid foods are known to be required for nutrition now revised to six months (WHO, 2002), it is clear that infants are already capable of acquiring some haptic information about food, and of taking it to their mouth for preliminary oral exploration, *before* they are developmentally ready to experience it inside their mouths. The connection between oral and manual exploration of objects may therefore be more closely related to feeding than previously thought, and possibly even integral to a thorough understanding of how infants spontaneously engage with food.

How infants respond to, and act on, novel objects has been well documented, in particular by Ruff and colleagues (Ruff, 1980, 1984, 1986, 1989; Ruff *et al*, 1992) and Palmer (1989). They describe looking, fingering, squeezing, picking up, rotating, transferring, banging and dropping (Ruff, 1984; Palmer, 1989), as well as touching with the lips and tongue (mouthing) and gnawing (Ruff, 1980; Ruff *et al*, 1992). Rochat emphasises the importance of poking, scratching and squeezing in the transition from reaching to grasping, enabling *“fine haptic scanning”* (Rochat, 1989, p.882) in the period before true grasping appears.

As he assimilates information, the infant varies his actions according to the properties he detects (Ruff, 1984), in what Gibson refers to as *“a kind of spiralling evolution”* (Gibson, 1988, p.35). He starts to manipulate objects purposefully, for different reasons – to experiment and explore rather than merely to experience and discover (Gallahue and Ozmun, 2002). As manual exploration becomes more expert, the links between vision and touch are enhanced (Gibson and Walker, 1984), with the ability to use both hands together or in parallel opening up yet more possibilities (Gibson, 1988). Discovering information about objects’ boundaries, and about common features of texture and shape, helps the

infant to learn to segregate things that are touching one another (Ruff, 1984; Needham, 2000) and is the basis for object individuation and categorisation (Gibson, 1988; Quinn, 2002; Wilcox *et al*, 2007). Over time, the infant learns to anticipate his own actions, planning and preparing for how he will grasp an object as he begins to reach for it (Savelsbergh *et al*, 1997; Denison *et al*, 2013). Having a sense of what objects are and what they can do is also a pre-requisite for talking about them and sharing them with others (Lock, 2001). The opportunity for object manipulation would therefore appear to facilitate not only the gathering of information but also physical development, cognitive function and language acquisition (Keenan and Evans, 2009). It follows that the opportunity to handle food may be similarly beneficial.

1.3.5 The nature and role of exploratory play

The interaction displayed by infants of six months with objects that interest them is often referred to as 'playing'. However, this is not play in the adult sense of relaxation or fun, nor is it the imaginative, or pretend, play common amongst older children (Hughes, 2010), nor yet the symbolic play that appears at around eight months (Sheridan, 1977). It is *exploratory* play, and its purpose is learning (Lock, 2001). Thus, while an infant of six months may take an unfamiliar spoon to his mouth, this is because he wants to explore it orally, not because he understands its function as a feeding tool (Fenson *et al*, 1976; Belsky and Most, 1981).

Definitions of play are legion (Pellegrini *et al*, 2007) but there is a general consensus that exploratory play differs from other types of play in certain key respects. In particular, it is usually solitary, undirected and accompanied by expressions of concentration rather than joyfulness (Lewis, 2002). Lock (2001) has noted that an infant's level of engagement with objects rather than people increases from the end of the fifth month, with the infant typically losing interest in face-to-face interactions and becoming "*engrossed by objects that [he] can manipulate*" (p.380). This coincides with the development, through practice, of the ability to focus attention, which requires learning to 'tune out' competing sensations (Gopnik, 2009). Bruce (2004) describes older children "*plunging deep and wallowing*" (p.162) in undirected play and maintains that the opportunity to do this increases confidence and encourages exploration and experimentation. This notion of wallowing is similar to the concept of 'flow', a state described by Nakamura and Csikszentmihalyi (2002) in which the individual is completely absorbed in what he is doing and existing 'in the moment', and which facilitates learning (Rathunde and Csikszentmihalyi, 2007). Wallowing and flow are both characterised by expressions of concentration rather than pleasure, a phenomenon described by Lewis (2002) as a tripartite model, in which, for infants, 'interest' forms a dimension that is separate from the pleasure-distress continuum.

The appearance of focused interest rather than obvious 'fun' is the reason why some writers (e.g., Weisler and McCall, 1976) prefer to describe investigative play as 'exploratory behaviour', reserving the word 'play' for activities that are more suggestive of pleasure than learning. Hughes (2010) alludes to a similar distinction but is less definite, identifying 'play with objects' as something that occurs both as part of sensorimotor, or 'practice', play and as part of symbolic play, "*although in different ways, of course*" (p.63). Hutt, however, is very clear that these are distinct activities, maintaining that infants and older children must first explore an object before they can play with it (Hutt, 1966, cited by Power, 2000). Langston and Abbott (2010) assert that even older children need to explore materials at a sensory level before they can use them to produce an end product. This suggests that it may be important to allow children to 'play' with their food.

While the underlying purpose of exploratory play may be to acquire information about the uses and dangers of objects in order to ensure survival (Power, 2000), a more immediate goal for the infant would seem to be simply to determine what an object is and what it can do. Only when these basic attributes have been established is further experimentation possible, thereby leading to discoveries about what the infant can do *with* it (Hutt, 1966, cited by Power, 2000). J.J. Gibson coined the term 'affordances' to denote the attributes of an object that contribute to an agent's interaction with that object. Greeno (1994), in his paper on Gibson's affordances, points out that what an object 'affords' depends on the abilities of the agent: "*Neither an affordance nor an ability is specifiable in the absence of specifying the other*" (p.338). In other words, what an object offers one infant may be different from what it offers another. It is what an object affords him that the infant seeks to uncover through exploratory play:

"Within seconds of interaction with a novel object, young infants display manual actions that are appropriate to potentially maximize the affordances of the object." (Rochat, 1989, p.882)

E.J. Gibson (1988) has identified three aspects of exploratory behaviour: perceptual, motor and knowledge-gathering. These are interlinked, in that acting on an object helps the infant to make connections between its appearance and what it can do (Perone *et al*, 2008). This forms the basis for the subsequent development of tool-using abilities (Lockman, 2000), as well as the capacity to think abstractly about events that have not happened but which might happen (Gopnik *et al*, 2004). Experience in everyday life suggests that adults are often keen to show an infant how something 'works', or what it is 'for', but the intended function of an object (as defined by an adult) is of no consequence to a very young child; he is interested only in the possibilities it offers *him*. His understanding of its function may be very different from an adult's (Perone and Oakes, 2006). Indeed, far from being unaware of what an

object can do, an infant is likely to find that it affords far more than an adult, who already knows what it is 'for', may perceive, because the infant's experiments are designed to go beyond what he already knows (Gibson, 2000).

Some researchers have espoused the notion of 'mastery motivation' to explain why infants act as they do (Jennings *et al*, 1979; Yarrow *et al*, 1983; MacTurk *et al*, 1987). This thinking revolves around the concept of mastery of a skill, or achievement of a desired task. However, studies of this type face "*the problems associated with experimenter- versus child-defined motivated behaviors*" (MacTurk *et al*, 1987, p.203). Infants younger than about 18 months do not have the capacity to imagine hypothetical results or indulge in counter-factual, or abstract, thinking (Gopnik and Meltzoff, 1986; Gopnik *et al*, 2004). The gathering of factual information and the accumulation of causal knowledge, that is, knowledge relating to why things happen, must necessarily come first, since it is this data that must be manipulated in order to make predictions. To talk, as do Yarrow *et al* (1983), of an infant's "*success*" at ringing a bell by pulling a string presumes that this was what the infant set out to do, and that he knew in advance that this was either the intended or the only likely outcome. If he repeats the action he may, as suggested (Yarrow *et al*, 1983), be relishing his "*mastery*" of the task – or he may simply be trying to discover whether the same thing, or something different, will happen. E.J. Gibson has noted that "*[e]xploratory play, even at a very early age, is controlled by some anticipation of an outcome.*" (Gibson, 1988, p.3). The key word here would appear to be '*an*': the infant is interested in the consequences of what he does, whatever those may be. He anticipates that something will happen but his focus is on the totality of what a novel object offers, not on achieving any one particular result. He may even be satisfied with no outcome, provided he feels he has exhausted all the possibilities. At this point he can be said to be 'familiar' with the object and he will tend to lose interest in it (Bendersky and Sullivan, 2002), whether or not he has found out what it is 'supposed' to do. It seems more plausible that an infant's key source of motivation, whether primarily intrinsic or extrinsic, is the potential for *unlimited* possible outcomes, rather than the achievement of any one.

Play and food

Power (2000) has compared research involving observations of the ways in which human infants approach novel objects with that focusing on other young primates in similar situations. He notes that, while the various researchers chose to document different sets of behaviours, there were commonalities across both animal and human studies. He identifies five categories of behaviour common to both: procuring, investigating, transforming, relating, and "*other gross motor activities*", each of which contains largely the same individual behaviours – a fact Power considers "*striking*", and suggestive of "*an evolutionary basis*"

(p.58). Power (2000) also highlights a number of similarities between the exploratory behaviours of non-human infant primates in response to novel objects, and those prompted by novel foods. This suggests that the young primate may view food as just another object, when first presented with it, only discovering later, through exploration, that it is edible.

E.J. and J.J. Gibson both point to a possible connection between a human infant's exploration of objects and his learning about food:

"The child learns what things are manipulable and how they can be manipulated, what things are hurtful, what things are edible, what things can be put together with other things or put inside other things – and so on without limit."

(Gibson, 1966, quoted in Gibson, 2000, p.55, my emphasis)

Gibson and Walker (1984) have suggested that learning to distinguish between rigid materials and those that are spongy may provide information about which foods are easily chewable and which will require more effort, or turn out to be inedible. Such discoveries may also give an indication of density and calorific content.

Gopnik *et al* (1999) have observed that:

"Six- or seven-month-olds will systematically examine a new object with every sense they have at their command (including taste, of course)."

(Gopnik *et al*, 1999, p.87)

The reference to taste appears to be an acknowledgement that infants tend to take novel objects to their mouths. However, presented as an aside like this it does scant justice to the fact that, when applied to food, the instinct to taste makes perfect sense, and that licking and mouthing may be important ways for infants to discover whether or not an object is both edible and safe to eat. Clearly, for infants to make these discoveries they must be allowed to handle edible things.

In his comparison of studies of primate young, Power (2000) notes several reported differences between the behaviours of human and non-human primate infants when faced with novel objects, the majority of which he considers *"undoubtedly reflect differences in the stimuli and coding systems employed in the studies used"* (p.58). He concludes, however, that three of the behaviours noted to be present in other primates are likely to be truly absent in human infants, namely buccal prehension (use of the mouth to pick up an object), object sniffing and object licking. He suggests that the absence of observed sniffing and licking in human infants reported by the researchers was *"probably a function of the more limited role of olfactory exploration in humans vs. other primates."* (ibid.). While olfactory exploration may indeed play a lesser role in the evolved lives of humans than it does in other animals, this does not mean that the sense of smell is any less acute in human infants,

nor that they do not pay attention to odours in a way that adults may have ceased to do. Odour is known to play a part in the perception of flavour (Ganchrow and Mennella, 2003) and to be important to humans from birth (MacFarlane, 1975; Porter, 2004). Infants as young as seven months have been shown to display different exploratory behaviour towards scented objects, compared with unscented ones (Durand *et al*, 2008). Indeed, Keenan and Evans (2009) assert that infancy is a time for learning about smells and their associations. An alternative explanation for the fact that sniffing does not feature in the behaviours listed in the human studies identified by Power, or in those conducted by researchers such as Ruff (1980), is not that it was not present, but that it was simply not looked for.

Power (2000) notes that the animal studies he reviewed utilised different materials from those made available to the infants in the human studies, suggesting that this may have accounted for some of the differences in behaviour seen. However, he does not remark on the fact that the prior experiences of the infants in relation to novel items were likely also to have been markedly different. This offers a third potential explanation for the differences noted in relation to sniffing: It is probable that, by the time they are old enough to be enrolled in studies requiring manipulatory skills, non-human primate infants are already familiar with a wide range of items that have distinctive and varying odours, and have learned that smell is important. By contrast, human infants of an equivalent age are likely to have had little such experience and may already have begun to consider smell to be less important than other features of new objects. This notion is supported by evidence that visually impaired children rely more heavily on smell than fully sighted children (Ferdenzi *et al*, 2010). The lack of exposure of human infants, in the industrialised world in particular, to non-man-made materials has been highlighted by Goldschmied and Jackson (2004), who recommend that they should be frequently exposed to a variety of natural materials, including those with discernible odours, via a 'treasure basket', to enable the sort of multi-sensual learning that is not possible when only toys made of synthetic materials are available.

Many foods have properties similar to those toys categorised by Hughes (2010) as 'structured construction' (for example, bricks) and 'fluid construction' (sand, clay and paint). They may therefore offer similar opportunities for discovery, and for the honing of emerging skills. Indeed, Goldschmied and Jackson suggesting that handling food may provide "*a foretaste of play with messy things like sand and water, clay and paint*" (p.87). The use of these materials in play therapy with older children (Landreth, 2012) suggests that they also have an inherent psychological and emotional value. Duffy (2004) describes the importance of 'messy play' as part of nursery education, highlighting the involvement of all the senses as a key stimulant of creative, free play. She notes that food is often used for messy play with younger children and that mealtimes also provide an opportunity for this type of

learning. This is hinted at by Perry *et al* (2013), who point to the potential of mealtimes to be “*rich multi-sensory experience[s]*” (p.7).

The adult’s role in infant play

Gopnik (2009) has said that the infant is “*consumed with insatiable curiosity*” (p.35), and that his drive to learn is innate and unavoidable. Since he must act on the world if he is to learn about it and develop the necessary skills to live safely and successfully within it (Palmer, 1989; Gallahue and Ozmun, 2002), his need to do so is fundamental to his survival. Interrupting an infant’s exploratory play violates his autonomy (Ryan and Deci, 2000), that is, the freedom to make decisions for himself. It also risks interrupting both his physical and mental development. Even something as simple as picking up an object to hand it to an infant who is already reaching towards it may interfere with the calculations he has made about how to approach and grasp it (Thelen, 1995; Savelsbergh *et al*, 1997; Smitsman, 2004). There is also every likelihood that the adult’s perception of the task on which he is focused is not the same as the infant’s. Goldschmied and Jackson (2004) stress the importance of adults *not* intervening in children’s play and to “*the right of babies to be undisturbed*” (p.102). They say that adults should be “*attentive but not active*” (p.99) when children are engaged in exploratory play. This type of support is similar to the ‘scaffolding’ first described by Wood *et al* (1976), in which the task as defined by the infant is respected, and assistance is provided only in relation to those aspects of the task that he or she cannot manage alone.

1.3.6 The infant at six months – summary

By six months, the infant recognises and trusts his main caregiver, usually his mother, and shares a reciprocal relationship with her that operates on a physiological as well as a psychological level. Feeding forms a key part of this relationship and the introduction of solid foods constitutes a milestone in its development. The six-month-old infant is able to hold his head and trunk erect, which allows him to interact with the world around him, through reaching, grasping and manipulation. He is capable of picking up pieces of food, taking them to his mouth and exploring them with his lips and tongue. He is also beginning to be able to bite into foods, chew them, and deal with different consistencies and increasingly firm textures intra-orally. These abilities coincide neatly with his emerging need for nutrients not obtainable in sufficient quantities from breastmilk or formula alone.

The infant appears driven to explore his environment. He uses all his senses to acquire information, doing so most effectively when he can employ them in combination with one another. His learning activities are characterised by exploratory play, which appears to be prompted and directed by an open-ended desire to discover what objects can do and the possibilities they afford. Only once he has made these discoveries can the infant make use

of what he is presented with. Comparisons of the behaviours of human infants with the responses of non-human primates to both novel objects and novel foods suggest that, given the opportunity, human infants of six months may respond to unfamiliar foods in ways that resemble their responses to unfamiliar objects. Thus, they may wish to touch and act on food, and to explore it with all their senses. Since, at this age, all their nutrient needs are still capable of being met by breastmilk or infant formula, there is no reason to suppose that their motivation for engaging with food is necessarily hunger. Indeed, it may be the case that infants do not instinctively know what constitutes food, and that this is something they need to discover for themselves through exploratory play. Meanwhile, food may offer the infant learning opportunities that are not available from the other materials to which he has access.

Infants appear to learn most effectively when they are allowed to focus their attention and when their actions are not directed or interfered with. This in turn contributes to their overall physical and neurological development and well-being. The infant at six months, then, is poised to expand his self-confidence and physical skills, as well as to learn about food, through active engagement with edible objects.

1.4 Non-milk feeding in the first two years

Studies with a focus on the feeding of children under two years appear to fall into two categories. These can be broadly defined as reflecting the fields of nutrition and behaviour, that is, what and how much children eat, and how they behave at mealtimes. The need to understand these phenomena has become a priority in recent years, not least because of rising levels of childhood obesity, especially in developed countries (Wang, 2001; Dehghan *et al*, 2005; Wang and Lobstein, 2006; Dattilo *et al*, 2012; Ogden *et al*, 2012), and much recent research has focused on ways to educate and support parents to ensure good dietary habits in their offspring (Daniels *et al*, 2009; Ward *et al*, 2011). There is evidence that attitudes towards food and eating are, to a large extent, established during childhood (Kelder *et al*, 1994; Ashcroft *et al*, 2008; Nicklaus, 2009), and that the first two years may be critical in this regard (Skinner *et al*, 2002b).

1.4.1 The development of food preferences

Infancy has been shown to be an important period for the development of food preferences (Nicklaus and Monnerypatris, 2003). The attributes of food that have been studied most widely in relation to infants and young children are taste and oral texture. There are five basic tastes: sweet, salt, sour, bitter and umami (a savoury enhancer). Infants are able, from birth, to detect all of these except salt (Rosenstein and Oster, 1988; Ganchrow and Mennella, 2003; Beauchamp, 2009). Newborn infants show a preference for sweet flavours (Desor *et al*, 1973; Crook, 1978; Rosenstein and Oster, 1988) and have been found to have

a latent preference for salt that develops with experience and is modified by breastfeeding (Harris *et al*, 1990). The persistence of these innate preferences has been shown to be dependent on subsequent dietary experience (Harris *et al*, 1990; Sullivan and Birch, 1990; Liem and Mennella, 2003).

Less is known about the development of a liking for sour or bitter-tasting foods but Liem and Mennella (2003) found that children aged five to nine years had a greater liking for sour flavours than did adults. An aversion to bitter flavours, especially vegetables from the brassica family, such as cabbage, Brussels sprouts and broccoli, is believed to be present at birth in most individuals, with an arch-like mouth opening gesture being described as a response of newborns to such flavours (Steiner, 1979). This aversion is generally lost over time and with repeated experience but appears to be retained by those with a particular genetic predisposition (Reed *et al*, 1997; Keller *et al*, 2002; Turnbull and Matisoo-Smith, 2002; Newcomb *et al*, 2012). Umami has only recently been identified as a taste distinct from the other four. Preliminary research suggests that newborns are able to detect umami, even though they may not necessarily prefer it, and that breastfeeding tends to increase their acceptance of it (Beauchamp, 2009; Schwartz *et al*, 2012).

The five basic tastes combine with smell, and to some extent texture, to produce specific flavours (Ganchrow and Mennella, 2003). Infants who breastfeed have been shown to be more accepting of different flavours during the weaning period than infants fed on standard infant formula (Gerrish and Mennella, 2001; Forestell and Mennella, 2007; Maier *et al*, 2008; Beauchamp and Mennella, 2009; Shim *et al*, 2011). Several studies (e.g., Sullivan and Birch, 1994; Maier *et al*, 2007; Mennella *et al*, 2008) have shown that, when infants are repeatedly fed an individual flavour, they acquire an apparent liking for that flavour. In a longitudinal study, Williams *et al* (2008) found that older children accepted new foods more readily as their diet expanded, indicating that the wider the variety of food experiences a child has the less they are deterred by novelty. A similar mechanism may account for the findings of Birch *et al* (1998), that infants aged four to seven months who were fed a commercially prepared banana daily for ten days were subsequently more keen to eat a commercially prepared peach or pear, although the researchers acknowledge that there was a sub-taste common to all the commercial foods that was absent from home-prepared mashed banana, for which the infants did not show an increased liking.

Other studies have been concerned with the responses of infants/toddlers to the texture of food. Northstone *et al* (2001) found that the range of flavours and textures eaten at 15 months was less when 'lumpy' foods were introduced after ten months of age than when they were introduced before nine months. Similar differences in the range of foods eaten at 15 months were noted in the same cohort of children at two years (Northstone and Emmett,

2013) and seven years (Coulthard *et al*, 2009), reinforcing the apparent significance of the first year, at least, for later food preferences. Unfortunately, while the authors of these papers use the term 'lumpy' interchangeably with the phrase 'meals with lumps in', they offer no clear definition of either term, nor do they give examples of the foods so categorised.

In a study of 12 infants aged between four and eight months, Lundy *et al* (1998) found that those who had experienced lumpy 'applesauce' as well as, or instead of, puréed 'applesauce', were more accepting of diced 'applesauce' when offered it than were those who had experienced only the puréed format. The formats puréed, lumpy and diced were as defined by the manufacturer of the brand of baby food used. In a separate study reported in the same paper, the authors offered 12 infants (6-12 months) and 12 toddlers (13-22 months) the same puréed, lumpy and diced applesauce. They found that the infants preferred the puréed food, whereas the toddlers favoured the lumpy or diced format. They concluded that there appears to be a shift towards a liking for more complex textures as the infant matures. However, since this was a cross-sectional study, this apparent shift may simply reflect the formats to which the infants at these various ages had become accustomed. A further criticism of both studies is that all three textures were delivered by spoon. Effective clearance of a spoon containing lumpy or diced foods requires an action different from that needed for puréed food (Wickenden, 2010). Such foods may therefore present a difficulty for an infant who has not had the opportunity to adapt his technique. Since the ability to manage the food may be a factor in the infant's response to it, an alternative conclusion might be that it is the ability, and therefore the willingness, to manage a variety of textures *presented on a spoon* that increases with age and experience, not, or not solely, the willingness to accept lumpier foods *per se*.

The appearance of food has been shown to be of significance to children over two years of age (Carruth *et al*, 1998; Zeinstra *et al*, 2010) but no papers were identified that investigated its potential importance to infants. Mennella *et al* (2008) mention the possible influence of the colour of the food in their study of infants aged between four and nine months but they do not report that the infants were routinely given the opportunity to look at it. Maier *et al* (2008) actively instructed parents to touch their infant's lips with the spoon in order to elicit mouth opening, thereby effectively preventing the infant from seeing the food. One reason for the lack of attention to the issue of the appearance of food where younger infants are concerned may be a tacit recognition that, since the difference in appearance between foods when they are puréed or mashed is much less marked than it is between those same foods presented in graspable pieces, visual inspection will provide the infant with little useful information. Alternatively, omission of the opportunity for infants to look at food may be a deliberate research ploy, designed to save time or to reduce the chances that the food will be refused.

Food aromas are made up of many elements (Booth *et al*, 2010), any of which may prompt a response. However, although human infants are known to respond to smell, and infants of 12 months and older have been shown to be deterred by strong food odours (Wagner *et al*, 2014), no studies were found that considered the potential significance of food odour to infants under one year. In contrast, Ueno and Matsuzawa (2005) found that self-feeding chimpanzee infants unfailingly “sniff-licked” novel foods before ingesting them. Zdunek (2013) suggests that such behaviour offers the chance to anticipate flavour and make decisions about desirability, ripeness and decay, implying that it may be an important part of learning about food.

Newborn infants are very sensitive to touch, especially through their hands and mouths (Jacklin *et al*, 1981). In spite of this, the possible importance to infants and young children of the haptic properties of food appears not to have been explored. Both Carruth and Skinner (2002) and Connolly and Dalgleish (1989) studied children under two years of age and noted that they appeared to want to touch their food with their hands. However, they did not discuss why this might be. Given that the first two years comprise Piaget’s ‘sensorimotor’ stage of cognitive development, in which infants and toddlers interpret the world largely through their own actions (Keenan and Evans, 2009), it seems likely that they would wish to touch food, and may even need to do so in order to make sense of it, in the same way that non-human primate infants appear to do (Addressi *et al*, 2007; Jaeggi *et al*, 2008).

Newborn human infants are very sensitive to temperature (Hernandez-Reif, 2003). However, no studies were found that looked at the responses of infants to foods of different temperatures, although Holt *et al* (1962) noted that preterm infants showed no preference for either warmed or cold milk feeds.

1.4.2 Food refusal, neophobia and picky eating

The introduction of non-milk foods to the diet of the infant in the second half of the first year not only requires him to acquire a liking for a variety of flavours and textures, it also changes the dynamics of the feeding relationship. Behavioural feeding difficulties in childhood are reported to be common, especially during the pre-school years. Wright *et al* (2007) found that 20% of parents in a large population-based UK study perceived their children’s eating to be a problem, while Berlin *et al* (2009) refer to estimates of the prevalence of feeding problems in typically developing children ranging from 18% to 45%. De Moor *et al* (2007) found that 65% of 422 Dutch children aged 18-36 months had at least one feeding problem, although most were not considered severe.

Chatoor *et al* (1997) and Arts-Rodas and Benoit (1998) noted that the variation in terminology used to discuss difficulties with children’s eating did not help in understanding

the nature and extent of the phenomena in question. This confusion still exists. 'Feeding problems' is a frequently used expression but so also is 'feeding disorders' (Jacobi *et al*, 2008), a term which is itself commonly used interchangeably with the diagnosis of 'failure to thrive', in which infants demonstrate inadequate growth. Piazza *et al* (2003) alternate between 'feeding disorder' and 'feeding problem', defining the former as necessarily resulting in poor nutrition and the latter as potentially doing so. However, according to Johnson and Harris (2004), refusal of food that is sufficient seriously to affect health or growth rarely occurs without a pathological cause. Since such disorders require very different management from those that are behavioural in origin, this lack of distinction is unfortunate.

The majority of feeding problems reported in young children revolve around some degree of food refusal. However, the way in which 'refusal' and its counterpart, 'acceptance', are defined is not universal, and varies with the age and developmental abilities of the children being studied (Ganchrow and Mennella, 2003). Where newborn infants are concerned, researchers commonly deduce the infants' responses to different stimuli from their facial expressions, for example, frowning and lip puckering to indicate dislike (Rosenstein and Oster, 1988). In studies involving food, the willingness of the newborn to suck, and his resulting intake of a flavoured liquid, are frequently used as measures of his liking for it (Crook, 1978; Schwartz *et al*, 2012). For older pre-verbal infants, positive and negative body language and gestures, such as leaning towards the spoon, opening the mouth, turning the head, pushing away the spoon and spitting out the food, are key identifiers of acceptance (or liking) and refusal, with amounts ingested also used in some studies (Harris *et al*, 1990; Birch *et al*, 1998; Lundy *et al*, 1998; Maier *et al*, 2007; Mennella *et al*, 2008; Mennella *et al*, 2009). Children who are old enough to speak are commonly either videotaped during a meal (Addessi *et al*, 2005) or invited to indicate verbally their preferences, dislikes and willingness to eat (Birch *et al*, 1987; Sullivan and Birch, 1990). Comparisons between age groups are therefore problematic.

Refusal, or reluctance, to eat unfamiliar foods is usually termed 'food neophobia', while a refusal to eat familiar foods is referred to as 'fussy' or 'picky' eating (Dovey *et al*, 2008). There is disagreement over whether food neophobia and picky eating are distinct or related behaviours; some children show elements of both and some researchers, notably Carruth and her colleagues (Carruth *et al*, 1998; Carruth and Skinner, 2000; Carruth *et al*, 2004a), appear to consider the two as one entity. One relatively recent classification (WCEDCA, 2007) uses the term 'selective eating' to denote both restricted ingestion of known foods and refusal of new foods. The type of selective eating that has interested many researchers over the last decade (Wardle *et al*, 2003; Cooke, 2007; Maier *et al*, 2007; Bante *et al*, 2008; Mennella *et al*, 2008; Zeinstra *et al*, 2010; Blissett, 2011; Schwartz *et al*, 2011; Hausner *et*

al, 2012; Barends *et al*, 2013; Caton *et al*, 2013, 2014; De Wild *et al*, 2013) is that related to the consumption of fruit and vegetables, mainly because of the low intake of these foods in both children and adults in many industrialised countries, including England (HSCIC, 2013).

The Oxford English Dictionary defines neophobia as the fear or dislike of what is new (OED, 2010b). In the context of research on infant feeding, 'new' means foods which the child perceives as new. Food neophobia is generally accepted as a normal phenomenon in the pre-school years, emerging as the child becomes mobile, peaking soon after the second birthday, and gradually dwindling thereafter (Cashdan, 1998; Cooke *et al*, 2003; Nicklaus, 2009). It is thought to be a survival mechanism, ensuring that the child, who is beginning to move away from his mother, does not ingest something that may be poisonous (Birch, 1999). Cashdan (1994) proposes a 'sensitive period' in the first two to three years, during which children are learning which foods are safe to eat.

Birch and Marlin (1982) found that two-year-olds became increasingly willing to taste and eat an unfamiliar food as the number of occasions on which the food was presented increased. Their report does not indicate whether or not the children were encouraged to touch or sniff the food and the children's reasons for eating or not eating it were not sought; the researchers' focus was on the participants' apparent familiarity with the visual appearance of the food. In their review, Dovey *et al* (2008) concluded, similarly, that young children draw on their familiarity with the appearance of food to help them decide whether or not to eat it. Harris (1993) comments that, in her experience, young children often seem to be wary of green vegetables, and suggests that this colour may indicate a potentially bitter-tasting food. Bitter foods carry a high potential for poison or indigestibility, suggesting that avoidance of them may be innately programmed (Glander, 1982; Rozin, 1989). As noted above, no studies were found that considered the responses of younger infants to the appearance of food.

The term 'picky eating' has not been consistently defined, although a recent attempt has been made to identify a picky eater profile (Tharner *et al*, 2014). Generally, picky eating describes a child's rejection of either individual, unrelated foods or certain types or groups of foods, for example, vegetables, or foods of a particular texture or colour. This behaviour tends to limit the variety of food eaten (Dubois *et al*, 2007) and has been shown to be associated with the development of more serious eating disorders in adolescence (Marchi and Cohen, 1990). Research in the industrialised world suggests that picky eating, as defined by parents or other caregivers, is common in young children (Carruth *et al*, 1998; Carruth and Skinner, 2000). In one study in the USA, 19% of caregivers considered their infant of four to six months old to be a picky eater, with this figure rising steadily to 50% amongst caregivers of two-year-olds (Carruth *et al*, 2004a; Carruth *et al*, 2004b). Children

exhibiting neophobic or picky eating tendencies have been found to eat fewer vegetables and have a lower intake of vitamins than other children (Galloway *et al*, 2003; Galloway *et al*, 2005; Wardle *et al*, 2005) but this is not reported to constitute nutrient deficiency. Indeed, most children considered by their parents to be picky eaters have a nutritionally adequate diet (Carruth *et al*, 2004b; Johnson and Harris, 2004; Wright *et al*, 2007), suggesting that picky eating is identified by parents primarily in relation to foods that they wish their child to eat, rather than those that he actually needs to eat.

Some foods are rejected by the picky eater on the basis of texture. Smith *et al* (2005) suggest this may be a sign of over-sensitivity to oral touch while Nederkoorn *et al* (2015) link it to a general tactile sensitivity. Werthmann *et al* (2015) found that children aged between 32 and 48 months were more influenced by changes to the texture of a liked food than by alterations to either colour or taste. However, it appears that it may have been the change in the appearance of the food brought about by the change in texture that was influential, rather than the difference in intra-oral texture. Previously experienced negative post-ingestive consequences (such as vomiting), or concurrent illness, can result in aversion to specific foods, pointing to a survival mechanism (Birch, 1999; Johnson and Harris, 2004). Carruth *et al* (2004a) found that picky eaters were particularly likely to reject dishes in which several foods were mixed together. This may be because mixing makes recognition of the contents, whether by appearance, smell, taste or texture, more difficult, something that may have implications for detecting poisonous foods (Cashdan, 1998). It may also hamper the operation of 'sensory specific satiety', the process by which humans can become satiated in relation to one food while remaining willing to eat a different food (Rolls *et al*, 1981), which is thought to be important for ensuring a balanced intake of nutrients. It is interesting to note that, in spite of this, weaning foods, whether home-made or commercially bought, commonly consist of several ingredients combined into a single purée.

The majority of studies that focus on feeding problems are concerned with the diagnosis and treatment of those problems, rather than seeking to throw light on their aetiology:

“Despite the potential seriousness of the problem, little is known about the etiology of feeding problems or factors that maintain feeding problems.

Rather, the vast majority of research on feeding problems has focused on treatments to increase acceptance and decrease problematic mealtime behavior.”

(Piazza *et al*, 2003, pp.187-8)

This implies tacit recognition that the roots of the problem may lie in a period before the difficult behaviour first appears. When this is considered alongside the work on the development of food preferences and the notion of a sensitive period for the introduction of

new foods, it seems reasonable to view the beginning of weaning as a potential trigger point for later problems.

1.4.3 Gaining familiarity with food

Parkinson and Drewett (2001) have noted that “[c]hildren commonly develop feeding problems over the weaning period” (p.971), when the infant is encountering many foods for the first time. An infant’s familiarity with a particular food, and therefore how ‘new’ it is to him, depends on how many times he has been ‘exposed’ to it. The definition of an ‘exposure’ depends, in the research literature, on the focus of the study and the ages of the participants. Exposure may begin in utero, where it occurs naturally via the smell and taste of the mother’s amniotic fluid (Cooke and Fildes, 2011). Researchers focusing on early infancy (e.g., Desor *et al*, 1973; Crook, 1978; Harris *et al*, 1990; Mennella *et al*, 2008; Mennella *et al*, 2009) use ‘exposure’ to mean the introduction of a few drops of liquid, a flavoured drink, or a ‘bite’ of food directly into the infant’s mouth, via a bottle teat or spoon. Such an exposure is solely an oral experience, involving only taste and intra-oral texture. In contrast, researchers investigating the responses of older children to a variety of foods use ‘exposure’ to mean opportunities to see, smell and/or taste food in an experimental setting (Sullivan and Birch, 1990; Wardle *et al*, 2003; Williams *et al*, 2008), or simply the provision of a serving of the food as part of a meal (Hausner *et al*, 2012).

The nature of the exposure may be of significance. Birch *et al* (1987) compared the relative effectiveness of two types of exposure, ‘look’ and ‘taste’, on children aged two to five years. The children were invited either to look at the food or to taste it. The results indicated that repeated opportunities to look at an unfamiliar food were not sufficient for a child to decide that he ‘liked’ it, although familiarity with the appearance of the food did make consent to taste it more likely. Overall, the researchers found the look-and-taste exposure to be more effective at enhancing children’s preference for a food than the opportunity to look without tasting. They acknowledge that the ‘taste’ condition involved looking as well as tasting, and that both conditions offered the potential for olfactory input. However, they did not actively invite the children to smell the food, nor did they ask them what made them decide whether or not to taste it. It is not clear, either, whether the children were encouraged to touch the food. Thus, the potential importance to the children of its haptic and olfactory qualities were not explored. It is of interest that Birch *et al* (1987) did not include an option to taste *without* looking, which is, in effect, the type of exposure used in research involving infants.

The existence of, and distinction between, different types of exposure is not always acknowledged by researchers. For example, when reviewing the evidence, Cooke focuses on the number but not the nature of exposures needed to bring about a change in taste preferences in children of different ages:

“[T]he number of exposures required to alter preferences differs according to age. Studies with infants suggest that only one exposure to the taste of a new food may be needed to dramatically increase their intake and liking [... whereas] between five and ten exposures were required to increase 2-year-olds’ liking for novel fruits and cheeses [... and] eight to 15 exposures were required to enhance 3- to 4-year-olds’ preferences for sweetened, salted or plain tofu ...” (Cooke, 2007, p. 296)

This lack of differentiation tends to invalidate Cooke’s conclusions, since the experience of the infant or child during one type of exposure is not the same as that during another and cannot be assumed to be either comparable or equally influential.

What matters in determining whether a food is new is not whether the child has in fact previously seen or tasted it but whether he believes he has. A change in the presentation of a familiar food may make it unfamiliar to the child. Carruth *et al* (1998) note, almost in passing, that, for the children aged 24 to 36 months in their study, *“[i]n some cases, a familiar food prepared differently was viewed as novel”* (p.183), while Zeinstra *et al* (2010) found that familiarity with the method by which vegetables were prepared played a part in older children’s preference for them. These findings suggest that children are not able to transfer familiarity with the appearance and/or taste of food in one format to the appearance of the same food in another. If this is the case, then infants who are familiar with either the taste or the appearance, or both, of a particular food in puréed format may need to begin the familiarisation process afresh when presented with the same food as ‘table food’².

Dovey *et al* (2008) note that:

“As children age, their experiences with foodstuffs are more varied and frequent; therefore they will become less neophobic because fewer things are novel to them ...” (Dovey *et al*, 2008, p.184; my emphasis)

It would seem that the period during which food neophobia is reportedly increasing in intensity, namely the second year of life, commonly coincides with the move away from puréed foods and towards table food. It follows that, if children in this age group rely on the appearance of food to gauge its familiarity, the change of format will result in more foods seeming to them to be novel. This raises questions about the best time to introduce table foods, if neophobia is to be minimised. It also suggests that problems caused by the late introduction of lumpy foods (Northstone *et al*, 2001) may be as much due to their unfamiliar appearance as to physical eating challenges presented by their texture.

² ‘Table food’ is a term favoured by many American researchers when discussing the infant or toddler’s transition to sharing meals with the family. It refers to *“nonpuréed fruit and vegetables, grains, meats, eggs”* (Birch and Doub, 2014, p.723S).

Food recognition may work equally the other way around, when a child thinks he recognises a food that he has not in fact experienced, merely because it resembles something he has eaten. This is illustrated by the following anecdotal report: a mother relayed that her child of just two years, who had developed a liking for green beans, reached eagerly for a spear of asparagus, a food which he had not previously been offered, only to look at her with an expression of surprise as soon as he took a bite of it. She concluded that he had taken it to be a bean, on the basis of its appearance. As she said, “*It wasn't that he didn't like it – he just looked really puzzled.*” (Personal communication from mother, 2010.) It is possible that experiences like this may make children wary even of foods that they think they recognise.

Aldridge *et al* (2009) suggest that, by about two years of age, children are starting to rely on stored references to help them make decisions over whether or not they are prepared to eat particular foods. Thus, the neophobic child will reject food he does not remember ever having seen, whereas the picky eater will reject foods that he recognises but which are linked with an unpleasant memory. There is, however, some dispute about how early such memories may be formed. Piaget believed that children under the age of seven years are not able to conceptualise classes of objects (Cole *et al*, 2005). However, according to Cole *et al* (2005), children aged between two and six years (Piaget's 'pre-operational' stage), while unable to form categories according to multiple criteria, are nevertheless influenced by the visual attributes of objects. Nguyen and Murphy (2003) showed that children as young as four years were able to classify items and draw inferences about them based on their knowledge of similar objects.

Rakison (2000) maintains that children under two years do group objects into categories but that their systems for doing so do not match the hierarchies used by adults. Younger and Fearing (1999) have shown that ten-month-olds are capable of sophisticated categorisation of objects, based on their appearance and other sensory characteristics, while Xu and Garcia (2008) showed that infants of eight months were able to make inferences about objects using previous knowledge. The work of Wright *et al* (2011) and Brown and Lee (2011a) suggests that the establishment of links between the taste, texture and appearance of food may be possible for infants of six months, while Bornstein and Mash (2010) found that even five-month-old infants showed signs of rudimentary categorisation based on the visual attributes of objects. Since infants of this age do not have the verbal or cognitive skills to explain their thinking we can only guess at how these connections are made but it seems reasonable to conclude that the appearance of food may be important even for quite young infants, and that, in addition to taste and intra-oral texture, olfactory stimuli and/or haptic properties may also play a role in the formation of a reference database for foods.

1.4.4 Parental feeding styles and practices

There is a dearth of evidence for the influence of parents on the food preferences and mealtime behaviour of infants but the literature concerning young children offers interesting insights, many of which may be applicable to an infant's early experiences of solid food. Parents commonly seek to influence their children's eating, both in terms of food consumed and how the child behaves while at the table. They employ a range of strategies (Wright *et al*, 2007; Russell *et al*, 2015), many of which can have a significant impact on the child's food preferences, eating habits and weight gain (Baughcum *et al*, 1998; Benton, 2004; Johannsen *et al*, 2006; Wardle and Carnell, 2006; Haycraft and Blissett, 2008; Hughes *et al*, 2011; Rodgers *et al*, 2013). Concerns about the child's weight and/or nutrition have been shown to be key drivers (Faith *et al*, 2004a; Powers *et al*, 2006; Farrow and Blissett, 2008; Ventura and Birch, 2008; Joyce *et al*, 2009; Gregory *et al*, 2011; Cassells *et al*, 2014), with some studies pointing to issues of gender and body image as possible complicating factors (Johnson and Birch, 1994; Francis *et al*, 2001; Tiggemann and Lowes, 2002; Birch *et al*, 2003; Farrow and Blissett, 2005; Blissett *et al*, 2006; Johannsen *et al*, 2006).

Strategies employed by parents may be covert, for example, the deliberate disguising of foods (Caton *et al*, 2011) or overt (Ogden *et al*, 2006). Overt practices fall into two key categories: modelling of desired behaviours, and persuasion or coercion. Modelling by parents or peers has been shown to be effective in persuading children to eat healthy foods (Brown and Ogden, 2004; Chatoor, 2009; Greenhalgh *et al*, 2009; McClain *et al*, 2009; Palfreyman *et al*, 2015), while eating the same food as the parents is highlighted as a key benefit of shared family mealtimes (Skafida, 2013), leading to improved nutrition (Salvy *et al*, 2008). Modelling relies on visual clues: Addressi *et al* (2005) showed that children aged from two and a half to five years were more likely to eat unfamiliar foods if they saw others eating what *appeared* to be identical foods, while Shutts *et al* (2009) found that one-year-old children were more inclined to eat food that they witnessed adults eating enthusiastically. This is reminiscent of the behaviour of non-human primate young, who have been noted to observe their mothers eating novel foods before tasting them themselves (Addressi *et al*, 2007; Jaeggi *et al*, 2008). While modelling *per se* is not the focus of this thesis these findings nonetheless support the contention that the appearance of food may be important to even quite young children.

Practices such as pressuring or forcing children to eat food that they do not like but that their parents wish them to eat, and withholding or restricting foods that the children would prefer to eat but that their parents would prefer them not to – referred to by Scaglioni *et al* (2008) as “*natural parenting impulses*”, albeit with no evidence for why they should be considered natural – are less successful than modelling. They may lead to short-term positive behaviour

change but they have been found to be counter-productive in the long term (Fisher and Birch, 1999; Batsell *et al*, 2002; Fisher *et al*, 2002; Bante *et al*, 2008; Jansen *et al*, 2008; Gregory *et al*, 2011; Powell *et al*, 2011; Ystrom *et al*, 2012). Restrictive practices, in particular, have been found to be correlated with childhood obesity (Faith *et al*, 2004b; Clark *et al*, 2007), possibly because they encourage overeating or eating outside mealtimes (Joyce *et al*, 2009). Rewarding children for eating foods they dislike by giving them foods they enjoy is similarly unsuccessful as a strategy, resulting in the preferred foods being liked more strongly and the disliked foods avoided more keenly (Birch *et al*, 1980; Newman and Taylor, 1992; Fisher *et al*, 2002; Jansen *et al*, 2008; Joyce *et al*, 2009). Non-food rewards, however, appear to have a positive effect, at least in the short term (Holley *et al*, 2014).

Enjoyment of eating is an important factor in children's food choices (Skafida, 2013). Wickenden (2010) notes that, in the second year, infants "*enjoy exploration of new foods, if given an atmosphere in which they are in control*" (p.13). Van der Horst (2012) found enjoyment to be inversely associated with picky eating, and suggests that non-enjoyment of eating, and hence picky eating, may be the result of 'high controlling practices' by a parent, although what constitutes a 'high' level – as opposed to an acceptable, or even necessary, level – is not defined. If the meal situation is experienced as negative or unpleasant, the child will tend to eat less, or to develop a dislike for foods eaten at that meal (Birch *et al*, 1980; Koivisto *et al*, 1994). One potential source of negative mood during a meal is the mismatch that may arise between the desires of the child and the expectations of the parent in relation to the child's eating. Carruth *et al* (1998) suggest that this may happen "*[a]s infants begin to eat from the family table*" (p.180). Unfortunately, they do not identify when this move should normally take place, nor how its effects may be moderated.

It has been suggested that the practices implemented by parents during a family meal are closely related to their overall parenting style (Nicklas *et al*, 2001; Hubbs-Tait *et al*, 2008; Sleddens *et al*, 2014). Direct links between parenting style and children's dietary behaviours have also been found (Gregory *et al*, 2010; Xu *et al*, 2013). However, the mechanisms are complex (McPhie *et al*, 2014) and cross-referencing between studies is hampered by a lack of consistent terminology and concepts (Blissett, 2011), such that more research is needed (Vollmer and Mobley, 2013). Baumrind (1971) appears to have been the first to identify the three parenting styles, *authoritative*, *authoritarian* and *permissive*. Engle (2002) uses the terms *controlling*, *responsive* and *laissez-faire*, with approximately the same meanings. Hughes *et al* (2005) divide the permissive/laissez-faire style into *indulgent* and *uninvolved*, while Sacco *et al* (2007) also sub-divide the authoritarian/controlling style, opting for: *responsive*, *pressuring*, *restrictive*, *indulgent* and *laissez-faire*. Joyce *et al* (2009) used six 'parenting dimensions', *warmth/involvement*, *structure*, *autonomy support*, *rejection*, *coercion* and *chaos*, to examine children's disinhibited eating – that is, eating in the absence

of hunger. Overall, authoritative/responsive parenting has been shown to lead to less conflict, as well as better dietary outcomes and greater food knowledge, than either authoritarian or permissive parenting (Engle and Menon, 1999; Nicklas *et al*, 2001; Patrick *et al*, 2005; Aboud *et al*, 2009; Black and Aboud, 2011; Brown and Lee, 2011a, 2011b; DiSantis *et al*, 2011b). There is also evidence that a controlling approach by the parent is associated with reduced satiety responsiveness in the child (Johnson and Birch, 1994; Lewinsohn *et al*, 2005), which may contribute to both obesity and eating disorders in adolescence (Brone and Fisher, 1988; Marchi and Cohen, 1990; Batsell *et al*, 2002). A controlling parental feeding style would therefore appear to be disadvantageous for the child.

Physical control during feeding

Verbal persuasion to eat (or not) is unlikely to influence the intake of infants, whose cognitive abilities do not allow them to understand threats and bribes. It follows that parents of infants may be more likely to resort to attempts to control the feeding process physically if they wish to influence their child's intake, especially if they believe the child to be incapable of feeding himself. This belief is reflected in the academic literature. For example, Goldschmied and Jackson (2004) note that during breastfeeding the infant is active and the mother responds to his lead but that, "[w]hen weaning starts, with new tastes and textures, their roles will be reversed" (p.86). Van Dijk *et al* (2009) state unequivocally that "the infant is not yet capable of self-feeding when the first solid food is introduced" (p.766). Toyama (2014) is equally dismissive of the potential abilities of infants:

"During solid feeding, infants do not yet have self-feeding skills, and caregivers, therefore, play a prominent role in the weaning process. At the start of solid feeding, infants are entirely reliant on their caregivers. Babies consume the food, but caregivers choose, pick up, and carry food to the child's mouth." (Toyama, 2014, p.203)

Physical control has been shown to affect food intake to a greater degree during bottle feeding than during breastfeeding (Crow *et al*, 1980; Wright *et al*, 1980; Li *et al*, 2010; Brown *et al*, 2011). A breastfeeding infant cannot be forced to continue feeding once he has taken all he needs (Dewey *et al*, 1991); bottle feeding, by contrast, allows the infant's appetite to be overridden by the caregiver (Wright *et al*, 1980; Li *et al*, 2010). For example, moving the teat against the infant's palate in such a way as to elicit a suck reflex obliges the infant to keep feeding even after he has signalled his satiety (Woolridge, 1986). This may, in turn, lead to excessive weight gain (Mihirshahi *et al*, 2011; Li *et al*, 2012). Although the exact mechanism by which breastfeeding provides protection from obesity is unclear (Miralles *et al*, 2006; Bartok and Ventura, 2009), the ability of the infant to regulate his intake appears to

be key (Singhal and Lanigan, 2007; Carnell and Wardle, 2008). Indeed, breastfeeding appears to foster appetite control beyond infancy: Brown and Lee (2012) and DiSantis *et al* (2011a) found that breastfeeding for more than the first few weeks was linked to increased satiety responsiveness at ages 18 to 24 months and three to six years, respectively.

It has been suggested that the choice of feeding method in the early months may be a predictor of the degree of control allocated to the infant by his parents when solid foods are introduced (Brown and Lee, 2011b, 2011c). This is supported by evidence that mothers who have successfully breastfed their infants are less likely than those who have not breastfed to choose a high-control approach to weaning (Brown and Lee, 2012) and to demonstrate controlling behaviour at mealtimes when their child is one year old (Fisher *et al*, 2000; Taveras *et al*, 2004). Conversely, encouraging a bottle-fed infant to finish the bottle has been linked with later efforts to encourage the school-age child to finish the food on their plate (Li *et al*, 2014b).

Control over feeding around the time of weaning may be implicated in the aetiology of childhood obesity (Townsend and Pitchford, 2012; Thompson and Bentley, 2013). Farrow and Blissett (2006b) found that lower maternal control during feeding at six months was related to moderation of infant weight gain in the subsequent six months, while Brown and Lee (2011c) reported that a controlling feeding style in mothers of infants aged between six and 12 months was associated with maternal concerns about the infant's weight. Non-responsive feeding, in which the caregiver is unaware of, or chooses to ignore, the infant's hunger and satiety cues, has been found to lead to overfeeding in infancy and toddlerhood (Worobey *et al*, 2009; DiSantis *et al*, 2011b).

Chatoor *et al* (2001) highlight a difference between spoon feeding and force feeding (with a spoon), linking the latter to food refusal, but do not consider whether spoon feeding *per se* may carry a similar, albeit smaller, risk. Other researchers (Brown and Lee, 2011b, 2015) have noted that spoon feeding, like bottle feeding, necessarily allows the caregiver to determine what, how much and how quickly the child eats to a greater extent than is possible when the child feeds himself. Although prospective studies are lacking, there is some evidence that a self-feeding approach during weaning may encourage satiety responsiveness, and thereby appetite self-regulation, beyond infancy, and that this may contribute to a reduced risk of obesity in later childhood (Brown and Lee, 2015; Taylor *et al*, 2012; Townsend and Pitchford, 2012). However, the possibility of a disparity between spoon feeding and self-feeding, similar to that between breast- and bottle feeding, appears not to have been explored.

Feeding as a power struggle

The move to self-feeding once weaning has started has been pinpointed as a time when control over feeding shifts from caregiver to infant. This is seen as coinciding with the infant's growing autonomy and as a potential trigger for conflict (Linschied *et al*, 2003). Lewis *et al* (1990) and Lewis and Ramsay (2005) maintain that infants as young as four months show frustration, anger and sadness when faced with loss of control and when prevented from achieving their goals; Lewis *et al* (1990) cite being prevented from feeding as an example of such a situation. Chatoor and Ganiban (2003) report that food refusal most commonly becomes a matter of concern for parents *"between nine and 18 months of age, during the infants' transition [from being spoon fed] to spoon and self-feeding"* (p.139) and that sensory food aversions *"often become apparent when infants are introduced to baby food or table food with a variety of tastes or textures."* (p.142). Benton (2004) echoes this when, commenting on Young and Drewett's (2000) finding that a child of one year might refuse a food up to 89 times in a single meal, he states, *"[i]t is clear that at the stage of transition from a liquid to a solid diet food refusal occurs commonly"* (p.860). Harris and Booth (2006) observe that at about 12 months, *"[t]he child will want to feed him- or herself, and will often refuse to be spoon-fed"* (p.101). Van Dijk *et al* (2009) suggest that the prevalence of food refusal in one-year-old children may be because *"the infants' growing eating independence and will to feed themselves might lead to more food refusal when food is offered by the caretaker"* (p.766).

Conflict during feeding can result in inappropriate behaviour by the parent as well as resistance in the child. For example, parents may employ strategies that have implications for nutritional as well as emotional outcomes:

"Babies who consistently dominate their own eating patterns are seen as 'fussy' eaters, and they will often be fed preferred foods, have their meals served separately, or be bribed with treats." (DH, 2010, p.23)

In spite of these concerns, the progression towards autonomy in eating has so far been poorly studied (Schwartz *et al*, 2011). Indeed, many researchers appear to accept struggles over agency as being inevitable during the toddler years, rather than exploring whether and how they might be avoided. Thus, while the passing of control to the child is discussed by several authors (Blissett and Harris, 2002; Chatoor and Ganiban, 2003; Douglas, 2011), this is only in relation to an existing problem of food refusal, rather than as a preventative measure. Chatoor (2009) has acknowledged that *"children in general and toddlers in particular are more willing to try new foods if it is in their control"* (p.47) but she does not discuss how or when this control might best be granted or achieved. Satter (1986, 1995, 2002) stresses the importance of allowing young children control over their eating as a way

of preventing conflict but she does not relate this specifically to infants who are just starting solid foods, when it seems infants are least likely to be accorded the role of agent.

The literature review revealed several papers that considered feeding problems in an interpersonal context, in which issues of agency are key (Lindberg *et al*, 1996; Chatoor *et al*, 1998; Davies *et al*, 2006), but the implication in all of these is that, until the child makes a bid for control, the control rests with the parent and the child is happy to comply. There appears to be no evidence for how the transition, either from puréed foods to table foods or from spoon feeding to self-feeding, should be, or is usually, managed. Crucially, no papers were found that addressed the possible significance of spoon feeding in the development of issues relating to agency, nor the possibility that what is commonly interpreted as ‘food refusal’ may in fact be *feeding* refusal.

It is possible that conflicting goals may be at the root of power struggles over feeding. According to Orrell-Valente *et al* (2007), “*the overriding goal of the majority of parents of young children is to get children to eat more*” (p.42), implying that this is not the child’s goal. Chatoor *et al* (2001) allude to a difference in goals between parent and infant when they say that,

“during the transition to spoon- and self-feeding ... infants show intense interest in play and exploration but appear to have a low hunger drive. They engage in control battles with their caretakers during feeding because they would rather play than eat.” (Chatoor *et al*, 2001, p.596)

However, they do not consider that infants may have good reasons for preferring to play. On the contrary, in a more recent paper Chatoor notes that it is the parent who is inconvenienced by the infant’s actions:

“As early as eight to nine months of age, infants [...] may grab the spoon and other feeding utensils, play with them, throw them, and generally get in the way of the parents’ feeding efforts.” (Chatoor, 2012, p.3)

Van Roon *et al* (2003) note that infants commonly bang and drop spoons as well as putting them in their mouth. They recognise these as exploratory behaviours, which they say may be directed either at finding out what the spoon affords or at selecting actions that achieve “*the goal*”, the implication being that there is only one goal – or only one that has value – and that it is shared by parents and infant. They go on to remark that, “[*o*]bviously, during mealtimes the spoon serves for self-feeding, not for dropping or banging” (van Roon *et al*, 2003, p.77), without acknowledging that this may be far from obvious to the infant. As seen, infants of six months are not accomplished tool users (Lockman, 2000) and manipulative play in this age group shows no symbolic acts or understanding of the intended function of

everyday objects, including those connected with eating (Fenson *et al*, 1976; Belsky and Most, 1981). Even when an infant has learned that a spoon affords eating, it is only the cultural context, and the goals of his caregivers, that determine that it is not equally useful for dropping and banging. A caregiver whose goal is that the infant should eat may interpret this type of exploratory behaviour as resistance, or as a sign that the infant needs 'help'. Unfortunately, attempts to provide this help are likely to be met with further resistance if eating is not the infant's goal.

Responsive feeding

'Responsive feeding' is a term used increasingly frequently in relation to infant feeding, especially in the work of organisations such as the World Health Organization and UNICEF (PAHO, 2003; WHO, 2005; UNICEF, 2012). Responsive feeding is generally accepted as being "*characterized by caregiver guidance and recognition of the child's cues of hunger and satiety*" (Hurley *et al*, 2011, p.495). It involves the caregiver in:

"encouraging and attending to the child's signals of hunger and satiety; and [...] responding to the child in a prompt, emotionally supportive, contingent, and developmentally appropriate manner." (Black and Aboud, 2011, p.491)

This approach fits well with a responsive parenting style in that it is characterised by the responsiveness of the caregiver to the mood and wishes of the infant, as gleaned from the signals he or she gives. Hodges *et al* (2008) have identified three key elements of responsive feeding, namely, 'perception' and 'accurate interpretation' of the infant's cues by the mother, followed by an 'appropriate response'. In contrast:

"Nonresponsive feeding is dominated by a lack of reciprocity between the parent and child, with the caregiver taking excessive control of the feeding situation (forcing/pressuring or restricting food intake), the child completely controlling the feeding situation (indulgent feeding), or the caregiver being completely uninvolved during meals (uninvolved feeding)."

(Hurley *et al*, 2011, p.495)

Responsive feeding has been shown to be associated with increased willingness to eat and improved levels of nutrition (Moore *et al*, 2006; Nti and Lartey, 2007; Dearden *et al*, 2009; Moding *et al*, 2014), but only as compared with non-responsive feeding. Indeed, the use of the phrase 'excessive control' would appear to suggest that some degree of control is considered either desirable or unavoidable, even when feeding is responsive. In their study of responsive feeding in children aged six to 17 months, Flax *et al* (2013) found the odds of the child accepting a bite were higher when he or she was self-fed. Aboud *et al* (2009) found a similar correlation between self-feeding and the amount eaten in children aged eight to 20 months. However, self-feeding was rarely seen among the younger infants and the option of

using this approach as a primary strategy was not explored (Aboud, personal communication, 2010).

Mentro *et al* (2002) studied feeding responsiveness on the part of the infant, defining this as:

“the manifestation of physiologically influenced visual, expressive, vocal and motor reactive behaviours expressed by an infant in reaction to a caregiver’s feeding attempts, indicating a readiness to feed.” (Mentro *et al*, 2002, p.210)

They refer to a dictionary definition of feeding only in its transitive sense, as *giving food* to another, and their descriptions of positive and negative responses relate to infant behaviour triggered by attempts by the caregiver to initiate feeding, albeit in response to hunger cues from the infant. The cases used to illustrate the argument are infants of three, six and eight months old respectively, with each scenario consisting of a bottle feeding interaction. The authors state that:

“It is the responsibility of the caregiver during feeding to be sensitive to infant cues, alleviate distress, and provide growth-fostering situations, while it is the role of the infant to display clarity of cues and responsiveness to the caregiver.” (Mentro *et al*, 2002, p.209, my emphasis)

The implication is that if the infant fails to play his part, feeding cannot take place. According to these authors, positive responsiveness by the infant is characterised by, for example, gazing at the caregiver and smiling. While it may be the case that it is infant behaviours of this sort that encourage parents to continue to care for their offspring and are mutually rewarding (Reyna and Pickler, 2009), it is clear from evidence of newborns’ spontaneous feeding behaviours that the act of breastfeeding, at least, does not require this level of face-to-face communication (Moore *et al*, 2012). It may be that a different type of responsiveness is necessary, depending on the interaction required by the feeding method.

1.4.5 Spoon feeding versus self-feeding

As seen, healthy, full-term infants have the necessary skills to feed themselves with food presented in a graspable format, without the need for cutlery. The ability to use eating implements is therefore not a prerequisite for being able to feed oneself. Despite this, in the industrialised world, *“the introduction of solid foods is ... coincident with the commencement of spoon feeding”* (Reilly *et al*, 2006, p.18).

Current day feeding practices in traditional societies have been difficult to establish within this literature review, since the majority of texts (e.g., Selinus, 1970; Negayama, 1993; Sellen, 2001; Nti and Lartey, 2007; Lin *et al*, 2011) appear to focus on the practice and duration of breastfeeding and the timing of the first solid foods rather than on the means by

which those foods are offered. This may reflect the fact that the use of separate, pre-prepared foods for infants has become widespread in recent decades (Palmer, 2011). Watson (2000) reports that premastication and the insertion of food into the infant's mouth using chopsticks was common in China in the first half of the 20th century but that manufactured 'baby foods' have gradually become the norm since then. Gracey (2000) tells us that hunter-gatherer Aboriginal parents probably weaned their infants on to foods such as wild fruits, tubers, eggs, birds, lizards and fish. Gracey does not say how these foods were prepared or offered but it seems unlikely that they were puréed and spoon fed, although they may have been pre-chewed (Pelto *et al*, 2009).

The use of purées

The first foods offered to infants in the UK nowadays are almost always of a puréed consistency, with 'baby rice' being the most common (McAndrew *et al*, 2012). Indeed, cereals are the most frequently chosen first solid foods throughout the world, although this may have more to do with their comparative availability as a cheap staple than with beliefs about their suitability for infants (Palmer, 2011). Ninety-four per cent of UK mothers interviewed in 2010 reported giving their baby mashed or puréed food, with only 4% offering foods that the infant could pick up with his fingers (McAndrew *et al*, 2012).

The belief that soft foods are necessary appears to be widespread, and may be perpetuated in part by the baby food industry, which has an interest in encouraging parents to use commercially prepared weaning foods (Palmer, 2011). Reeves (2008) states that, "*purées are an obvious transition food to bridge the gap between liquid and solid foods*" (p.108). However, she presents no evidence to support the notion that the infant's gradual transition from a liquid diet to one that includes chewable foods requires him to be offered foods that are themselves transitional in consistency. Stevenson and Allaire (1991) comment that the case for semi-solids is not proven but is based on child-rearing beliefs and customs. Reilly *et al* (2006) concur, pointing out that many non-industrialised cultures do not use 'weaning foods'. This is supported by evidence from fossils, which indicates that our ancient ancestors were chewing hard foods from the eruption of the first teeth (Corruccini, 1999). Indeed, over-reliance on soft foods is thought to contribute to poor facial growth (Lieberman *et al*, 2004), and an increased risk of dental, respiratory and aural problems (Corruccini, 1999; Kiliaridis, 2006; Montgomery-Downs *et al*, 2007; Gibbons, 2012).

Puréeing alters not only the appearance of food but also its cellular structure, thereby affecting its textural properties and potentially increasing its viscosity (Waldron *et al*, 2003). Viscous foods tend to adhere to the lining of the mouth, which may make them awkward to manage intra-orally (Lucas *et al*, 2004). Delaney (2010) found evidence that purées are not necessarily easily managed by infants and that their skills in this regard do not increase in

the way that those related to more solid textures do. She notes her surprise at these findings, given the fact that “*this texture is thought to be easy to chew*” (Delaney, 2010, p.71). Delaney also found evidence that experience accelerates the development of chewing skills over and above what would be expected through maturation alone, and that infants as young as eight months were able to demonstrate a greater number of skills on a range of textures than was previously thought to be the norm (Delaney, 2010). In her conclusion she questions the accepted wisdom that experience with purées predisposes children to learn other oral skills and suggests that earlier introduction of textured foods may be warranted. Coulthard *et al* (2014) found that infants introduced to solid foods after five and a half months ate less of a novel purée than did those who had started solids before this age. They concluded that infants are less accepting of new foods when the start of weaning occurs at or after six months than when it occurs earlier. An alternative explanation may be that six-month-olds are less accepting than younger infants of new foods *presented as a purée*.

Puréeing also affects the intensity and nature of the flavour of food, by allowing the dispersal, in advance, of volatile elements that would normally be released gradually while chewing, so interfering with the way the individual experiences the flavour of the food (Wilson and Brown, 1997). A homogenous texture and the lack of a need to chew further detract from the appreciation of flavour (Ganchrow and Mennella, 2003; Waldron *et al*, 2003) and preclude the stimulation of other senses, notably hearing (Duizer, 2001; Spence and Shankar, 2010; Woods *et al*, 2010b), thereby limiting the pleasure to be gained from eating. Although not the subject of this thesis, it is interesting to note that commercially prepared foods, in addition to lacking an equivalent nutrient value (Nazanin *et al*, 2011; Wright *et al*, 2011; Garcia *et al*, 2013), rarely taste the same as home-cooked versions because of the effects of the processing to which they are subjected (Oey *et al*, 2008; Kocadağlı and Gökmen, 2014). This may result in them being difficult to identify, even for adults (Birch *et al*, 1998). As both Harris and Booth (2006) and Forestell and Mennella (2007) have noted, it is possible that experience with commercial infant foods may hinder infants’ acceptance of home-cooked foods. It follows that it is also possible that experience with home-cooked foods presented as purées may not encourage a liking for the same foods presented ‘whole’. For various reasons, therefore, the routine use of purées would seem to be less than ideal.

The use of spoons

The starting point for the current study was a search of the literature to identify existing research into the feeding method used to introduce solid foods. While the majority of papers on infant feeding published since 2002 support the view that solid foods should not be

introduced before six months, none, other than those concerned with baby-led weaning, appears to challenge the accepted wisdom that the first solid foods should be spoon fed. For example, van Dijk *et al* (2009) set out to give “*a thorough description of the process of weaning*” (p.766) but go on to describe a series of naturalistic observations of spoon-feeding-only interactions. Nicklaus (2011), in her review of the literature on infants’ acceptance of new foods, cites several factors that are known to have an impact on food preferences but does not comment on the possible effect of the method of feeding solid foods. Blissett and Fogel (2013), in their paper examining the effects of intrinsic and extrinsic influences on children’s acceptance of new foods do not mention the potential impact of the method of feeding.

Phase two of the literature search, which focused on studies of the behaviour of infants and young children in relation to solid foods, uncovered several hundred papers, none of which highlights the feeding method as a potential factor. Many do not even mention the feeding method. In most cases (e.g., Remy *et al*, 2013) clues within the text, or the use of a purée as the test food, imply spoon feeding by a caregiver; in others the method remains in doubt. This omission itself suggests the assumption of a common understanding about how infants will access solid foods, which the reader will share and which therefore does not need to be stated. This is borne out by experience in everyday life, where the image of an adult using a spoon to scoop up food from around an infant’s lips and chin is almost *de rigeur* in babycare literature and the popular media.

Wickenden (2010) describes how, when adults use a spoon to convey lumps of food to their mouths, they employ a bite-type action to remove the food. In contrast, she explains, infants who are used to obtaining food through breast- or bottle feeding using a sucking action will tend to use this action when first presented with a spoon. While this works reasonably well for semi-solids, it is not an efficient way to clear the spoon of lumpy or diced foods. In addition, it tends to propel food towards the back of the mouth, making chewing more difficult and gagging and choking more likely (Wickenden, 2000; Naylor, 2001) – an effect which is compounded when the food is partially liquid or semi-solid (Logemann, 1998).

The ability to use the top lip to clear a spoon is reported as developing between three and six months of age, as puréed foods are introduced (Wickenden, 2010). There is an implication in much of the literature that this is a feature of simple maturation. Recent work, however, points to its being a learnt skill, prompted by the introduction of the spoon. Sheppard (2008) notes that, when an infant of weaning age is presented with semi-solid food on a spoon s/he, “*marshals available components [oral motor skills] that best fit the nature of the task*” and concurs with Thelen (1989) that, “*it is the task, not any pre-existing practice, that assembles the emerging skill*” (Sheppard, 2008, p.229). Van den Engel-Hoek

et al (2014) found that infants aged between four and eight months took from two to ten weeks to acquire this skill, irrespective of the age at which spoon feeding began, while Delaney (2010) found that eight-month-old infants' mastery of feeding skills, including taking food from a spoon, was related to experience rather than to age or the texture of the food. Delaney and Arvedson (2008) note that there is a dearth of formal evidence for the developing skills of "*transition feeders*" but that, initially, infants use a jaw movement that is much wider than necessary to take puréed foods from a spoon. They point out that this movement is more appropriate for the biting and chewing of solid foods and highlight the fact that infants take some time to achieve the skill of lip closure needed to clear a spoon effectively. However, they do not appear to consider the possibility that it may be more appropriate to offer infants bitable foods than to persist with spoon-fed purées.

Toyama (2013, 2014) describes a complex level of synchronous interaction between mother and infant as being necessary during the weaning period, with the infant needing, for example, to pay attention to his mother's arm movements during feeding in order to coordinate his mouth opening with the arrival of the food³. Learning to synchronise one's movements with those of another person would seem to demand an exacting level of concentration. By contrast, infants learn to coordinate mouth opening with their own arm movements spontaneously, as part of the normal development of hand-eye coordination and fine motor skills. Toyama's account, like those discussed above, implies a learning hurdle that the infant is obliged to address, rather than considering the possibility that spoon feeding is not a good fit for his skill-set at the point when solid foods are indicated.

A small number of authors have reported on how young children acquire the skills needed for self-feeding but their focus has been on the mastery of spoon use. The work of Smith (1944, 1960) suggests that this has been the case for at least the last 70 years. Young and Drewett (1998) divide the necessary skills, which the infant will need to "*learn*", into four stages, all of which relate to managing a spoon. The order of Sheppard's (2008) seven "*eating milestones*" similarly implies that eating with a spoon is a pre-requisite for self-feeding. Carruth and Skinner (2002) recorded spontaneous efforts by infants from around eight months of age to grasp food with their hands but their account implies that this was encouraged only in relation to foods such as 'crackers'. Pridham (1990) acknowledges the use of fingers from about seven months but highlights nine months as the age at which infants commonly "*start to reach for the spoon*" (p.S175). Chatoor *et al* (1997) identify the period between 12 and 18 months as being when "*most toddlers transition to self-feeding*" (p.89), suggesting that self-feeding, with or without a spoon, will not normally occur before one year. The implication in all these accounts is that self-feeding is not expected to happen

³ Although not stated by the author, a spoon feeding scenario is strongly implied.

until eating from a spoon has been accomplished, and that true 'self-feeding' is defined by the use of utensils rather than fingers.

Connolly and Dalgleish (1989) have focused on how infants learn to manipulate spoons, as part of what they present as the normal progression of feeding-related skills. They note that spoons are not easy to use, and that:

"Few infants are using a spoon even in a rudimentary fashion before the end of the first year [although] most have some discernible competence by the end of the second year." (Connolly and Dalgleish, 1989, p.897)

In particular, they note that, "[f]illing the spoon causes great difficulty and often requires adult assistance" (p.896). The authors state that they chose to use food of a "semi-liquid" consistency for their examination of children's spoon-feeding skills because this consistency "makes spoon feeding appropriate" and ensured that, "the constraint presented no difficulties for the mothers" (Connolly and Dalgleish, 1989, p.898, my emphasis). The subtext here is that a spoon may *not* be the most appropriate tool for managing food in the more solid formats usually eaten by adults, and that most adults would find it difficult to manage such food with a spoon. Indeed, the use of spoons for feeding infants appears to go hand in hand with that of purées, such that a predilection for this method of feeding may itself perpetuate the need for semi-solid foods, and vice versa.

Chatoor (2012) notes that eight to nine months is "the beginning of a challenging period when during each meal, parent and child need to negotiate who is going to place the spoon into the child's mouth" (p.3). She cites a mother who dealt with this problem by giving her nine-month-old the spoon. Unfortunately, the child took three months to master its use and did not gain weight during that time. Chatoor's conclusion is that spoon feeding *by the child* was not appropriate, not that spoon feeding *per se* may have been the issue.

Spoons have not always existed as regular feeding implements. Van Roon *et al* (2003) report that cutlery became popular in Europe between the sixteenth and nineteenth centuries, as people from the upper classes sought ways to avoid sharing others' body fluids, and that 'rules' were devised for the handling of the various implements, in order to differentiate the well-to-do from the peasant classes. Spoons, in particular, were intended to be difficult to use correctly. Both Carruth and Skinner (2002) and Connolly and Dalgleish (1989) agree that most children are able to manage table food orally at an age when they are not yet proficient with a spoon but they do not comment on this apparent skill discrepancy, nor on why a spoon, rather than, say, a fork, should be the first piece of cutlery children are expected to master. Connolly and Dalgleish (1989) dismiss using the fingers to get food to the mouth as "not very efficient" (p.897). However, it appears they are referring

to food that is semi-solid in consistency. They do not acknowledge that, for some foods, fingers may be *more* efficient than a spoon. A useful comparison is with other non-human primates: Although they have hands, ape mothers do not insert food into their infants' mouths, nor do spoons feature in their lives. They make food available to the infant but it is the infant who picks the food up and brings it to his mouth (Addressi *et al*, 2007; Jaeggi *et al*, 2008), using his hands.

Speed of eating

Both the method of feeding and the consistency of the food may affect the infant's ability to regulate his intake. Spoon feeding allows the caregiver, rather than the infant, to choose the content of each mouthful and, to a large extent, to control both the quantity consumed and the pace of eating (Hurley *et al*, 2011), while runny purées, if not more viscous ones, are known to promote rapid swallowing (Gisel, 1991). Conversely, French and Cecil (2001) and de Graaf (2012) have shown that oro-sensory stimulation, such as that produced by chewing, plays an important role in appetite suppression. Zijlstra *et al* (2009), Smit *et al* (2011) and Higgs and Jones (2013) found, similarly, that increased oral processing time decreased voluntary food intake. The use of food that can be swallowed quickly may therefore make it easier to override an infant's natural appetite control. The issue is further complicated by the fact that the portion size will have been determined by the caregiver, or, if a ready-made commercial baby food is used, indicated or implied by the manufacturer. While portion size has not been shown to influence infants as young as six months it has been found to affect adults' eating behaviour (Fisher *et al*, 2003; Wansink, 2004; Wansink *et al*, 2005). It may therefore influence caregivers' decisions about how much food to give to infants, which may in turn encourage them to set a fast pace, in order to 'get the child fed'. As well as encouraging excessive intake, rapid oral processing of food may impede effective digestion, since it reduces the time available for the food to mix with enzyme-containing saliva (Pocock *et al*, 2013). It also allows less time for the appreciation of flavours (Zijlstra *et al*, 2009), albeit that this may be considered advantageous if the food is disliked.

'Mindful eating' is recommended as a way for adults to avoid overeating (Wansink and Sobal, 2007; Wansink, 2009; Beshara *et al*, 2013). Bays (2009) tells us that:

"Mindful eating is an experience that engages all parts of us [... It] involves all the senses. It immerses us in the colours, textures, scents, tastes and even sounds of drinking and eating. It allows us to be curious and even playful as we investigate our responses to food and our inner cues to hunger and satisfaction."

(Bays, 2009, p.3)

In mindful eating, "arriving at food", "awakening to food" and "tuning in to the body" are key parts of the eating experience (www.mindfuleating.org, 2013). Attention to the totality of the

experience allows the individual to become attuned to internal cues of hunger and satiety, rather than relying on external cues to indicate when and how much to eat (Wansink *et al*, 2007). The feeding of purées to infants would seem to encourage mindless eating.

Baby-led weaning

The approach to the introduction of solid foods known as 'baby-led weaning' (BLW) involves allowing the infant to decide whether to eat, what to eat (from among the foods on offer), how much and how fast to eat, and when to stop eating (Rapley and Murkett, 2008). It is suggested that it represents a natural progression from breastfeeding in terms of the infant's control over his eating (Rapley, 2014). Baby-led weaning centres around infants' participation in family mealtimes from approximately six months of age, with the opportunity to use their hands to feed themselves with pieces of food taking the place of spoon feeding (Rapley and Murkett, 2008). Food is placed within the infant's reach and he is free to choose to engage with it or not, and to continue eating for as long as he wants. This approach challenges the assumption that purées and spoon feeding are a necessary part of the infant's transition to a mixed diet (Brown and Lee, 2011a; Cameron *et al*, 2012a). Rather, the argument is that the weaning period need consist only of an *overlap* of liquid and solid foods, during which the solid foods form a gradually increasing proportion of the diet, and that the changeover can be adequately negotiated by the infant himself, as he becomes more proficient at chewing (Rapley, 2013).

Proponents of BLW suggest that it encourages infants to be more adventurous with food and to eat more healthily during childhood (Rapley and Murkett, 2008). Opting to follow a BLW approach has been shown to be associated with the choice to breastfeed (Brown and Lee, 2011b) and to be a good predictor of adherence to the current recommendations concerning the timing of the first solid foods (Moore *et al*, 2014). To date, studies of longer-term outcomes are few but there is tentative evidence that BLW may lead to a reduced desire for sweet foods, a lower risk of obesity and greater satiety responsiveness in the toddler years (Townsend and Pitchford, 2012; Brown and Lee, 2015). There is also a suggestion that allowing infants to feed themselves with their hands from the initiation of weaning may lead to a lower incidence of conflict at mealtimes in the ensuing months (Brown and Lee, 2011b; 2011c; Wright *et al*, 2011; Cameron *et al*, 2012a; Rapley, 2013). However, as Brown and Lee (2011b) point out, whether it is the case that breastfeeding itself causes mothers to adopt a more relaxed attitude towards their child's eating, or that mothers who are able to adapt to the 'baby-led' nature of successful breastfeeding are likely also to allow their child greater agency during weaning, has not been established.

Critics of the proposed benefits of BLW point to studies, such as those by Brown and Lee (2011a, 2011b), which show that parents who adopt the approach tend to be better

educated and may be more likely to adopt a less controlling parenting style than parents who spoon feed. Another criticism is that there is no accepted definition of baby-led weaning and that the existing studies may therefore not be examining the same thing. This is compounded by the use of parental reports to categorise the feeding style (Brown and Lee, 2011a, 2011b; Townsend and Pitchford, 2012). Cameron *et al* (2013) found that strict adherence to the principles of BLW – for example complete avoidance of spoon feeding – was rare, while Arden and Abbott (2014) reported that parents adjusted their approach as weaning progressed. However, it is worth noting that the arguments put forward by some critics, for example, Cooke (2014), appear to be more concerned with the recommended minimum age for introducing solid foods than with self-feeding *per se*.

Whether or not infants can safely be relied upon to select a balanced diet appropriate to their needs has yet to be established (Story and Brown, 1987; Strauss, 2006; Cameron *et al*, 2012a). However, some critics of BLW have taken the position that this cannot be the case, or have not recognised the principle of allowing choice to rest with the infant as being a key feature of this approach. For example, Rowan and Harris (2012) showed that parents who stated they were following BLW neither adjusted their own diet during the weaning period nor offered their infant all the same foods as they themselves were eating. However, the researchers did not investigate whether the parents had previously changed their diet, for example during pregnancy or the early weeks of their child's life, nor did they examine what the infants actually ate. Reeves (2008) states, "*Purées are ideal for being able to introduce a known volume of food to the infant and provide essential nutrients*" (p.108), asserting later that a diet containing both finger foods and purées "*is the most likely to provide the variety of foods and nutrients that a developing infant requires.*" (p.109). This is a view echoed by Caroli *et al* (2012). Yet there appears to be no evidence that someone other than the infant must necessarily know better than he what his nutrient needs are at any one meal.

Clearly, more research is needed into whether allowing infants to feed themselves with solid foods is a good idea. Cooke considers that a large-scale trial is unlikely, given "*the very remote likelihood of gaining consent from mothers to be randomised to a largely untested infant feeding intervention*" (Cooke, 2014, p.26, my emphasis) – a description which, ironically, could refer as easily to spoon feeding as to BLW. Meanwhile, Wright *et al* (2011) have pointed out that "*feeding children purées is not without its problems*" (p.32). They highlight the fact that BLW is increasing in popularity and that there have so far been no case reports of adverse outcomes. In their view, based on average developmental abilities, self-feeding from six months is "*probably feasible for a majority of infants*" (p.27), a conclusion echoed by Cameron *et al* (2012a).

1.4.6 Non-milk feeding in the first two years – summary

Food preferences and mealtime behaviour appear to dominate the current and recent research into the non-milk feeding of infants and young children. The literature reveals that newborns have a preference for sweet flavours but that a liking for salt, sour, bitter and umami tastes develops over time, as experience of them accrues. Breastfeeding is known to provide infants with some of this experience. Meanwhile, a liking for individual flavours is dependent to a large degree on opportunities to gain familiarity with those flavours.

The willingness of the infant to accept lumpy and diced textures appears to be reliant on a growing ability to manage them, as well as the opportunity to experience them, although it is argued that the practice of feeding infants with a spoon regardless of the texture of the food may have obscured our understanding of the learning processes involved. The appearance of food appears to be important to children over two years old and there are indications that those younger than this may be similarly influenced. Little is known about the importance of the smell of food to infants of weaning age and no evidence was found concerning the possible significance to infants and young children of the haptic qualities of food.

Food neophobia and picky eating are commonly reported in children aged between 18 months and four years, who draw on stored information about the appearance of different foods to help them decide whether or not to eat them. It is not known how early the compilation of a reference memory for individual foods may begin, although it is feasible that it may be assisted by the opportunity to look at, smell or touch food prior to eating it. The possible impact on later food recognition of offering table foods, rather than puréed foods, to infants during the weaning period appears not to have been explored.

Parents are known to employ a range of strategies to influence their child's eating, for a variety of reasons and often in association with a particular parenting style; however, much of the research in this area has been conducted with the parents of young children rather than infants. Physical control over eating has been described by researchers in relation to the method of milk feeding but its relevance to spoon feeding versus self-feeding has not been explored. Rather, there appears to be a widespread assumption that infants necessarily require active feeding by a caregiver once solid foods are introduced.

The introduction of solid foods alters the dynamic between infant and caregiver and may be the starting point for feeding problems. Control by the caregiver is recognised as potentially contributing to negative mood, while it is suggested that a discrepancy between the goals of the caregiver and child may be the trigger for conflict. Responsive feeding has been shown to improve eating outcomes over those achieved by non-responsive (spoon) feeding but neither has been systematically compared with self-feeding.

The emphasis in much of the literature concerning physical feeding skills is on the need for infants first to acquire the skill of taking food from a spoon held by someone else, and then to learn to use a spoon independently. The evidence for these as learnt skills is in contrast with the spontaneous reaching, grasping and mouthing that are part of normal infant development. The use of puréed foods, too, is widely accepted as necessary during weaning, albeit that their appropriateness for infants who can chew has not been established. The potential impact of the alteration in the properties of the food brought about by puréeing has similarly not been studied, nor has the speed of eating that the combined use of spoons and purées allows.

The predominance of spoon feeding mirrors an unspoken view that control of feeding should rest with the parent at the beginning of weaning. There is general recognition that, at some point in later infancy or the toddler years, control of feeding will be transferred to the child, but in spite of speculation that the roots of some common feeding problems may lie in the interaction between parent and child during this handover, there is a dearth of evidence as to how the transfer of control should be managed in order to minimise conflict. In contrast, the literature on baby-led weaning (BLW), while limited, and mixed in its support for the approach, presents self-feeding as a realistic option for infants beginning solid foods at six months, which may have long-term benefits. The current study aims to progress research into the possible benefits of BLW through a focus on a specific element of this approach, namely the use of self-feeding and graspable foods in place of spoon feeding and purées.

1.5 The infant's right to agency

Autonomy and competence have been shown to be key elements in determining an individual's sense of well-being (Sheldon *et al*, 1996; Reis *et al*, 2000). The Oxford English Dictionary defines autonomy as "*liberty to follow one's will; control over one's own affairs; freedom from external influence, personal independence*" (OED, 2014b). This is closely related to agency, which is the "*ability or capacity to act or exert power*" (OED, 2015). Agency is a prerequisite for the operation of autonomy by an individual who cannot convey his wishes to others except through his own actions. It is therefore implied in discussions of the right to autonomy.

The United Nations' Convention on the Rights of the Child (OHCHR, 1989) accords children equivalent rights to those enjoyed by adults, tempered with the need for protection. Although the right to autonomy and agency is not overtly stated it is implied in the right of children to be treated with dignity and respect. However, in some instances the wording suggests that children who cannot talk are exempt. For example, Article 12 states that: "*the child who is capable of forming his or her own views [shall have] the right to express those views freely*

in all matters affecting the child" (OHCHR, 1989). According to Jones (2009), young children commonly have their rights removed or denied, simply because they are unable to communicate verbally.

The risk to infants' agency and autonomy may be further increased by the fact that parents look to health professionals for advice. Hardy and Armitage (2002) note that the perceived incompetence of young children (including infants) to decide what is in their best interests is a key feature of UK healthcare delivery:

"The paternalistic approach to children [...] denies the child autonomy; and although it may provide opportunity for self-direction and choice, it is only with the willingness and permission of the adult."

(Hardy and Armitage, 2002, p.112)

The biological immaturity that characterises infancy and childhood is a universal feature of human groups but the meaning attached to the various stages of development, and the expectations adults have of children, vary both culturally and historically (James *et al*, 1998). Archard (2004) explains this phenomenon:

"In simple terms, to have a concept of 'childhood' is to recognise that children differ interestingly from adults; to have a conception of childhood is to have a view of what those interesting differences are."

(Archard, 2004, p.27)

Such a conception, or 'construction', reflects a meaning "*constructed by human beings as they engage with the world they are interpreting*" (Crotty, 1998, p.43).

James *et al* (1998) note that the concept (or construct) of 'babyhood', as distinct from 'childhood' does not appear to have been considered in the English-speaking world until the late 19th century, prior to which the high risk of death within the first two years meant that infants were not thought to be worth investing in. In an echo of this, stage one of the eight stages of development recognised by the Navajo people of North America does not begin until two years of age, while the Kaluli people of Papua New Guinea do not engage in conversation with their children until they reach 18 months (Montgomery, 2009). These distinctions mirror the different approaches used in much of the existing research into the development of food preferences, according to whether the children participating in the study are under or over two years old, reflecting what appears to be a widespread assumption about the need for children below this age to have feeding 'done to' them.

Several writers have pointed to a persistent lack of consideration, in the academic literature, for the perspective of the infant (Gottlieb, 2000; De Graeve, 2015). The problem may be an ideological one: Benn (1998) describes ideologies – that is, systems of belief and ways of thinking based on vested interests – that underpin the way a society operates but which are

open to challenge. He cites as an example the ideology of male dominance that, according to the feminist view, dictates the place of women in society. Archard (2004) compares this to the ideology dominant in much of the world today, which states that children are incompetent and need to be protected. He argues that there is a self-fulfilling element to such an ideology, in that treating children as if they are incompetent may make them appear incapable, or even cause them to be so:

“Presumed unable to do something, children may simply not be allowed to show that in fact they can. [... Alternatively, a] child may display incompetence just because she has been prevented from doing what would give her the ability.”

Archard, 2004, p.96)

Jones (2009) echoes this:

“Adults can create a vicious circle whereby they leave little room for the child to be seen as capable, because their preconception is that children are not capable.”

(Jones, 2009, p.64)

Presumptions about infants' inability to feed themselves would seem to reflect these observations. Indeed, Wright *et al* (2011) have acknowledged that infants may begin to reach out for food at a younger age than has been reported, if they are encouraged to do so.

Crotty's (1998) chilling assessment of an ideology is as something that *“is not seen for what it is but is taken to represent the way things really are”* (p.121). Graue and Walsh (1998) take this one stage further, warning that *“[a] dominant image of children does not simply shape practice with children. The investment in that image promotes practice that develops children in that image.”* (p.29). It may be that insistence on spoon feeding is linked both to a belief that infants are incapable and to a desire to keep them that way.

Children, and especially infants, are commonly seen as passive as well as incapable (Jones, 2009). That this view exists is evidenced in the language of 'acceptance' of new foods – as opposed to active choosing of them – found in the academic literature. Maintaining this view serves adults' needs (Archard, 2004), allowing them to do things to children, and to use 'the child's best interests' as an excuse, while in fact pursuing their own interests, or those of society (Jones, 2009). As Graue and Walsh (1998) have said, *“The boundaries of children's experiences are patrolled by adults.”* (p.12). Thus, while there appears to be no evidence that spoon feeding is in the best interests of infants of six months and older, it is an approach that allows the adult's goal of getting the infant to eat to be fulfilled more easily.

Parents are necessarily in a high-power position relative to children (Hoffman, 1960). Bruce (2004) notes that children who become used to following an adult's lead do not learn to think

autonomously or creatively. Grolnick and colleagues showed that infants whose mothers supported their autonomy during play, for example by holding a toy steady for the infant to handle, showed greater engagement and developed greater competence than those whose mothers directed their play (Grolnick *et al*, 1984; Frodi *et al*, 1985). Pridham *et al* (2000) found, similarly, that attention-directing behaviour by the mother was a predictor of reduced focused exploration by the infant, while Lewis *et al* (1990) showed that infants as young as two months displayed anger when their efforts were thwarted. This suggests that infants have an innate drive to act for themselves, and that they are likely to respond negatively, or to lose interest in an activity, if their efforts are blocked. Respect for the infant as an agent, capable of acting on the world and engineering his own learning, would seem to be a prerequisite for the optimal development of his physical skills and sense of well-being (Ryan and Deci, 2000), as well as being a way to prevent conflict (Deci *et al*, 1993).

1.5.1 Evidence of an adult-centred approach to feeding problems

The lack of control that young children would appear commonly to experience during mealtimes is echoed in the way feeding problems are discussed in the research literature. Many authors refer to 'children with feeding problems', thereby implying that it is the child who is experiencing, or possibly even responsible for, the difficulty. Terms such as 'food refusal' and 'picky eating', similarly, describe behaviours exhibited by the child from the parent's perspective. Much of the research in this area seeks to find ways to overcome these behaviours but, since the child's health is rarely affected (Wright *et al*, 2007), it seems likely that this is for the benefit of the parent. Thus, it is the occurrence of food refusal and concomitant negative mealtime behaviour, rather than the quality of the eating experience for the child, that is seen as the issue to be resolved, and the need for resolution is the parent's, not the child's.

The use of the word 'feeding' is of interest, since, as discussed, it implies something that is 'done to' the child. This contrasts with descriptions of problems connected with diet and eating in adolescents and adults, which are usually referred to as 'eating disorders'. Cooper and Stein (2006) discuss both "*feeding problems*" and "*eating disorders*" but they do not clarify at what age feeding becomes eating, nor at what point the 'problem' is identified as such by the child rather than the parent.

Davies *et al* (2006) advise that feeding disorders should be recognised as having their base in the "*systemic and multi-determined nature of the feeding relationship*" (p.412), rather than within the child himself, and propose a definition of feeding problems as "*feeding disorders between parent and child*" (ibid). However, their first criterion for such a disorder is:

“Feeding disturbance between parent (or caregiver) and child as manifested by the child’s persistent failure to eat in keeping with developmental expectations and cultural and subcultural norms.”

(Davies *et al*, 2006, p.412; my emphasis)

This wording reinforces the view that, even though he may not be solely responsible for it, it is nevertheless the child’s behaviour, and its impact on the parent, that defines the problem.

In a recent study, Morawska *et al* (2014) observed the interaction between mothers and infants ranging in age from six to 11 months and noted the positive and negative strategies employed by the mothers during feeding. Their report does not clarify what these strategies were intended to achieve but the inference is that the aim was to get the infant to eat the amount of food chosen by the mother, and it is on this basis that the efficacy or otherwise of a given strategy appears to have been judged. As with other studies in this field, the implication is that the infants were being spoon fed during the observed interaction, although this is not overtly stated. The authors noted a tendency by the mothers to continue to try to persuade the infant to eat after he or she had refused the food, such that they chose to use ‘infant food refusal’ (IFR) as a measure of satiety. They explain their rationale thus:

“IFR was the only child behavioural measure used, as it is an easily discernible infant behaviour, and during the preverbal stage of development it is the only communicative cue that the infants are satiated, but this measure was potentially limited. At some point during the feeding interaction there has to be IFR to indicate to the parent to stop feeding [... otherwise] the infant could still be hungry at the end of the interaction.”

(Morawska *et al*, 2014, p.532, my emphasis)

This clearly suggests a position in which the parent’s overall control of the meal is assumed. The infant is expected to comply with what he is being asked to do and it is only when he stops being compliant (and sometimes not even then) that his perspective is taken into account: he *has* to refuse to comply in order to register his satiety. Young and Drewett (1998) echo this position, albeit less forcefully:

“In an adult the cessation of eating can be used as a measure of satiation. This approach also works with children old enough to feed themselves, but it is not clear that it does with weanlings, because of the contribution of the adult to the feeding of the child.”

(Young and Drewett, 1998, p.35, my emphasis)

Hodges *et al* (2013) suggest that mothers in industrialised nations may be more responsive to their child’s hunger than to their satiety. It is possible that this, too, may be linked to the necessity for the infant to signal actively that he wishes to stop eating.

The requirement for the infant to communicate his satiety in order for feeding to cease contrasts strongly with what happens in baby-led weaning, when the cessation of self-feeding is taken as a sign that the infant is no longer hungry (Rapley and Murkett, 2008). This echoes what happens during breastfeeding, when, rather than needing to communicate fullness, the infant merely lets go of the breast. 'Refusal' to eat does not happen when nothing is being proffered, because there is nothing for the infant to refuse. Similarly, when no attempts are made to control what he does, there is nothing for him to resist. Spoon feeding appears to reverse this active-passive dynamic, demanding that the infant register non-engagement actively and engagement passively. Hence, far from being the only communicative cue to satiety possible for preverbal infants, it seems likely that IFR is the product of an adult-controlled feeding process, and that the infant is forced to employ this as his strategy, and to restate it if it is ignored, simply because it is the only communicative cue *available to him*. It seems unfortunate that what is regarded as normal feeding should require the infant to employ a behaviour that may later be identified as a problem.

The methods used to study children's eating further underline the adult-centredness of much of the research in this area. While some studies have used questionnaires specifically designed to assess parental beliefs and attitudes to their child's eating (Baughcum *et al*, 2001; Birch *et al*, 2001), other non-observational studies have used this method as a way of identifying and classifying the child's behaviour (Wardle *et al*, 2001; Carruth *et al*, 2004a; Carruth *et al*, 2004b; Lewinsohn *et al*, 2005). Such research assumes an equivalence between parents' interpretations of their child's behaviour and the true nature of that behaviour. Reporting of this type is necessarily subjective and may reveal more about the parents' (and the researchers') expectations and values than about the reality of children's eating habits.

Mealtime observations are commonly used in clinical practice as part of the assessment of wider patterns of interaction between parents and children. To assist in the identification, categorisation and treatment of feeding problems, various diagnostic tools have been developed. Both the tools themselves and the reports associated with their use present a picture of spoon feeding as the norm, with the caregiver firmly in control of the feeding situation. Chatoor *et al* (1997) devised and tested a feeding scale for use with children from one month to three years old, and their mothers. Scrutiny of the items in this scale reveals that it presumes a situation in which the mother is the active agent in the feeding process, and that the infant's focus of attention will normally be on her, rather than on the food. For example, for the infant, avoiding the mother's gaze and spitting out the food are considered negative behaviours, while the mother who "*positions [the] infant for reciprocal exchange*" (p.83), that is, face to face, is rated positively.

The Nursing Child Assessment Feeding Scale was developed by Sumner and Speitz in 1994, primarily for the assessment of milk feeding (Hodges *et al*, 2007). Hodges and colleagues (2009) evaluated the appropriateness of this tool for use with toddlers and identified several items from the scale as being applicable to this age group. Many of these – for example, “*caregiver stops or starts feeding*” (p.665) and “*child responds to feeding attempts*” (p.666) – point to an unacknowledged expectation that the toddler’s eating will be largely controlled by the caregiver.

Parkinson and Drewett (2001) carried out a study of eating behaviours in children aged 12 to 14 months, with their parents. In each case the child was given the opportunity to feed him- or herself but the parent quickly took over if the child showed no inclination to do so. The assessment tool identified the parent’s actions in purely descriptive terms but labelled the majority of the child’s actions in the context of those of the parent. Thus, the parent ‘gave’ food and the child either ‘accepted’ or ‘refused’ it; while the child might ‘fail’ to get food into his mouth, an equivalent failure by the parent was coded as refusal by the child. A similar study by Bober *et al* (2001) considered self-feeding toddlers aged 12 to 19 months to be “*off-task*” if they engaged in finger feeding or “*played*” with the food. The ‘task’, defined by the researchers, was self-feeding with a spoon; the goal, also set by the researchers, was to complete the task, rather than to eat, *per se*. This implies an unspoken assumption, either that the toddlers shared the researchers’ goal, or that any other goals they may have had in this situation were inappropriate or unimportant.

The Responsiveness to Child Feeding Cues Scale, developed by Hodges *et al* (2013) is designed for use with infants and children aged from seven to 24 months. It revolves around the perception, interpretation and response to a child’s cues of hunger and fullness by the child’s caregiver. Having trialled the scale with a pilot group, the authors note:

“Interestingly, mothers tended to be more responsive to the hunger and fullness cues of self-feeding children than younger children who were still primarily fed by the caregiver.” (Hodges *et al*, 2013, p.217)

However, they do not explore this phenomenon, nor do they describe whether or how the cues given by the self-feeding children differed from those given by the younger children, or provide information about the ages of the children in the two categories. This is of interest: the premise of the scale itself would appear to be that the infant/child must provide cues, and that these must be perceived, interpreted and acted upon if he is to eat sufficient food. However, when a child is feeding himself, provided there is food within his reach he does not need to provide cues for his caregiver to do, or stop doing, anything, to enable him to eat. If the distinction between self-feeding and being fed is not made the validity and usefulness of such a scale are in doubt.

Studies of young children's behaviour at mealtimes often refer to 'appropriate' and 'inappropriate' behaviour. Some use a pre-defined scale (Crist and Napier-Phillips, 2001) while others provide their own definitions. For example, Piazza *et al* (2003) define appropriate behaviour as, "*acceptance of food*" (p.190); inappropriate behaviours include, "*head turning, batting at the spoon [and] throwing food or utensils*" (p.191). Woods *et al* (2010a) use a similar taxonomy. The implication is that expectations of mealtime behaviour are universal laws, rather than, as is likely to be the case, varying between individuals and within families, communities and societies. Presumably, the children in these two studies, the oldest of whom were seven and eight years, respectively, considered their behaviour entirely appropriate, given the situation with which they were faced, even if their parents and/or the researchers did not.

Casey *et al* (2009), in line with some other researchers, refer to the removal by parents of food that has been refused by the child as "*escape*", and discuss the efficacy of "*escape extinction*", in which refused food is not removed, as a means of achieving food acceptance. This terminology has echoes of imprisonment or entrapment, with the parents indisputably in control. It makes no attempt to intuit the reasons for the child's behaviour or to acknowledge that he may be experiencing distress. The infant is portrayed not as an autonomous agent but as a recipient of, and *reagent* to, care decided for him by adults, with the implication that this situation is either actively desirable or simply unavoidable.

1.6 Summary of the evidence and rationale for the study

The literature review showed that food is important for human beings' health and well-being and suggested that survival is enhanced if eating nutritious foods is a pleasurable experience. Diet in infancy has been shown to have long-term health implications; breastmilk is the ideal first food and breastfeeding confers many benefits on both infant and mother, as well as preparing the infant for the flavours of other foods. Healthy, normally developing infants are capable of feeding themselves at birth and the act of feeding appears to be central to their relationship with their primary caregiver. Breastmilk can continue to meet the infant's nutritional needs for the first six months of life, after which the introduction of complementary foods is recommended.

Infants of six months are interested in, and able to act on, the world around them and they appear to need to do so in order to learn about it, primarily through focused exploratory play. Prerequisites for optimal learning are the opportunity to use all the senses and an autonomously supportive environment. There is reason to believe that infants may extend the same approach to foods as they do to other objects and that inspection, touching, sniffing, tasting and manipulation of food may be as important for safe eating as for general

learning and development. The development of food preferences relies on the infant's exposure to food but it is not clear which type or types of exposure are most influential, and from what age, nor what role, if any, the feeding method may play. Feeding problems are common in toddlerhood and there is evidence to suggest that their roots may lie in the weaning period, which is recognised as a time of potential conflict during which power may need to be negotiated between infant and caregiver. Here again, the role of feeding method is unclear. Both spoon feeding and puréed foods would appear to be unsuited to the developmental abilities and needs of six-month-old infants, and to demand learnt rather than naturally acquired skills. Both may also have the potential to undermine infants' agency and appetite regulation, and to make eating less pleasurable. Yet their use continues to be presented as the norm in the majority of the academic literature.

The literature review revealed a common 'cut-off' point of around two years, such that studies of the development of food preferences and/or feeding problems appear to focus either on children of two years and older, who are feeding themselves and sharing table food with other members of their family (Carruth *et al*, 1998; Cooke *et al*, 2003), or on those younger than this, who are being spoon fed puréed or mashed food (Harris *et al*, 1990; Mennella *et al*, 2008; Birch and Doub, 2014), with types of 'exposure' and ways of identifying responses varying according to the age group. Thus, although not generally acknowledged, the focus of research into the responses of infants to solid foods has been on their reactions to having food inserted into their mouth with a spoon, rather than on their responses to food *per se*. Recognition that this is the case must cast doubt on many of the conclusions that have been drawn from this research. This thesis argues that, without the method of feeding being considered as a potential confounding factor, our understanding of infant's responses to food cannot be said to be comprehensive.

As well as revealing a lack of attention to the method of feeding during weaning, the literature review found no evidence of attempts to understand the introduction of solid foods from the infant's point of view. Rather, even in the 25 years since the publication of the United Nations Convention on the Rights of the Child (OHCHR, 1989), which demanded a voice for children, research into the feeding of infants between six and 24 months has tended to view the child as the object or subject of the study, rather than as a participant or informant in it. This is consistent with Hogan's assertion that:

"Most research conducted with children over the last century of developmental psychology has not sought to understand children's subjective experience."

(Hogan, 2005, p.22)

The current study seeks to redress this balance by considering the introduction of solid foods from the infant's perspective.

Figure 1.3 Determinants of an individual infant's food consumption during weaning

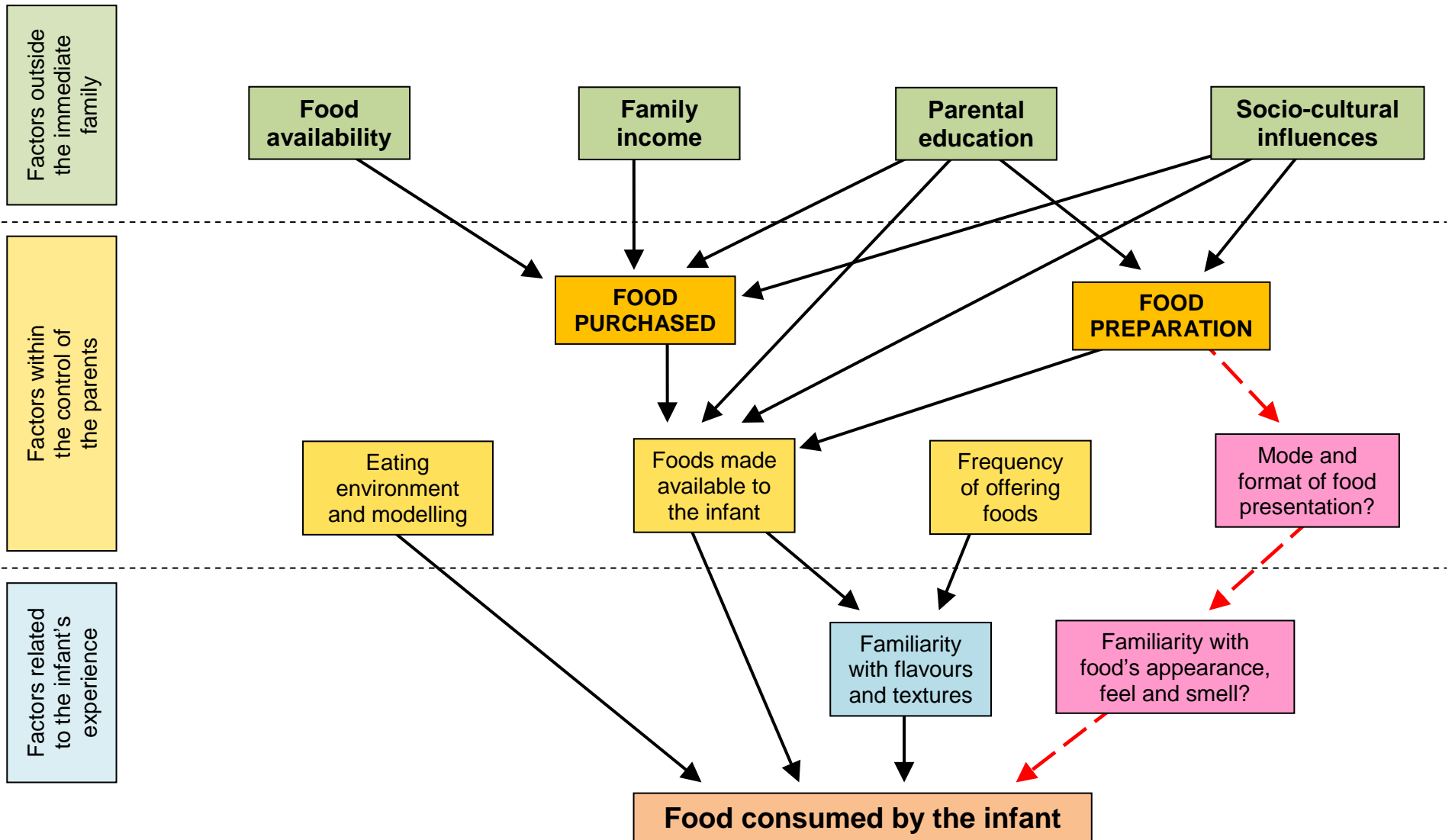


Figure 1.3 summarises the complex interaction of factors that would appear to determine the diet of an individual infant once weaning commences. The available literature suggests that geographical, financial, educational and socio-cultural factors will influence decisions made by the infant's parent(s) regarding the food that is purchased for the household. To a lesser degree, they may also influence the eating environment within the household, the type of food offered to the infant and the frequency and manner in which it is offered. Within these external constraints, decisions made by the parent(s) further define and limit the experience the infant has of food and mealtimes, and determine the range of flavours and textures with which he becomes familiar. The missing element in the existing research evidence, as illustrated by dotted red arrows and pink-shaded boxes, would seem to be information about whether and how the mode and format in which the food is presented – specifically, whether it is 'whole' or puréed and self-fed or spoon fed – influences the infant's attitude towards it, and therefore the nature and amount consumed. It is this element that this study addresses.

1.6.1 Focus of the study

The literature review revealed that, while there is sound evidence to support six months as the age at which complementary feeding should start, there are large gaps in our knowledge about how this change should be managed. The following questions, in particular, remain unanswered:

1. Do infants of six months approach their first solid foods in the same way as they do other novel objects?
2. Do the visual, olfactory and haptic qualities of food appear to be important to them?
3. What impact, if any, does the format of the food have on the infant's response to it?
4. What impact, if any, does the feeding method have on the infant's response to the food?
5. What impact, if any, does the feeding method have on the interaction between infant and caregiver?
6. How might any observed or inferable differences between spoon feeding with a purée and self-feeding with graspable pieces of food affect the development of food preferences and/or common feeding problems?

The current study set out to address these questions through an interpretive exploration of the infant's first encounter with solid food. However, while considering the approach the study should take it was recognised that there might be other, unanticipated differences between the two feeding methods and food formats. Accordingly, the following, broader question was devised to guide the research:

What can observing infants of around six months tell us about how their first experience of solid food differs according to whether the food is presented as a piece, for the infant to pick up, or as a purée, on a spoon held by the parent?

In focusing thus on the infant's lived experience of the introduction of solid foods the enquiry represents "*another way of looking*" (Richards and Morse, 2007, p.41) at a phenomenon whose very familiarity may have prevented an awareness of what Usher (1996) refers to as our 'pre-understandings' of what it entails.

1.7 Chapter summary

This chapter has considered why human beings need food, our motivation for eating and the interplay of factors that determine what we eat. The current recommendations for the feeding of infants have been outlined and the nature of the breastfeeding relationship examined, including the role of the infant as an active self-feeder. The development of the infant in the first six months has been described, both in the context of his relationship with his main caregiver and in relation to physical skills, including those needed for self-feeding with solid foods. The infant's desire to learn about the world around him and the means by which he does this have been explored, and the lack of recognition that such learning may be relevant to eating highlighted.

An overview has been provided of our current understanding of the ways in which infants and young children learn about food and develop food preferences, as well as of the phenomena of food neophobia and picky eating, both of which commonly manifest themselves as food refusal. The influence of parents on their children's diets has been explored, and issues of agency highlighted, especially in relation to infants. The nature and prevalence of spoon feeding and the use of purées has been examined, and assumptions about their appropriateness for infants of six months uncovered. A popular alternative approach, baby-led weaning, has been described, and questions raised about the possible role of feeding method and food format in the acceptance of foods and the development of mealtime behaviour. Finally, evidence has been presented of an adult-centred bias to the way in which feeding problems are reported, investigated and addressed.

The chapter has concluded with the outline of a rationale for the current study and the presentation of its aim. The next chapter describes the methodological perspective for the study and shows how the research question was translated into a practical method of enquiry.

Chapter 2 – Methodology

This study is an attempt to understand the introduction of solid foods from the infant's perspective. This chapter describes the approach taken to the investigation, beginning with the underpinning philosophy. It explains the reasons for the methodology selected and presents the study objectives. It offers a rationale for the study design and describes the methods adopted. Finally, it details the procedures that were followed during the processes of recruitment and data collection and outlines the conduct of the analysis.

2.1 Theoretical perspective

Chapter 1 has provided a review and critique of the existing research into the development of food preferences in infants and young children, and into feeding problems commonly encountered by parents. Much of this research has used quantitative methods to provide generalisable results, such that infant behaviour can be predicted. The philosophy underlying the approach taken in such studies is a positivist one. The positivist paradigm, or 'world view' (Creswell, 2009), is based on the premise that knowledge exists separately from individuals, whether or not they are aware of it or concur with it (Crotty, 1998). It holds that there is a single reality that can be identified, tested and shown to be true in all cases that meet the required conditions. Punch defines this view as:

“the belief that objective accounts of the world can be given, and that the function of science is to develop explanations in the form of universal laws – that is, to develop nomothetic knowledge.” (Punch, 2005, p.27)

The positivist view has been criticised for several reasons. One is that put forward by Popper (1959), who maintained that absolute certainty is impossible to achieve and that scientific progress is instead made through the falsification of existing theories. On this account, even 'established' facts exist only until they are disproven, and the function of scientific enquiry should be to seek to refute currently accepted wisdom. Failure to disprove an existing theory gives that theory strength but it does not, and can never, prove it to be unequivocally true (Ayer, 1973). A second criticism is that, in order to be examined and measured in isolation, the phenomena of interest must be 'reduced' to a set of specific, observable components or variables that can be tested (Harrison, 2001), and that the efforts required to do this render the results meaningless in the real world, which is full of inconsistencies (Crotty, 1998). Greene and Hill (2005) note that this approach pertains in the field of developmental psychology, which *“has had and continues to have a fascination with statistics [that cannot capture] the richness of individual lives”* (p.4). Donmoyer (2000) points out that, *“[e]ven statistically significant findings from studies with huge, randomly selected*

samples cannot be applied directly to particular individuals in particular situations” (p.51) and goes on to say that, in order to achieve the goal of generalisability, researchers working within a positivist paradigm are forced to strip away much of what makes their work interesting and relevant to people in real-life situations. A useful illustration of this from the field of infant and young child feeding is the study by Sullivan and Birch (1990), which established that three-year-olds may have to be introduced to a new food 15 times before they will accept it. Such a ‘rule’ may be verifiable but its usefulness to a parent wishing to predict how their own child will respond is questionable since, as Gomm *et al* (2000) point out, no single individual has all the combined features of the population studied.

The positivist paradigm is challenged at the philosophical level by the argument that absolute objectivity is impossible and that knowledge cannot exist independently of the knower. Instead, it is claimed, knowledge is subjective and exists within the mind (Grbich, 2007). It is the nature of the relationship between the individual and a particular object, and the significance of the object to him at that moment, that determines its reality for him (Crotty, 1998). This is the interpretivist view. Research within an interpretive paradigm aims to arrive at an understanding of a phenomenon or a consensus on what is a reasonable interpretation of the findings in relation to that phenomenon (Cryer, 2000), or to expand the range of available interpretations (Donmoyer, 2000), rather than to isolate verifiable concrete facts. This means that the individual himself does not need to be reduced to a set of behaviours or beliefs for meaningful discoveries to be made.

Social scientists argue that human beings are aware of what is happening around them and make choices about how to act, such that their behaviour cannot be predicted in the same way as naturally occurring phenomena (McNeill and Chapman, 2005). Infant feeding is a social phenomenon in that it occurs *“in a specific context, and is likely to be the product of multiple causal processes”* (Gomm *et al*, 2000, p.99). While some of these processes have been investigated within the existing research, I have argued that the identification and definition of feeding problems, the methods used to investigate them, and the interpretations of the results have largely been set within an adult agenda, and that the significance of the feeding situation *for the infant* has not been explored. It seems likely that gaining insight into the infant’s point of view would increase our understanding of the aetiology of feeding problems and provide alternative strategies for tackling and preventing them. As Flyvberg argues:

“[F]rom both an understanding-oriented and an action-oriented perspective, it is often more important to clarify the deeper causes behind a given problem and its consequences than to describe the symptoms of the problem and how frequently they occur.”

(Flyvberg, 2006, p.229)

A key aim in the development of the current study was to set aside the *a priori* conceptions about infant feeding that appear to have clouded previous research, and which, as Donmoyer (2000) has pointed out, are likely to be themselves social constructions created by the society within which the research has been devised. This echoes Crotty's (1998) assertion that:

“Observation takes place within the context of theory and is always shaped by theory. All our observing is done within a horizon of expectations and is therefore necessarily selective.” (Crotty, 1998, p.33)

As a way of resisting this, Crotty (1998) calls for the use of counter-induction, or the “*calling of ‘commonly-used concepts’ into question by developing something with which they can be compared*” (p.39). Accordingly, this study sought to explore the beginning of the relationship between infants and solid food, in an effort to understand both its nature and the meaning the food has for the infant. It was hoped that examining the infant's first encounter with solid food would cast light on the relationship as it exists before the appearance of ‘feeding problems’, and capture the novelty of the situation from the perspective of the infant.

2.2 Chosen methodology

The study employs an interpretive methodology, using two methods of data collection – observation of the infants' interaction with the food and interviews with each infant's primary care-giving parent – to generate both quantitative and qualitative data. Interpretivism is about *verstehen*, or understanding the social ‘life-world’ inhabited by individuals (Crotty, 1998). Support for an interpretive approach for a study of infants comes from Greene and Hill (2005), who argue that qualitative methodologies are most appropriate for researching children's experience, since they are better able to “*capture the nature of children's lives as lived*” (p.3). Sumsion and Goodfellow (2012), similarly, favour “*looking and listening-in*” as a means of understanding a child's world.

The current study draws on several commonly used interpretive methodologies, while conforming fully to none of them. In line with case study research, the number of individual participants is small (Stake, 2000, Yin, 2003), allowing a focus on detail (Flyvberg, 2006) and the chance to see familiar things differently as well as to see new things (Donmoyer, 2000). In common with ethnography, on the other hand, the study aims to see the world in the way that key participants – in this case ten infants – see it (Crotty, 1998; Silverman, 2006), and to *learn from* rather than to *study* them (Spradley, 1980). As discussed, in this sense it differs from much of the previous research into young children and eating.

The study also has echoes of phenomenology, in that it is concerned with uncovering the lived experience of human beings, that is, how life appears from the individual's perspective

and the meaning that the people, objects and events in his/her world have for him/her (Richards and Morse, 2007). In attempting to see the infant's first encounter with solid food through the infant's eyes, and to understand the immediacy of it for him, the study seeks to identify *"the essence of human experiences"* (Creswell, 2009, p.13) and to make available something that was previously hidden (Leonard, 1994). However, phenomenology is typically undertaken through the medium of language, either spoken or written (Flick, 2009); infants of six months do not have sufficient language to be able to describe their experiences by either of these means. Indeed, Fraser (2004) notes a *"long-held view of social and psychological researchers ... that young children are not competent to describe or understand their own world"* (p.16).

Lack of speech and written language may preclude the conduct of a truly phenomenological study of the 'life world' (Leonard, 1994) of an infant but it should not prevent his or her voice being heard. Langston *et al* (2004) assert that:

"from birth children are social beings, skillful at communicating, competent at learning and able to 'say' (if others learn to 'listen') something about their lived experiences."
(Langston *et al*, 2004, p.157)

Messer (1994), too, has pointed out that:

"During the first months of a child's life, the lack of speech does not [...] prevent social interaction and communication from occurring between infants and adults."
(Messer, 1994, p.1)

Similarly, Clark and Moss (2001) have emphasised the importance of using observation to gain insight into the world of pre-verbal children, and point out that *"listening [...] is not limited to the spoken word"* (Clark and Moss, 2005, p.8). This echoes Greig and Taylor (1999), who maintain that observation allows the *"silent 'voice'"* of a child to be heard (p.83). Danaher and Briod (2005), while holding to the view that, in order to pursue a phenomenological study of children, *"the researcher must wait for language"* (p.221), nevertheless suggest that there is scope for interpreting children's *"expressive bodies-in-action"* (ibid.) as a way of gaining insight into their experiences.

McNeill and Chapman (2005) assert that *"actions are the results of people's interpretations of the situation that they are in"* (p.19). Thus, it would seem reasonable to assume that an infant's actions are the result of his interpretation of the situation in which he finds himself, and that observing them can provide clues to his perspective. It should therefore be possible to go beyond merely describing an infant's behaviours in a feeding situation, as has tended to happen in the past (for example, Birch *et al*, 1998; Carruth and Skinner, 2002; Chatoor and Ganiban, 2003), and instead to analyse them interpretively.

This proposal, to use infants' actions, rather than verbal reports, as a guide to their experience resonates with the phenomenological perspective of Merleau-Ponty, who emphasised the 'embodied' nature of the experience for the individual (Leonard, 1994) and an individual's body as his means of communication with the world (Smith *et al*, 2009). A concept of embodiment seems particularly apt for the infant who, at six months, is only just beginning to be aware of himself as an individual being, distinct from the objects and people around him (Thompson *et al*, 2011), and whose chief way of making sense of his world is through touch and action (Gallahue and Ozmun, 2002). In addition, facial expressions, movements and gestures, are recognised as key ways for pre-verbal infants to express their emotions (Sheridan, 1973; Messer, 1994; Murray and Andrews, 2000; Lock, 2001; Messinger, 2002; Yale *et al*, 2003). Since it is also the case that, until they are around four years old, children are unable to conceal or falsify their emotional responses (Thompson *et al*, 2011), attention to these observable signs should provide what Chatoor *et al* (2001) describe as "*a window to their inner life*" (p.595).

The analysis of the data from the current study draws on the techniques of Grounded Theory. This approach was first described by Glaser and Strauss (1967) and subsequently developed separately, along two divergent paths (Glaser, 1978, 1998; Strauss, 1987; Strauss and Corbin, 1998). It has since been modified by other researchers and, according to Bryant and Charmaz (2007, p.6), "*has taken on a life of its own*". Grounded Theory is so called because the theory is grounded in, and arises from, the data. There is no *a priori* hypothesis, making it particularly appropriate for studying topics that have not previously been explored. Thus, while the aim of the current study was not to generate theory, the techniques of constant comparison and theme development used in Grounded Theory were considered appropriate.

2.3 Rationale for a mixed methods approach

A departure, in the current study, from the usual format of interpretive research is the inclusion of an element of quantification. Quantitative methods are traditionally associated with positivist research since quantitative data, which are numerical in nature, can be subjected to parametric statistical methods of analysis and can therefore be used to confirm factual hypotheses and calculate probability (Flick, 2009). In contrast, the data used in interpretive research are primarily qualitative, that is, descriptive or narrative, consisting of words, images and/or artefacts (Punch, 2005), and are not amenable to mathematical analysis (Cryer, 2000).

Mixed methods research has been the subject of much discussion in recent years but the mixing, or combination, of methods in a single study is generally considered feasible without

incurring a methodological conflict (Maxcy, 2003; Teddlie and Tashakkori, 2003). Thus, in the same way that a single study may use more than one method of data collection, so too it may employ more than one method in the analysis of that data. Teddlie and Tashakkori (2003) refer to this approach as pragmatism. Cryer (2000) argues, as does Silverman (2010), that interpretive data, while primarily descriptive, do not have to be exclusively qualitative. Creswell (2009) agrees, maintaining that it is possible to incorporate some basic counting within a qualitative piece of work in order to clarify the phenomenon itself and enhance understanding. Indeed, Creswell and Plano Clark (2007) hold that choosing an approach that permits the use of more than one method frees researchers to use whichever combination best suits the purpose of the research, and can lead to a greater understanding of the problem under investigation, although, as Kemper *et al* (2003) point out, for this to work well the methods chosen need to complement one another in terms of their relative strengths and weaknesses. Creswell (2009) further suggests that the use of mixed methods can lead to greater insight, which is especially desirable when the area of interest is more or less uncharted. Punch (2005) concurs:

“[W]e cannot find out everything we might want to know using only one approach, and we can often increase the scope, depth and power of research by combining the two approaches.” (Punch, 2005, p.238)

Maxwell (2010) argues that it is not the use of numbers *per se* that determines whether a study is quantitative, qualitative or mixed methods, but the way of *thinking* about those numbers, which in turn determines the way in which they are used. Quantitative approaches lend themselves to the production of statistical information, as seen in the quinquennial infant feeding survey carried out in the UK (McAndrew *et al*, 2012). In this case, the results are expressed in the form of statistics and inferences are drawn directly from them. Used qualitatively, however, numbers can contribute to the analytical process and make the conclusions of a study more robust, without altering their interpretive nature (Maxwell, 2010). For example, simple counts can indicate the relative importance of some of the research findings and can help to generate meaning (Smith *et al*, 2009; Onwuegbuzie and Teddlie, 2003). As will be shown, the inclusion of numerical data in the current study enabled a more convincing description of what was observed, thereby enhancing understanding of the phenomenon of the infant's first encounter with solid foods.

2.3 The study design

The aim of the study was to answer the question:

What can observing infants of around six months tell us about how their first experience of solid food differs according to whether the food is

presented as a piece, for the infant to pick up, or as a purée, on a spoon held by the parent?

The study focused on parent-infant pairs. The objectives of the study were:

Objective (i) – Eliciting the parent’s experience

To elicit parents’ accounts of their experience of a food when presented to them as a piece and when spoon fed to them as a purée.

This objective was to be met through a first interview with the parent (Interview #1).

Objective (ii) – Examining the infant’s behaviour

To examine infants’ behaviour in response to being presented, for the first time, with a piece of food, versus being offered the same food puréed on a spoon.

This objective was to be met through observation of the infant’s first encounter with solid foods (the Observation) and a second interview with the parent (Interview #2).

Objective (iii) – Examining the parent’s behaviour

To examine parents’ behaviour according to whether they present their infant with his or her first solid food as a piece, or puréed on a spoon.

This objective was to be met through the Observation and Interview #2.

The study progressed as follows:

1. Observation of the infant’s first encounter with food.

The infant was presented with the selected food as a piece and as a purée. An audio/video-recording was made of his or her responses and some of the actions of the infant’s parent. This was accompanied by brief field notes.

2. Interview #1: The parent’s experience of the food.

The parent was presented with the same selected food as a piece and as a purée and interviewed about their experience of it.

3. Interview #2: The parent’s review of the infant’s first encounter with food.

The parent was shown the audio/video-recording of their infant and interviewed about their interpretation of his or her behaviour, and their own behaviour.

The analysis followed a generic inductive qualitative model (Hood, 2007) with a small embedded quantitative element (Creswell and Plano Clark, 2007).

2.3.1 Rationale for examining the infant's first encounter with solid food

There were four reasons for the decision to focus on the infants' very first encounter with solid food. Firstly, it has been suggested that the roots of some of the feeding problems evident in older infants and toddlers may lie in the period before those problems commonly manifest themselves, namely during the early part of the weaning process. *How* early is not clear but it seemed reasonable to investigate the beginning as one potential trigger point. Secondly, as seen, infants' willingness to accept new flavours increases with their experience of different foods. The only way to ensure that all the infants in the study had previously had comparable experiences with solid foods was to specify that they should have had no such experience. Thirdly, the introduction of solid food marks a significant milestone in the infant's daily life, and represents the beginning of a fundamental change in his relationship with his mother, something that it may not be possible to recapture later. Fourthly, having defined the beginning of weaning, on the basis of Sellen and Smay's (2001) work, as the first mouthful of anything other than breastmilk or infant formula, it seemed appropriate to try to capture and observe that very first mouthful. Focusing on the infant's first ever direct encounter with solid food in any format ensured as far as possible that what was captured were his or her spontaneous responses, uncoloured by previous experiences. This avoided the potential influence, either negative or positive, of earlier incidents connected with solid feeding and provided the opportunity to try to divine the meaning the infant attached to the food in his first moments of contact with it.

The infants were each presented with the same food in two different formats, one after the other. Unfortunately, as soon as an infant has once tasted a particular food, that flavour is no longer novel to him. It was possible, therefore, that experience with food in one format, delivered by one method, would affect the infant's response to the same food in a different format and/or presented differently. Offering the infant the same food in the two different formats and by both methods simultaneously was not deemed feasible, since it would be likely both to confuse the infant and to make it difficult to correlate the behaviours with either format/method with confidence. The next best option was to vary the order in which the two formats/methods occurred, to increase the chances of detecting behaviour related to one or the other, rather than to the fact of having encountered it first or second. Two protocols were therefore developed, to be alternated infant by infant; these can be found at Appendix I.

2.3.2 Rationale for the choice of food

The study was concerned with the infants' first encounter with *any* solid food. In order to facilitate comparisons between the infants, and to enable the combined data from the parents' experience of the food to be applied to all the infants, the decision was made to use the same food in each case. Broccoli was chosen, for several reasons:

Firstly, the use of a vegetable or fruit – rather than meat or cheese – meant that the same food would be acceptable to the majority of potential participating parents, including those who would not wish their infant to be offered foods of animal origin. In general, vegetables have less potential to cause allergy or intolerance than fruits (Sampson, 2003), so the choice of a vegetable carried fewer risks of provoking a physical reaction in the infant. Vegetables are also a food group which children are known to avoid (Blanchette and Brug, 2005; HSCIC, 2013); the possibility of gaining insights into why this may be was therefore an added bonus.

Secondly, shape and texture of the piece of food were important if the infant was to be able to handle it easily. A broccoli floret with about 6cm of stalk is a convenient shape for an infant of six months to grasp (Gallahue and Ozmun, 2002), and is less slippery than most fruits. It can be cooked so that the stalk remains firm enough to grip while the top is soft and easily chewed. Its non-uniform shape and varied texture also make it potentially more interesting in appearance than a simple stick of a root vegetable.

Thirdly, research suggests that, when presented with a novel food, infants are least likely to accept bitter tastes, such as vegetables of the brassica family (Turnbull and Matisoo-Smith, 2002; Dovey *et al*, 2008). This coincides with my own experience as a health visitor, which is that broccoli has a reputation among parents and professionals as a food usually disliked by young children. Conversely, sweet foods, such as banana or apple, are generally considered likely to be accepted, especially by infants accustomed to the sweetness of breastmilk. However, anecdotal reports indicate that brassicas are often liked from the outset by infants who feed themselves (source: online accounts on parenting forums and personal communication from parents, 2008-2010). The use of broccoli therefore offered a good chance of generating a range of responses.

Finally, the difference in both appearance and texture of cooked broccoli when presented 'whole' and as a purée is more marked than is the case with, for example, raw banana or steamed carrot. Broccoli is also more likely to retain its shape, rather than becoming rapidly 'puréed', when handled by inexperienced infants. This feature increased the likelihood that the two formats would remain distinct throughout the Observation. This was important, given the pioneering nature of this piece of research, since it maximised the chances of producing findings that could be considered significant. By the same token, if few or no differences were seen using the same food offered in two such distinct formats, this would tend to refute the idea that an enquiry of this type was worth pursuing.

2.4 Methods

The study used a combination of observation and interviews. The use of multiple methods to explore the same phenomenon is considered a particularly useful strategy for exploratory work in new areas of study (Creswell and Plano Clark, 2007), especially within the social sciences (McNeill and Chapman, 2005). This approach is similar to the strategy of triangulation used in quantitative research (Robson, 2002), that is, the collection of data from more than one standpoint. Silverman (2010) considers that triangulation in qualitative research can mitigate against focus and detail. He argues that the strategy is a positivist one, which assumes there is a unifying truth to be arrived at, and that it is therefore not applicable to qualitative research. Denzin and Lincoln (2008) disagree:

“Triangulation is not a tool or a strategy of validation, but an alternative to validation [...], a strategy that adds rigor, breadth, complexity, richness and depth to any inquiry.” (Denzin and Lincoln, 2008, p.7)

The point may be a semantic one: Richards and Morse (2007) tell us that, if the methods used do not address the same question, as they rarely do in qualitative work, then the findings of each cannot support the other(s); the effect is therefore not true triangulation. However, there seems to be general agreement that a multiplicity of methods can predispose to new interpretations. This reasoning resonates with the purpose of the current study, which was to throw light on the infant's experience of the introduction of solid foods, rather than to confirm any particular hypothesis. It fits particularly well with an attempt to see things through the eyes of an individual who cannot be interviewed, allowing the researcher to adopt two positions, as described by Smith *et al* (2009) in relation to interpretive phenomenological analysis, or IPA:

“[T]he IPA researcher is, in part, wanting to adopt an ‘insider’s perspective’ [...], see what it is like from the participant’s point of view, and stand in their shoes. On the other hand, the IPA researcher is also wanting to stand alongside the participant, to take a look at them from a different angle, ask questions and puzzle over things they are saying.” (Smith *et al*, 2009, p.36)

Since no single method is available that can be relied on to reveal the infant's perspective, the casting of light from more than one direction would seem to be the best way to gain as full a picture as possible – thus, illumination rather than triangulation.

2.4.1 Observations

Observation of the infants' first encounter with solid food was chosen as a means of addressing Objectives (ii) and (iii), namely, ***to examine infants' behaviour in response to being presented, for the first time, with a piece of food, versus being offered the same***

food puréed on a spoon and to examine parents' behaviour according to whether they present their infant with his or her first solid food as a piece, or puréed on a spoon.

Previous researchers in the field of infant feeding have chosen to interview parents about their children's eating experiences as a way of gaining insight into those experiences (Carruth *et al*, 2004a; Johnson and Harris, 2004; Maier *et al*, 2007; Coulthard *et al*, 2009). However, Sacco *et al* (2007) have shown that parental reports are unreliable as a way of establishing the facts of what takes place during feeding. This is likely to be because this method introduces the risk of 'selective memory' observer bias (Robson, 2002), not least because parents will be influenced by their own wishes and expectations in relation to their child's eating. In addition, because they do not share the researcher's aims and objectives, they may not notice all potentially relevant behaviours; they may also omit to report behaviours that they either do not consider relevant, or that portray either them or their infant in an unfavourable light. Depending on the time lapse between the interviews and the events in question, they may simply forget what happened, or the order in which things occurred. In addition, they may apply their own evaluative interpretation to the behaviours they do report. When the researcher subsequently applies her interpretation to the parent's account, a 'double hermeneutic' is introduced (Scott and Usher, 1996; Crotty, 1998), in which the interpreter sees the data through both her own and the parent's lenses. This can mean that the findings as reported are a long way from the reality as it occurred.

By six months, most infants have developed a wide range of non-verbal ways of conveying feelings. These include vocalisations, such as squeals, growls, shouts, screams, cries and laughter; facial expressions, including smiles, frowns, expressions denoting fear or disgust, gazing and looking away; and bodily movements, such as stiffening, arching, kicking, feet-rubbing, arm-waving and banging a hand or object on a surface (Sheridan, 1973; Murray and Andrews, 2000; Lock, 2001). They use many of these in combination (Yale *et al*, 2003) and are beginning to use facial expressions to share their experience of objects with others (Striano and Bertin, 2005). Thus, attention to an infant's body language and vocalisations can tell us a great deal about how he is experiencing the world. This makes the use of direct observation an appropriate method of studying infants' responses to novel events and situations.

Direct observation, as opposed to participant observation, is especially appropriate for research that seeks to understand or explain everyday behaviours (Rolfe, 2001). Rhode (2004) suggests it may be particularly suited to collecting information about an infant's bodily experiences. This makes it a good fit with a feeding situation, since this is an everyday occurrence involving physical, or bodily, sensations for the infant. The current study aimed to observe infants' facial expressions, vocalisations, gestures and actions in response to the

food and the feeding situation, as well as any visible parental actions directly related to the infant. No pre-designed checklist or scale was used, since the intention was to observe this outwardly familiar scenario with 'fresh eyes'. It was hoped that repeated behaviours might point to the existence of themes, in the same way that repeated words and phrases can be detected in phenomenological studies based on written or spoken language.

Rationale for recording the observations

One way of conducting observational research is for the researcher to make field notes as the action takes place. However, as Lee (2000) has pointed out, the act of writing takes the observer's eyes away from the action, meaning that she must choose between watching the events as they unfold and taking her gaze away in order to write. Maintaining running records of real-time observations therefore carries the risk that the observer will miss important events, especially fleeting facial expressions (Rolfe, 2001), or that she will simply fail to note down everything that happens. If no notes are taken during an observation, with reliance instead on salient points being committed to memory and written up as soon as possible after the event, it is likely that the observer will remember only events that struck her as particularly significant at the time (Robson, 2002). Digital audio/video recording resolves these limitations because it captures the event in real time, allowing it to be scrutinised later. It also frees the researcher to monitor any timings that are to be adhered to during the observation and to remain relaxed and attentive throughout. It was therefore decided not to attempt to observe the infant directly during his or her first encounter with food but rather to record the event, and to make whatever field notes were necessary to identify relevant occurrences that took place outside the scope of the camera lens. This would enable an explanation to be furnished for behaviours that were unconnected with the encounter itself and which may otherwise have been misinterpreted when the recording was later analysed. These 'notes' were to be committed to memory while the camera was rolling and documented in writing, either as soon as the equipment was switched off or on leaving the infant's house, so that they were as contemporaneous as possible. In this way the audio/video-recording of the infant's first encounter with food effectively became the Observation.

A key advantage of real-time audio/video recording is that it allows the same episode to be reviewed as often as necessary to gather all the required information. This facilitates exhaustive analysis outside the time constraints of the actual event. It also permits different issues to be explored on different occasions (Heath *et al*, 2010). This is particularly useful where the purpose of the research is to investigate something that has not previously been studied (Silverman, 2010), since it allows access to the maximum amount of data without the observer needing to know in advance which aspects will turn out to be significant. In an exploratory enquiry such as this, where there is no *a priori* hypothesis to be tested, any and

every occurrence or behaviour is potentially relevant. However open-minded the researcher, it is not possible for her to absorb and note down all the available information on a single viewing of the activity; the ability to review the event means that she is not 'stuck' with her initial interpretation but can revise it over time (Silverman, 2010).

Video recording is a particularly effective means of accessing fine details of behaviour and the subtleties of human interaction and has been used to excellent effect in studies of mother-infant interaction (Heath *et al*, 2010). Indeed, the contribution of video to the analysis of human activity has been described as being "*akin to the effect of the microscope on biology*" (Heath *et al*, 2010, p.3). It also offers a meaningful and engaging way to share research findings, for example at seminars, in that the original footage may be more evocative than words (Nastase, 1999; Pink, 2001). However, it must be recognised that whoever controls the recording will inevitably make decisions about what is likely to be relevant when deciding, through the positioning of the camera, lighting of the scene and so on, what will be captured. This means that even a seemingly objective recording nevertheless represents an individual researcher's 'take' on the event in question and constitutes a limitation of the research (Pink, 2001).

Aiming for naturalistic observation

The purpose of the study was to gain insight into the everyday 'life world' of the participating infants. For this reason, the venue was carefully considered. Much of the existing observational research into the food preferences and mealtime behaviour of infants and toddlers has been carried out in a laboratory, clinic or nursery setting rather than in the home (e.g., Birch and Marlin, 1982; Rosenstein and Oster, 1988; Chatoor *et al*, 1997; Lundy *et al*, 1998; Woods *et al*, 2010a), albeit with some exceptions (e.g., van Dijk *et al*, 2009). Such venues have several advantages for the researcher whose approach is positivist. For example, a structured setting allows a degree of control to be imposed in order to produce specific behaviours (Rolfe, 2001; O'Leary, 2005). A controlled setting is also an asset where the aim is to elicit results that are quantifiable, since standardisation of the venue and equipment eliminates differences in the study environment as potentially confounding variables. Finally, conducting observations in a central setting is likely to offer a cheaper and easier option for the research team in studies involving large numbers of participants. However, removing participants to a setting that is not familiar to them may give rise to atypical behaviours (Lee, 2000), thereby distorting the findings and threatening their validity (Denscombe, 2010). Infants, in particular, are less likely to behave in their usual manner in unfamiliar surroundings as compared with their own home:

"Children, including young babies, respond to a number of contextual factors and for this reason, research in children's homes may be more representative"

of their 'normal' behaviour than in an out-of-home setting, with which they are less familiar." (Langston *et al*, 2004, p.154)

Since the intention was to observe the study infants and their parents behaving as far as possible in a natural and normal manner, the home setting seemed the preferable option. It was also the most pragmatic, since access to a laboratory or clinic would have been complicated to arrange. In addition, the choice of the home setting meant that there was a good chance that the Observations would yield information different from that found in existing studies.

The venue is not the only potential barrier to naturalistic observation, especially where direct observation and recording are involved. Overt observation necessarily involves the presence of the observer in, or adjacent to, the observed situation. This has the potential to influence the behaviour of those being observed, since humans tend to behave differently when they know they are being watched (Robson, 2002; Flick, 2009). The 'reactivity' thereby induced may cause them to be inhibited in their actions, to seek to impress the researcher by exaggerating certain aspects of their behaviour, or to make assumptions about what the research is intended to show and adjust their behaviour to help achieve the 'right' result (Lee, 2000). Infants, too, may react to the presence of a stranger, albeit that they will not understand that their behaviour is being studied and will therefore not make decisions about how to behave on that basis.

Covert observation pre-empts most of these problems. When observation is covert, those under scrutiny are not aware that they are the subject of research. They will therefore tend to behave in their usual way rather than in a 'reactive' manner (Lee, 2000) and the resulting data will be more 'true' (Spradley, 1980). Covert observation is, theoretically at least, relatively easy to achieve for infants of six months, because at this age they are only just beginning to understand that things and people exist even when they cannot see them (Thompson *et al*, 2011). It is, however, difficult to accomplish without the use of screens and sound-proofing, both of which would threaten the naturalness of the home setting and be impossible to realise without the awareness and cooperation of the parent. Covert observation was therefore rejected as the method for this study and overt observation selected as the pragmatic option.

The effects on research participants of being observed may be increased by the presence of a camera (Rolfe, 2001), partly because of the physical nature of the equipment and partly because of what having their behaviour recorded may mean for them. Infants under one year old do not have the cognitive ability to understand the meaning and possible consequences of having their behaviour recorded and my own professional experience suggests that they are not usually influenced by the presence of unfamiliar equipment once

their attention is directed elsewhere. However, infants are acutely sensitive to the behaviour of their parents (Sunderland, 2007). It was therefore possible that any unfamiliar behaviour on the part of the parent might in turn affect the behaviour of the infant. Thus, while the audio/video recorder chosen was a small camcorder, which it was hoped would provide as discreet as possible a means of recording the infant's first encounter with food, its presence nevertheless constituted an additional limitation regarding the naturalistic nature of the Observations (Lee, 2000).

The decision was made to visit each infant's home before the day of the Observation, in order to meet the parent(s), and ideally also the infant. Individuals are generally more relaxed in the company of people they know (Rolfe, 2001) and they are more likely to be able to ignore the activities of a researcher if they know what those activities are likely to be (Lee, 2000). Getting to know the infants and their parents in advance of the day set aside for the infant's first encounter with food, in order to gain their trust and familiarise them with the equipment to be used, was intended to reduce the strangeness of the research situation and increase the chances that both infant and parent would act in their usual manner. It also provided an opportunity to reassure the parents about the nature and purpose of the audio/video-recording and to explain that the focus would be on their infant, not on themselves, which, it was hoped, would further encourage relaxed, natural behaviour. It was decided that the food would be offered by the infant's parent, with whom the infant was familiar and whom he or she trusted, rather than by the researcher, as an additional means of ensuring that the first encounter with food would feel as normal and non-threatening as possible to both infant and parent. However, while all these measures were designed to reduce the 'observer effect', they offered no guarantee of nullifying it. It was therefore clear from the outset that the study could not claim to comprise entirely naturalistic observations, nor could the audio/video-recordings be considered to have captured exclusively normal, natural behaviours.

Logistical decisions about recording the infant's first encounter with food

Consideration was given during the planning of the study to the number of cameras to be used to record the infant's first encounter with food. Two or three cameras, focused on different aspects of the same scene, enable subtle details to be captured that might otherwise be missed, and permit the viewpoint of more than one individual to be portrayed (Lee, 2000). Where two or more individuals are involved in the interaction being filmed, the use of more than one camera allows each individual, or the viewpoint of each, to be studied separately. However, Silverman (2010) argues that, since there is no number of cameras that can claim to provide a complete picture of the event, and provided the limitations are acknowledged, a single camera is usually sufficient. The absence of a research team or

extended budget meant that a single camera was, in fact, the only feasible option for this study. The camera chosen was a small, palm-held camcorder with an integral microphone. It had a fold-out screen, obviating the need for it to be held up to the researcher's face, thereby allowing her to assume a relatively normal presence in the room and to gain a view of the infant that was slightly different from that captured by the camera's lens. This in turn permitted behaviours occurring outside the scope of the camera to be seen and noted.

Recording of the Observation took place continuously, rather than using a 'stop-start' approach. Stop-start recording is commonly employed where the aim is to examine the incidence of a particular behaviour over a long period, in a technique known as time sampling (Bakeman and Gottman, 1997). However, this requires a rationale and protocol for the length of both the bursts of filming and the gaps in between, an approach that is not indicated when, as with the current study, the total duration of the observation is short and what exactly is being looked for has not been established (Lee, 2000; Bryman, 2012). Continuous recording allows the frequency and duration of any and all behaviours to be measured, and the beginning and end points of each to be pinpointed, without preventing the application of time sampling to the recording itself, should this be desired later.

2.4.2 Interviews

In order to address all three of the study objectives, interviews with the infants' parents were employed in addition to the Observations. Spoken interviews were chosen in preference to a written questionnaire because they allow the questioner to be sure the respondent has understood the question, to clarify ambiguous responses, and to pick up nuances of tone, which may enhance understanding (Gomm, 2008). Interviews conducted face to face have the additional benefit of enabling the interviewer to use visual cues from the body language and facial expressions of the interviewee to gain information about their feelings that might not be obvious from their voice alone (Gillham, 2005). Face-to-face interviews were chosen for these reasons but also because, for the current study, they represented the best option from a pragmatic point of view, since the parent was necessarily present during the visits to the home. This approach has disadvantages in that it does not allow the respondent the time for reflection provided by a questionnaire, nor enable them to steer around sensitive topics (Frankfort-Nachmias and Nachmias, 1996) but, since the current study did not deal with such topics, and the majority of the questions related to in-the-moment sensations, these disadvantages were of minor relevance. Nevertheless, face-to-face interviews meant that the mere presence of the researcher may have made the parents feel under greater pressure to give answers that were acceptable. The researcher therefore took care as far as possible to avoid communicating her reactions to the parents' answers, either verbally or via her body language.

Semi-structured interviews, involving the use of open questions and prompts (Gillham, 2005), were used in preference to structured interviews consisting of closed questions. The use of open questions encourages the interviewee to talk freely (Punch, 2005), while also allowing the interviewer to ask for clarification of, and elaboration on, the answers (May, 2011). It also helps to prevent the participant making inferences about what the 'right' answer might be and increases the chance that they will offer information and insights that go beyond what the researcher may have anticipated. This format therefore offers a way to minimise bias and gather a wide range of responses. It is particularly appropriate when, as here, the researcher is interested in the interviewee's perceptions of a phenomenon (Mason, 2002) or when the goal is simply "*to find out more*" about a real-world issue (O'Leary, 2005, p.148). This fitted with the deliberate avoidance, in this study, of pre-designed measures and specific *a priori* hypotheses, in the hope of uncovering data that had not been predicted.

The two Interviews differed in their purpose and focus. The same introductory questions were used with each parent at the start of Interview #1. The questions used in Interview #2 were different from those used in Interview #1 but were applied, similarly, to each parent. In both cases encouragement and further questions or prompts were used as necessary to help elicit as much information as possible. The schedules for both Interviews can be found at Appendix II.

Interview #1: The parent's experience of the food

Interview #1 was designed to achieve Objective (i), namely, ***to elicit parents' accounts of their experience of a food when presented to them as a piece and when spoon fed to them as a purée***. Its purpose was to record the parent's subjective experience of eating the broccoli, presented in the same two formats and by the same two methods as it had been to the infant. The intention was not to link each parent's account directly with the observed behaviours of their own infant but rather to amalgamate the insights gained from all the parents and use them to inform the interpretation of the analysis of the Observations of all the infants.

As seen, much of the existing research on the introduction of solid foods to infants has been conducted and reported from an adult perspective. One of the disadvantages inherent in this is that adults come from a position of being familiar with the smell, taste and texture of the foods they offer to infants. There is therefore a risk that researchers, being adults, will interpret infants' responses in the light of their own subjective experiences (Silverman, 2006). Goldschmied and Jackson (2004) point to the value of placing oneself in the child's position at mealtimes in order to gain insight into their experience. Interview #1 sought to achieve this by asking the parent to focus on and articulate their individual experience of encountering and eating broccoli, both as a self-fed piece and as a purée offered by the

researcher on a spoon. While it was recognised that this would not provide an objective account, but rather the subjective view of each parent, it would nevertheless serve to extend the researcher's frame of reference and increase her awareness of the subjective and limiting nature of her own experiences and imagination. While this role could theoretically have been fulfilled by a group of adults unrelated to the study infants, the infants' parents provided a convenience sample for this purpose, since at least one parent would necessarily be with the infant during the Observation.

Interview #1 took place in the infant's home immediately following the infant's first encounter with food. This allowed food from the same pre-prepared batch to be used, so that the parent's experience of eating it would be as close as possible to that of their infant. Following the Interview schedule (Appendix II), the parent was offered the food in the two formats and in the same order as their infant. While they were studying and eating it, they were asked to describe what they were experiencing in as much detail as possible, focusing on the look of the food, the feel of the food, how it behaved inside their mouth, and what they had to do with their tongue and jaw in order to eat it. The questions were designed to act as prompts, rather than requiring specific answers. For example, the first question once the parent had taken a bite of the food was "Can you describe to me what that's like for you? Tell me as much as you can about what you're experiencing." The Interview was audio-recorded in order to allow the eating exercise to unfold naturally, without the parent needing to pause while field notes were made. This also allowed the researcher to observe the parent's facial expressions, gestures and other body language as they engaged with the food. This maximised the accuracy, both of her interpretation of their spoken comments and of the eventual transcript of the Interview.

Interview #2: The parent's review of the infant's first encounter with food

Interview #2 was designed to contribute to the achievement of all three of the study objectives. Its purpose was to gain the parent's perspective on, and interpretation of, their infant's behaviour during his or her first encounter with food, as captured by the audio/video camera. The parent was asked to talk the researcher through what they thought was happening in the video and what they imagined their infant was thinking or feeling. The rationale for this was three-fold: First, the parent, having played an active part in the Observation of the infant's first encounter with the food, was in a position to clarify or confirm what had taken place. The data from the Interview would thus help to ensure that the researcher's assessment of the interaction between parent and infant seen during the Observation was as accurate a reflection as possible of the event. Second, while infants are able to communicate their feelings through their vocalisations, facial expressions and bodily movements, an individual infant's repertoire of communicative behaviours has been

developed in the context of his own family, using his parents and siblings as examples to mimic and as sources of feedback on his efforts (Sunderland, 2007). It was hoped that the parent's knowledge of their infant, while not necessarily providing a reliable basis for conclusions about the infant's feelings, might nonetheless provide insights that were not available to the researcher. Finally, it was hoped that inviting the parent's interpretation of the infant's behaviour would reduce the risk of imposition of the researcher's own biases, either through selective attention only to certain details or through interpretation based on her personal or professional experiences (Robson, 2002).

Interview #2 was conducted during a third visit to the infant's home approximately one week after the Observation and Interview #1. This time delay was long enough to allow the researcher to carry out a preliminary analysis of the audio/video-recording before listening to, and potentially being influenced by, the parent's interpretation of it, and to note any aspects that would benefit from clarification by the parent during the third visit. One week was also considered sufficient to distance the parent temporally from the event, enabling them to view their infant's first encounter with food outside the context of other events that may have taken place on the day of the recording. It was, however, a gap short enough to maintain continuity and allow data collection to be completed within a reasonable time frame. The Interview was audio-recorded to enable easy mapping, later, of the parent's comments with the audio/video-recording.

2.5 Addressing issues of validity and reliability

Both validity and reliability needed to be addressed in the planning of the study, with the aim of maximising both so that the research would be robust and meaningful.

2.5.1 Validity

Validity relates to the ability of a piece of research to reveal the truth (Denscombe, 2010). While interpretive studies do not purport to elicit an ultimate truth outside of any one individual's experience, validity is nevertheless an important concept in this type of research (Silverman, 2010). Maxwell (2002) highlights three key types of validity essential to qualitative studies. The first is *descriptive validity*. This refers to factual accuracy, which requires that what is reported is what actually happened. This presents a challenge for all researchers, since our own knowledge determines the questions we ask and the themes we identify; as Charmaz (2008) has said, we cannot be a blank sheet, "[t]hus, our theoretical analyses are interpretive renderings of a reality, not objective reportings of it" (p.206). The decision to use video and audio recording in the current study was in part an attempt to reduce the risk that the researcher would miss, or choose not to record, a comment or behaviour that may have been important, thereby ensuring that everything relevant to the

Observations and Interviews was captured for later analysis. However, video, in particular, has been criticised as a research tool because it has the potential to provide a very subjective view (Pink, 2001). Although the recording itself can be shown to be authentic, decisions such as where to place the camera in relation to the activity, how wide a scene to capture, whether to film continuously or in stages, and how long to allow the camera to roll are all made by the observer (Silverman, 2010) and any measures taken to try to avoid such subjectivity are themselves the product of the researcher's subjective thought processes (Pink, 2001). These decisions have the capacity to distort what is documented and to represent the researcher's view of reality – and they force others, who may view the recording later, to adopt that same bias. Some of these decisions will be taken in advance but others may happen 'on the ground'. The need to be explicit about the rationale for decisions of this type, and to record accurately and explicitly what was done and why, was noted in the design of this study.

The second type of validity identified by Maxwell (2002) is *interpretive validity*. This relates, in the current study, to the researcher's interpretation of the infants' behaviour, as well as to her interpretation of the meaning of the parents' comments during the Interviews. One way to minimise the risk of subjectivity in interpretation is to 'bracket' the phenomenon under investigation, as advocated by Edmund Husserl (Moran, 2000). Denzin (2002) explains this: "*In bracketing the phenomenon, the researcher holds the phenomenon up for serious inspection, taking it out of the world where it occurs*" (p.355). Other researchers (Scott and Usher, 1996; Crotty, 1998; Holliday, 2002; Richards and Morse, 2007) refer to bracketing the researcher's own preconceptions, experiences and attitudes, so that they do not interfere with his or her examination of the phenomenon. The effect of both approaches is similar, in that the phenomenon is isolated from what may contaminate it.

In the current study, it was hoped that the effect of reducing each Observation to something taking place on a screen would help to distance it from the researcher's own experiences and expectations. In addition, the programme chosen to facilitate the analysis, NVivo 9, allowed the researcher to 'zoom in' to the recording and examine individual segments in minute detail, in isolation from one another. This was intended to reduce the likelihood that the researcher's expectations would colour her view and lead to cumulative bias in the interpretation. It was also intended to counteract the temptation to recognise apparent themes at too early a stage and then simply to look for confirmation of them. Instead, the process of constant comparison employed during the analysis allowed later instances to be sought that would either confirm or refute earlier findings, thereby increasing validity. However, inherent in this approach was a risk that the sense of the overall context in which the behaviours occurred would be lost; each recording was therefore reviewed as a whole ('zooming out') at regular points during the analysis.

The Interviews with the parents were intended not only to illuminate the Observation data but also to minimise researcher bias. Interview #1 was designed to throw light on the infants' behaviour from a perspective other than the researcher's, so giving a fuller picture and helping to minimise subjective interpretation. Similarly, it was hoped that gaining the parent's view of their infant's first encounter with food (Interview #2) would force consideration of interpretations other than those that appeared obvious to the researcher and provide an element of "*respondent validation*" (Silverman, 2006, p.291). Meanwhile, the quantitative elements of the study allowed subsequent statements about behaviours occurring 'frequently' or 'rarely' to be verifiable, rather than representing merely the researcher's subjective interpretation of their frequency (Creswell and Plano Clark, 2007).

The choice of broccoli as the research food itself contributed to the interpretive validity of the research, in that the marked dissimilarity in appearance and texture between the broccoli presented 'whole' and as a purée reduced the potential for blurring and misinterpretation of the findings. Conversely, the use of a food which, when handled as piece, could rapidly have gained many of the characteristics of a purée would have made it less easy to attribute the responses of the infant to one or the other format with any confidence.

Maxwell's (2002) third type of validity is *theoretical validity*. This refers to a researcher's attempts to *explain* the phenomena. It requires the conclusions to be supported by the data and, where possible, by available literature. This points to a need to document all decisions and reasoning accurately at all stages of the study and to refer to existing literature as appropriate. All ideas, questions and reflections were therefore documented as they occurred, as memos within the NVivo programme, so that they formed part of the evolving analytical record.

2.5.2 Reliability

Reliability refers to the degree to which a study's methods are concurrent with its findings (Denscombe, 2010), and to the stability of the data over time (Punch, 2005). It also relates to the likelihood that the findings will be replicated by other researchers when applying the same processes to the same data (Flick, 2009). Reliability is difficult to ensure in interpretive endeavours because researchers cannot exclude their own prior experience and knowledge from an analytical process that requires inductive thinking (Silverman, 2010). When, as in the current study, a single researcher analyses all the data according to a custom-made framework, there is an even greater risk that subjective interpretations will underpin the analysis, making it unlikely that the findings will be reliably replicated by others. A partial solution to this problem is the maintenance of an audit trail that allows the researcher's thinking to be tracked and followed (Bringer *et al*, 2004; Richards and Morse, 2007). The

ongoing documenting of all questions and reflections as they arose in the current study provided this type of record.

The decision to record the Observations was taken with both validity and reliability in mind. An advantage of audio/video recording over 'live' observation is that the raw data from the study are preserved and can be reviewed repeatedly, and by different observers (Rolfe, 2001). Accordingly, a detailed, written guide to the way in which the recordings of the Observations were analysed – the coding scheme (Appendix III) – was developed, so that the process could be replicated at any time by another researcher. This also enabled a test of inter-rater reliability to be applied to the scheme. In addition, the use of NVivo meant that the coding could be displayed on screen in visual form alongside both the audio/video and the text-based data, thereby allowing its detailed application to be scrutinised. Finally, the saving of the NVivo file at key points during the analysis allowed changes to the coding scheme to be documented as the process evolved.

2.6 Ethical considerations

Research must not only be robust, it must be conducted in an ethical manner. Ethics relate to a moral obligation to behave respectfully to living creatures. There is an overall sense that researchers should treat human participants as they would wish to be treated themselves. This relies on fidelity on the part of the researcher, which in turn is underpinned by transparency and honesty in the research design, materials and procedures. International guidelines relating to ethical research (CIOMS, 2002) highlight the need to protect individuals who are especially vulnerable to exploitation or ill treatment, or who are unable to give informed consent to participate in research, such as infants and children.

Methods of conducting research *on* (as opposed to *with*) children have been repeatedly criticised (Alderson, 2004; Fraser, 2004; Langston *et al*, 2004; Greene and Hill, 2005; Hogan, 2005). Hogan comments that the emphasis of much this research is "*on long-term effects of early experiences, perhaps to the detriment of adequate attention to immediate effects and needs.*" (Hogan, 2005, p.27). She suggests that this is because children are seen as 'adults-in-the-making' rather than as beings in the here and now. Langston *et al* (2004) suggest that research approaches may have remained unchallenged until relatively recently because of a prevailing view of young children as incompetent and dependent, rather than as competent and capable of acting autonomously. Alderson (2004) echoes this, maintaining that, as researchers, our ethical relationship with the child in a research study depends on the model of childhood we hold in our minds:

“It is as if we put children into a small glass cage called childhood, and then examine how they perform within the cage’s restrictions, instead of looking critically at the cage itself, its causes and effects.”

(Alderson, 2004, p.101)

Changing attitudes towards children have meant there is a drive in current research to view them as ‘participants’ rather than as ‘objects’, to be acted upon, or ‘subjects’, who may have their views taken into account to a limited extent but whose competence to express valid opinions is decided by others (Robinson and Kellett, 2004). However, Woodhead and Faulkner (2000) have questioned the reality of very young children’s status as ‘participants’, given their inability to understand the nature or purpose of research. Robinson and Kellett (2004) support the view that children should be seen as participants or co-researchers rather than subjects, but they propose a fourth category, that of ‘social actor’. ‘Social actors’ are seen as having some degree of autonomy even though they may be unable truly to participate (Robinson and Kellett, 2004). This resonates well with the intention of the current study to gain access to, and present, the eating situation as seen through the infant’s eyes, and to keep the infant’s interests at the forefront throughout, rather than solely when selecting the methods to be used. Palaiologou (2014) uses the term ‘ethical eupraxia’ to describe such an approach.

The underlying principles of ethical research are described differently by different writers. Their application to the parents and infants involved in this study is considered here under the headings of beneficence and non-maleficence, confidentiality and respect for privacy, fairness and respect for the person, fidelity, transparency and honesty, and consent.

2.6.1 Beneficence and non-maleficence

Beneficence means “*doing good*” (OED, 2011) while maleficence means “*evildoing*” or “*harmfulness*” (OED, 2011). Where possible, research should be beneficial for the participants; at the very least, it should not be harmful (Gregory, 2003). The current study had a small potential benefit for both the parents and their infants in that it may have increased the parent’s awareness of their child’s response to the feeding options used, and thereby provided the opportunity for them to contribute to maximising their child’s future enjoyment of eating. By contrast, it had a much larger potential to cause harm, which needed to be addressed.

Use of a laboratory or clinic setting for the Observations and Interviews would have required the family to travel, thereby potentially causing harm through expense and undue disruption to daily life. It might also have caused anxiety because of the unfamiliarity of the environment. However, while these effects were avoided through the decision to conduct the

research in the participants' homes, the use of food and recording equipment in the home raised issues of safety in relation to people, furnishings and belongings that could have been minimised beforehand in a pre-prepared setting. For example, trailing wires present a risk of falling or electrocution, while spillages of food may damage carpets. To minimise risks from the recording equipment the camera was held securely and the audio recorder placed on a table where it would not easily fall or be knocked over. Both machines were battery-operated, so there were no electrical cables to present a hazard. The use of the family's own infant chair and spoon meant that no other unfamiliar equipment needed to be introduced to the home. The parents were encouraged to protect the floor under their infant's chair as they thought appropriate. An Introductory Visit to each home prior to data collection provided the opportunity for individual issues such as these to be discussed and planned in advance, in collaboration with the parent, so maximising safety for the family and their belongings.

The use of food as a key part of the study presented potential risks of allergic or other adverse reactions, burns and scalds, infection by micro-organisms ('food poisoning') and choking. The risk of adverse reactions was addressed through the use of a vegetable (Sampson, 2003), and through the decision to purchase a fresh, organically grown variety. The researcher home-prepared all the food used in the study, partly to enable standardisation but also to keep the effort required of the parents to a minimum and to reduce risks to them and their infant of burning or scalding during cooking and eating. The food was prepared within 24 hours of the scheduled visit and kept refrigerated in a sealed container until the researcher left home for the visit. The journey from her home to the family's home allowed the temperature of the food to adjust to the ambient temperature in advance of the Observation. The risk of infection by micro-organisms was minimised through attention to the hygienic preparation, storage and transport of the food, and by the use of the infant's own chair, tray and spoon. The risk of choking was minimised by ensuring that only infants who met the inclusion criteria were recruited, that the infant was well on the day of the visit, and that he or she was sitting upright to eat, as well as by the researcher's knowledge of appropriate first aid measures.

The possibility existed that the infant would find the experience of having a stranger in the home, or of being presented with unfamiliar items, stressful. He or she may also have been alarmed by the recording devices, which were soundless in operation but which may have been off-putting in appearance. It was hoped that the Introductory Visit would allow the infant, as well as the parent, to become acquainted with the researcher and familiar with the presence of the necessary equipment. Owing to the nature of the study it was not possible to familiarise the infant with the food or the spoon in advance but it was considered that this

unknown element was inherent in any infant's first experience of solid food, rather than a feature of the research *per se*.

Another potential for harm to the infant lay in the manner in which the food would be offered. There is no universally agreed benchmark for how persistent it is reasonable to be when encouraging a child to eat and, as revealed by the literature review, parents use many different strategies and parenting styles to persuade their infants to accept food. One option would have been for the food to be offered by the researcher in each case, so enabling her to choose the degree of insistence and to standardise the approach for all the infants. However, being faced with a relative stranger may have been equally, or more, stressful for the infants, whilst also jeopardising the naturalistic nature of the Observations. Instead, a pragmatic approach was adopted, in which the parent was asked to offer the food in whatever manner they considered appropriate. Meanwhile, the researcher stressed the fact that the aim of the study was not for the infant to eat any or all of the food but rather to observe his or her reaction to it, and that persuasion to eat was therefore not indicated.

The parent was asked to monitor their infant's behaviour throughout and to request that the Observation be stopped or interrupted at any point if they felt the infant was upset. At the same time the researcher was ready to step in on the infant's behalf if the parent seemed tolerant of a response that, in the researcher's view, indicated distress. This allowed for a situation where a parent might overlook their infant's discomfort in an attempt to please the researcher.

A key source of potential harm lay in the possible misuse, later, of the resulting data by the researcher, that is, the sharing of it in a way that betrayed the parents' trust and violated their and their infants' self-respect. This provided an additional reason for showing the parents the audio/video-recording of their infant's first encounter with food, enabling them to give fully informed consent to its use in the dissemination of the findings of the study. The parents were provided with a copy of the recording, as confirmation of the content of the footage retained by the researcher and as a gesture of thanks for their participation.

2.6.2 Confidentiality and respect for privacy

A significant area of risk for the study participants was in the management of data and the need to maintain confidentiality. Researchers in the UK not only have a moral obligation to ensure that participants' personal data are kept confidential but are required to do so legally, under the Data Protection Act, 1998, which exists primarily, but not exclusively, to prevent the misuse of data held electronically (ICO, 2013). Confidentiality refers to "*the confiding of private secrets*" (OED, 2011), while privacy means being "*free from public attention, interference or intrusion*" (OED, 2011). Maintaining a research participant's privacy and

confidentiality therefore means not exposing or sharing their personal secrets. Where possible, this principle was extended in the current study to one of ensuring anonymity, with details that could identify the individual or family, such as names and addresses, being known only to the researcher.

The use of participants' homes for the purposes of data collection raised wider issues of privacy, confidentiality and data protection than would have been the case had a laboratory been used, since it provided the researcher with access to aspects of the participants' lives that would not otherwise have been available. This was taken into account in planning the view to be captured by the audio/video camera and in the making and keeping of appointments to visit the home, which allowed the parents to anticipate and prepare for the visit and to conceal anything they did not wish the researcher to see. Additional protection for the family came from the fact that, as a registered health visitor, the researcher was bound by the code of conduct of that profession, as well as by Canterbury Christ Church University's systems of supervision and ethical approval.

To ensure privacy and confidentiality, all data that could have identified the participants, that is, names, addresses, telephone numbers and email addresses, were stored separately from the recordings, field notes and NVivo files. All electronic data were saved in password-protected computer files to which only the researcher had access. All audio tapes and paper documents were stored in locked cabinets, either in the University or in the researcher's home. Any data no longer required was destroyed. At the conclusion of the study, only those digital audio/video-recordings to be used, with the parents' consent, in disseminating the findings of the study were retained. The decision not to video-record the Interviews, and to avoid recording the parent's face during the Observation, were additional measures aimed at ensuring protection for the family. The infant's face was necessarily captured but the rapid alteration of young children's features over time confers a degree of anonymity, long term.

Participating parents were advised of the few situations in which the principle of confidentiality would need to be overridden, namely those in which the researcher had reason to suspect that a child might be at risk or that a criminal act had been committed or was planned. In this case there would be a duty to the individual at risk, or to the wider public, that would outweigh that to the participant, requiring the matter to be reported to the relevant authorities (Graue and Walsh, 1998).

2.6.3 Fairness and respect for the person

Respect for the person involves politeness, consideration and valuing of their free will. This means ensuring as far as possible that research participants understand what is proposed and what this will involve for them in terms of effort, time and inconvenience (Silverman,

2010). It also means ensuring that they are not coerced or threatened into taking part (Gregory, 2003). In the case of the infants in the study, respect also meant recognising their need for physical and emotional comfort. The use of the infant's own home, flexibility over the timing of visits in relation to the infant's feeding and sleep needs, the use of the infant's own chair, the participation of the parent, and the researcher's readiness to suspend the Observation if the infant appeared upset, tired or hungry, were all examples of respect for his or her person, and were built into the study design and procedures.

Fairness incorporates concepts of justice, equity and non-discrimination, meaning that researchers should treat people, including children, fairly, in a manner that is equitable and morally just, and without making any distinction that might be prejudicial (Graue and Walsh, 1998). This must be evident to the participants, such that they do not feel they have been singled out on the basis of any personal characteristic, or treated differently from any other participant. According to Pink (2001), research projects commonly involve more or less subtle power relations between those involved and not all can be completely eliminated. This presents even more of a risk where research with children is concerned (Hunleth, 2011). While the current study did not involve the researcher in exerting direct power over the infants, the parents may have felt obligated to her and they, in turn, had an element of power over their own infant. The following steps were taken to minimise the risk that the parents would feel that they or their infant had been selected to take part, or that their consent to do so could not be given or withheld freely, as well as to ensure as far as possible that those who were deselected understood why this was the case and felt that their offer of help had been appreciated:

- All visits and telephone calls were conducted in an informal and friendly manner, with the intention that neither the parent nor the infant should feel intimidated. Unnecessary contact with the family between the planned elements of the study was avoided, in case this should be interpreted as pressurisation.
- No inducements or incentives to take part were offered.
- Recruitment took the form of an online open invitation to volunteers to contact the researcher (Appendix IV), rather than a process whereby the researcher identified and approached individuals. This ensured that their identity would become known to her only if they chose to respond. It also avoided the use of a gatekeeper, who might have applied, or been perceived as applying, either pressure to take part or discouragement from volunteering.
- Once they had made initial contact with the researcher, all potential participants were given identical information about the study, asked to provide the same background

information, given the same guarantees of confidentiality, and allowed equal time and opportunity to ask questions, raise concerns and come to a decision.

- The parents were advised, both in an Introductory Letter (Appendix V) and verbally, prior to consenting to take part, that they could withdraw from the study at any time without needing to give a reason. In addition, the researcher took care to confirm their willingness to proceed, verbally, at every stage.
- Respondents who did not meet the criteria for the study were sent a reply thanking them for volunteering and explaining why their offer of help could not be accepted.
- All eventual participants underwent the same key elements of the study and were given equal opportunities to ask further questions and/or to withdraw from the project.

The parents were informed that the researcher was a registered health visitor. It was hoped this would help them to understand her interest in infant feeding and make them feel at ease with having her in their home. However, it was equally possible that this disclosure would cause them to be in awe of her, or to feel obliged to try to please her or agree to her suggestions, thereby exaggerating the existing unavoidable power dynamic. Worse, if their experience of health visitors to date were negative, it might make them resentful of her, albeit while feeling they could not refuse to take part. The researcher planned to manage these risks as far as possible by drawing on her skills of listening and empathy, by presenting a non-judgemental approach, and by dressing and behaving in a friendly and informal manner. She also explained that she was not in current practice as a health visitor, nor in contact with the family's own health visitor, and could therefore have no impact on their individual relationships with their healthcare providers.

2.6.4 Fidelity, transparency and honesty

Fidelity is *"the quality of being faithful"* (OED, 2011). Research participants need to be able to trust in the fidelity of researchers – that they will tell the truth and keep their word. The following steps were taken to maximise transparency and honesty within the study, in order to promote confidence in the researcher's commitment to fidelity:

- Full information about the study, including what would be required of the participants and possible consequences for them of taking part, was provided in the form of a Parents' Information Sheet (Appendix VI).
- A Preliminary Telephone Call was made to each potential participating parent to confirm receipt and understanding of the written information and to inform them about the food to be used in the study. This ensured that they had as much

information as reasonably possible about what they could expect, and what would be expected of them and their infant, before they invited the researcher into their home.

- An Introductory Visit to each home was carried out in advance of the main study to allow the parent to ask any further questions about the nature and purpose of the work and to agree with them the procedures to be followed. At this point it was explained that the food to be offered to both infant and parent would be broccoli, as a self-fed piece and as a spoon-fed purée. Consent to take part was requested at the end of this visit.
- The researcher took care not to make promises that could not be kept, or to visit unannounced. In addition, parents were informed if any change needed to be made to the research procedures, or to the timing of any agreed appointments.
- Each parent was involved in discussions about the setting out of the equipment needed for the recording of their infant's first encounter with food, both to gain their trust and to facilitate smoothness and efficiency on the day of the Observation.
- A thorough explanation of the measures to be taken to ensure confidentiality was provided, in order to maximise the parents' confidence in the research process.
- The decision to use fresh, organically grown broccoli would, it was hoped, increase the parents' confidence in the researcher's regard for their infant's wellbeing.
- Parents were asked to consent to the use of the audio/video-recording of their infant for teaching purposes only after they had viewed the recording and had had the nature of the anticipated teaching purposes explained to them by the researcher.
- Parents were given a copy of the audio/video-recording of their own infant.
- As well as being a means of obtaining useful data, it was hoped that inviting the parents to contribute their subjective experience of eating the food (Interview #1), and to share their interpretation of their infant's first encounter with food (Interview #2) would encourage them to see themselves as partners in the venture and provide evidence of the researcher's integrity.
- During both the Observations and the Interviews the parent was alerted whenever recording equipment was switched on or off, in an effort to avert potential suspicion about what was being recorded. In addition, it was hoped that the decision to use a small, Dictaphone-type audio recorder to record the Interviews, rather than the audio/video camera, would help to reassure them that there was no possibility of their image being captured on film, and later misused.

The assurance of fidelity, transparency and honesty depended almost entirely on the researcher's interaction with the parents, since, because the infants were too young to engage in conversation, she was unable to discuss her intentions with them or explain how the study would affect them. However, she took care not to act in ways that would surprise or frighten them, or make them suspicious of her.

2.6.5 Consent

Gaining a participant's consent to involvement in research is an essential part of the enrolment process and an ethical requirement. Its achievement in relation to the parents in this study was straightforward but its application to the infants was problematic.

Consent is a "*voluntary agreement to [...] what another proposes*" (OED, 2011).

Voluntariness relies on there being no coercion to agree and on the individual fully understanding the extent and significance of what is proposed (Gregory, 2003), namely:

- the purpose and nature of the research
- why they have been asked or invited to participate
- what will be required of them
- what will happen to them
- what benefits, if any, they can expect
- what risks, if any, are involved
- what consequences, if any, there may be for them as a result of the research.

Researchers have a responsibility to ensure that potential participants are given this information before they are asked to consent. They are also obliged to do what they can to ensure that participants understand the information, by providing explanations, both written and verbal, in a language easily understood by each participant, using simple terms and with no unnecessary use of jargon. The Introductory Letter (Appendix V) and Parents' Information Sheet (Appendix VI) used in the current study were written with this in mind and tested as part of the pilot study. In addition, a good command of English by the parent formed part of the criteria for inclusion, in order to avoid the potential for errors of translation. Care was taken at each stage to discuss the procedures with the parents to ensure full understanding before proceeding, and they were invited to ask questions if at any time they felt uncertain about, or uncomfortable with, the purpose and procedures of the study.

In the UK, the law states that children under 16 years cannot legally give consent on their own account; their parents or guardians must consent on their behalf. Where older children are concerned, it is usual to seek the child's verbal assent to take part (Alderson, 2004) but this is impossible in the case of infants, partly because they are not able to speak and partly because the nature of the research cannot be explained to them (Graue and Walsh, 1998).

In practice, where a child cannot give positive assent to a procedure, it is reasonable to assume their assent is implied when, and for as long as, they appear content to take part (Langston *et al*, 2004). Signs of distress, on the other hand, should be taken as an indication that this assent has been withdrawn:

“Very young children who are not yet verbal obviously cannot give their consent. However, they may indicate their like or dislike of taking part in a research study in a number of different ways. They may turn away, cry, refuse to engage with the materials or the researcher and so on. [...] Researchers need to be aware of the body language of babies and young children and show sensitivity to children and the messages they convey with regard to their consent or otherwise to taking part in research. Even very young babies can signal their dislike of a research procedure.” (Langston *et al*, 2004, p.152)

For the current study the decision was made to gauge the infant's ongoing assent as each Observation unfolded. However, this presented a dilemma specific to this enquiry, since it was not possible to separate the infants' inferred response to taking part in the research from their response to the food itself, and to their parent's attempts, if any, to feed them. As explained, care was taken to ensure that the parents understood that persuasion to eat was not required. However, it was anticipated that the keenness of some of them to be a 'good' participant, or their wish to persuade their child to eat for their own reasons, might lead them to apply a degree of pressure. For this reason, the researcher did not rely on the parents to call a halt to the Observation if their infant appeared distressed; rather, she was ready to step in if the parent did not take the initiative.

Two consent forms were used in the study; these can be found at Appendix VII. Consent Form #1 related to the Observations and Interviews, and to the making of the audio/video and audio recordings; Consent Form #2 related to the use of the resulting audio/video footage as part of the dissemination of the findings of the study via the completed thesis, and through teaching sessions and conference presentations. Both forms were developed from a Canterbury Christ Church University proforma and required the parent to initial the individual clauses of the agreement as well as signing in full at the bottom, thereby helping to ensure that they understood and agreed, on behalf of their infant and themselves, to everything the study would entail. This two-part process made consent to take part in the study less complex and daunting for the parent, and less potentially risky for the parent and the infant, because it avoided the need for them to consent to the dissemination of data that had not yet been generated. This, in turn, helped to ensure that any parent who may not have been prepared to consent in advance for the audio/video data to be shared was not discouraged from taking part in the study itself. It also meant that it would not be necessary

for an infant's data to be withdrawn from the analysis in the event that his or her parent refused consent to the later use of the recording. In a small study such as this, with little room for attrition, these were important considerations.

The research was approved by the Research Ethics Committee of the Faculty of Health and Social Care at Canterbury Christ Church University, following submission of a proposal that described the ways in which the above ethical issues were addressed.

2.7 Identifying the participant sample

The current study was an exploratory one, the purpose of which was to gain insight and increase understanding rather than to test a hypothesis; generalisation of the results was therefore not the intention. For this reason, no attempt was made to recruit large numbers of participants or to ensure that the sample was representative of a broad spectrum of infants and their families. Rather, the approach taken was that of purposive, or theoretical, sampling, aimed at meeting the objectives of the study through the acquisition of relevant, appropriate and valid data (Punch, 2005; Merrill and West, 2009).

Table 2.1 Inclusion criteria for the study

The infant must:

- have lived with at least one consistent care-giving parent since birth;
- have completed at least 37 weeks' gestation;
- have no diagnosed or suspected physical, psychological or developmental disorder;
- be growing appropriately for their age;
- be between five and six months of age at recruitment;
- have been exclusively (or almost exclusively) breastfed from birth;
- not yet have handled or tasted solid foods;
- live within reasonable travelling distance of the researcher's home;

and have a primary care-giving parent who:

- is over 18 years of age;
- is able to communicate easily in English;
- can confirm that both they and the infant's other parent like broccoli.

Table 2.1 lists the inclusion criteria for the study. The majority of the criteria related to the infant, with the infants' parents constituting a convenience sample (Punch, 2005). However, certain parental criteria were identified in order to minimise logistical and practical difficulties relating to data collection.

The intended participants were, in each case, the infant and his or her primary care-giving parent. The parent's role was four-fold: first, he or she was the gatekeeper to the recruitment of the infant; second, their involvement as the person offering the food to the infant was an important element of maintaining, as far as possible, a naturalistic approach during the Observation; third, each parent was to be invited to provide clarification and insights in relation to the recorded Observation; fourth, together the parents constituted a sample of adults whose own response to the food could be used to extend the researcher's understanding and awareness of what eating it entailed.

The study was concerned with the responses of normally developing, healthy infants to solid foods, offered for the first time at an age at which the introduction of such foods is considered appropriate. The target group was therefore infants who would be aged around six months (WHO, 2002) at the time of the observed first encounter with food, who had thus far experienced consistent parenting from a main caregiver, and whose health and development to date did not give rise to any concerns in relation to their ability to handle and digest solid foods. Of primary importance was the exclusion of infants who were either not healthy or whose development was at risk of being delayed or compromised, such that they might not display the necessary skills for self-feeding (for example, the ability to hold their head and trunk upright) at the expected age. Thus, infants born prematurely, that is, before 37 weeks' gestation, or who had any evident or suspected physical, psychological or developmental disorder or delay were excluded, as were those whose pattern of growth to date had given rise to any concern by the parents, or by the family's GP or health visitor.

For the purposes of the study 'around six months' was defined as between five-and-a-half and seven months of age. This allowed for individual differences in development, thereby ensuring that all the infants were able to sit upright⁴ when the first encounter with food took place, and therefore that they would be able to use both hands freely (Rochat, 1992). The adoption of a measure of flexibility over the actual age of the infant on the day also gave the researcher and parents the freedom to agree a mutually suitable date for the Observation to be carried out, as well as allowing for unforeseen postponements, for example, in the event that the infant was unwell. This in turn reduced the likelihood of attrition. Infants were to be recruited to the study when they were between five and six months old; this allowed time to acquaint the parents with the purpose and requirements of the study, and for them to consider whether or not they wished to participate, before the Observation needed to take

⁴ For the purposes of the study, 'sitting upright' was defined as requiring minimal or no support to maintain an erect head and trunk, in a chair that allowed the knees to be bent and the lower legs to hang vertically; long-leg sitting, as described by van der Fits *et al* (1999) and usually not achieved until after seven months, was not required. The use of a small towel or cushion around the infant's hips, to help maintain his or her stability (Rochat and Goubet, 1995), was considered acceptable.

place. It also minimised the chances of recruiting infants whose parents would subsequently opt to introduce them to solid foods before the scheduled Observation.

Breastfeeding is the biological norm for human infants and prepares them for new flavours (Mennella, 1995; Cooke and Fildes, 2011). It therefore represents optimal preparation for the introduction of new foods. It is also recognised as being primarily infant-led (Wright *et al*, 1980; Li *et al*, 2010), such that the parents are unlikely to have become used to controlling their infant's feeding. For these reasons the study focused on infants who had been breastfed, exclusively or almost exclusively, from birth⁵. The criteria therefore excluded infants who had received or were currently receiving the majority of their nutrition from infant formula.

A key criterion was that the infants should have had no experience of solid food prior to the planned Observation, so that this would constitute their first encounter with any such food. Currently, only a small minority of infants in the UK receive no solid food before six months (McAndrew *et al*, 2012). However, the likelihood that this will be the case is increased where baby-led weaning (BLW) is followed (Moore *et al*, 2014). Recruitment via BLW interest groups therefore offered the best chance of obtaining participants who fit this criterion. Since the Internet is widely used by parents, and several online groups of parents interested in BLW are in existence, this was chosen as the best means of accessing potential participants.

The criteria for recruitment ensured the exclusion of infants whose parents were aged under 18 years, families for whom communication in English (the researcher's native language) would be difficult, and those who did not live within reasonable travelling distance of the researcher's home. This was to avoid issues of consent relating to parents who were themselves minors, to enable easy verbal and written communication between parents and researcher, and to limit the travelling required. The other exclusion criterion relating to the parents was that of a dislike of broccoli. As seen, it has been suggested that such a dislike may be hereditary (Reed *et al*, 1997) and there was therefore a chance, if either parent disliked broccoli, that the infant might have an inherited dislike of it. In addition, dislike of broccoli by the main care-giving parent might affect their willingness to offer the food to their infant or to eat it themselves, as required by the study, or colour their behaviours and responses if they agreed to do so. This criterion was not mentioned in the Introductory Letter (Appendix V) or the Parents' Information Sheet (Appendix VI), since it was felt that to reveal details about the food to be used before there had been any direct contact with the researcher might lead to inaccurate speculation about the purpose of the study on the part

⁵ To have insisted on exclusive breastfeeding would have made recruitment overly difficult; only 1% of UK infants are exclusively breastfed from birth to six months (McAndrew *et al*, 2012)

of potential participants, which might, in turn, influence their decision to volunteer. Instead, this detail was explained during the Preliminary Telephone Call, at which point a final decision was made about the eligibility of the family to take part.

A theoretical, or purposive, sampling approach allows for the size of the participant sample to be determined by the data as it is generated (Punch, 2005). Accordingly, analysis of the data proceeded alongside recruitment, with new data being analysed and compared with those already accrued. The sample continued to be enlarged for as long as the analysis of successive audio/video-recordings revealed previously unseen actions; recruitment was terminated when this was no longer the case – that is, when substantive saturation was reached (Hood, 2007). This was achieved after the recruitment of the tenth infant.

2.7.1 Background data

The decision was made to gather background data concerning each parent-infant pair, as well as data that would confirm the infant's eligibility to take part in the study, in anticipation that these additional data might inform the interpretation of any unexpected or idiosyncratic behaviours noted during analysis of either the Observation of the infant's first encounter with food, the parent's experience of the food (Interview #1), or the parent's review of the infant's first encounter with food (Interview #2). The Background Data Form (Appendix VIII) was accordingly used to record the following:

For the infant:

- Gender
- Date of birth
- Ethnic group
- Position in the family
- Gestation, in completed weeks
- Birth weight
- Current weight, if known, and/or confirmation that there had been no concerns over the infant's growth to date
- Any past, current or suspected disability or disorder
- Feeding history to date:
 - any use of infant formula – if so, when, how much and for how long
 - any experience of solid food
- Any experience with spoon feeding, including the infant's reported response to that experience
- Whether any teeth had so far erupted.

For the primary care-giving parent:

- Current age
- Age of partner
- Ethnic group
- Occupation – current or, if not working, previous employment
- Level of completed formal education
- Awareness and understanding of baby-led weaning.

Experience with a spoon, for example for the giving of medicine, was considered relevant since it might influence the infant's response to the food when offered on a spoon. Similarly, although tooth eruption was not considered a prerequisite for the introduction of bitable food, the presence or absence of teeth might cause the infant to show a preference for food in one format or the other. Also, anecdotal evidence suggests that infants who are adjusting to the presence of erupted teeth sometimes bite their cheek, tongue or fingers unintentionally, causing pain and thereby potentially triggering responses unrelated to the food itself. Prior familiarity with the concept of baby-led weaning (BLW) may have influenced the parent's actions during the Observation of the infant's first encounter with food, as well as their comments on their own experience of eating the test foods in Interview #1 and their review of their infant's first encounter with the food (Interview #2).

The Introductory Visit provided the best opportunity for the collection of this data, with the exception of the question about baby-led weaning. This was deferred until the end of Interview #2, in order to avoid prompting speculation about the purpose of the study that may have affected the behaviour of the parent during the Observation and Interviews.

2.8 Piloting the methods

A pilot study is a means of testing research methods prior to the commencement of a study, in order to uncover and rectify any problems with tools and procedures, so that the eventual research proceeds smoothly and reliably (Edwards and Talbot, 1994). The planned methods of data collection and analysis were piloted before the main study commenced, with two parent-infant pairs recruited for this purpose. The pilot study confirmed the overall workability of the format of the Observations and Interviews and the appropriateness and effectiveness of the various materials. No ethical problems were revealed and NVivo was confirmed as an appropriate tool for the investigation. The pilot study did, however, expose several minor stumbling blocks, inconsistencies and flaws in the study design, which were subsequently addressed. These were:

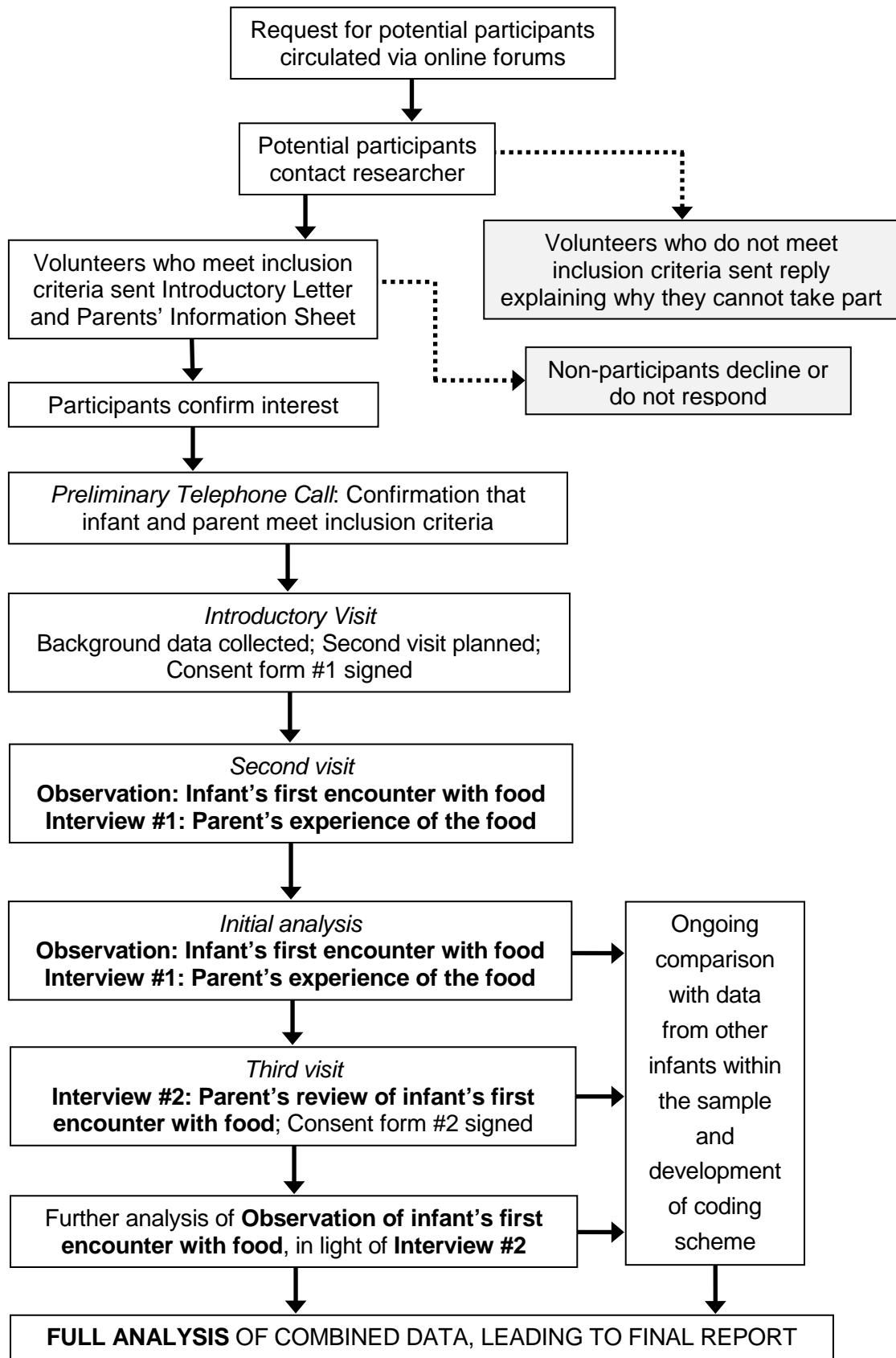
- The timing of the collection of background data. It was felt to be less intrusive for this to take place at the Introductory Visit than as part of the Preliminary Telephone Call.
- The need to record the infant's previous experience with a spoon, if any, and the nature of his or her response to it.
- The need for the infant's chair to be fitted with a tray, to minimise loss of food and to facilitate behaviours such as banging.
- The need for the infant to be familiar with the chair and have sat in it on at least two previous occasions, so that it did not constitute a novelty, and therefore a distraction, on the day of the Observation.
- The need for the piece of broccoli to be offered to the infant hand to hand, in the first instance, rather than being placed on the tray (from where it could be difficult to pick up), in order to maximise the time spent handling the food.
- The need for the spoon-fed broccoli to be puréed using an electric blender, rather than being mashed with a fork, to provide a greater contrast to the consistency of the piece of broccoli.
- The need to ensure that the infant's mouth was empty and the tray cleaned of food before introducing the broccoli in the second format, so that it would be clear to what the infant was responding.
- The need for the audio/video camera to be hand held rather than static, in order to permit small adjustments to the angle of view as the infant and/or parent moved, so enabling a close-up view of the infant's head, trunk and arms to be maintained.

Following completion of the pilot study, recruitment to the main study began.

2.9 Study procedures

The study procedures consisted of the same sequence of events for each parent-infant pair. This sequence is illustrated in Figure 2.1 (p.114), following which the events are described in detail, in order of occurrence.

Figure 2.1 Sequence of events comprising the study



2.9.1 Recruitment of participants

Three Facebook groups and one online discussion forum, all focusing on baby-led weaning, were identified as offering easy access to parents whose infants would be in the target age group, and who might be interested in taking part in research about weaning. Four local Facebook groups devoted to breastfeeding were also identified, whose members lived in the required geographical area. The owner or administrator for each of these Internet groups was sent either an online message or an email, requesting permission to use the forum to recruit study participants; all acceded to the request. The text of the online post was essentially the same in each case, but tailored to reflect the style of discussion and word limit of the forum in question; the three variations can be found in Appendix IV. After approximately four weeks, a sufficient number of volunteers had come forward to enable the first wave of the research to go ahead and the groups' administrators were advised that the posts could be removed. The process was repeated some months later, when analysis of the data suggested that the sample size needed to be increased.

Parents who responded to this initial 'call for help', and who stated that they met the inclusion criteria, were sent a copy of both the Introductory Letter (Appendix V) and the Parents' Information Sheet (Appendix VI) by email or by post, according to their preference. They were asked to contact the researcher again within a few days if, having read the letter and information sheet, they were still interested in taking part. Those who had responded by email were also asked for a contact telephone number, which would enable more immediate contact and would be more useful, should changes to appointments become necessary at short notice. Parents who volunteered information that showed they did not meet the inclusion criteria were telephoned or sent an email thanking them for their interest and explaining why it would not be possible to include them and their infant.

2.9.2 The Preliminary Telephone Call

On receipt of a contact telephone number the researcher telephoned the parent to introduce herself, to answer any questions they had, and to confirm the family's fit with the inclusion criteria. The food to be used in the research was explained at this stage and the liking of both parents for broccoli confirmed. The parents were asked to agree to ensure that their infant would not handle or taste any solid foods, or have the opportunity to play with a spoon, prior to the second visit, when the Observation of the infant's first encounter with food would take place. The purpose of the Introductory Visit was explained and a mutually convenient time and date for this arranged. The parents were invited to contact the researcher by telephone or email if they had any questions or concerns in the interim.

2.9.3 The Introductory Visit

The Introductory Visit had five objectives:

1. To enable face-to-face introduction and the establishment of a rapport between the researcher and the parent and infant.
2. To confirm that the parent had read the Parents' Information Sheet (Appendix VI), to provide an opportunity for any questions they may have had to be answered, and to explain the study procedures verbally to ensure full understanding, as far as possible.
3. To confirm eligibility for the study, including the normal development of the infant to date, and to collect the additional background data.
4. To discuss the logistical aspects of the infant's first encounter with food, to enable the smooth running of the Observation.
5. To obtain the parent's formal written consent for themselves and their infant to take part in the study, using Consent Form #1.

Logistical planning

The practical arrangements for the infant's first encounter with food were discussed. These included:

- How the infant would be seated – either in a high chair or a low, moulded seat (such as a 'Bumbo'). The parent was asked to ensure that the chair was fitted with a tray and that the infant had had experience of sitting in the chair on at least two occasions prior to the researcher's second (Observation) visit.
- The positioning of the infant and the camera in relation to issues of lighting and shadow that might affect the comfort of the infant and/or the quality of the recording.
- The positioning of the infant and the camera in relation to the surroundings, to ensure that nothing would be captured on the audio/video-recording, such as an envelope with a visible address, that could readily identify or locate the family.
- The nature and use of recording equipment, including any necessary safety precautions.
- Covering for the floor, which would allow dropped food to be retrieved and handed back uncontaminated, if necessary, as well as protecting the floor itself.

The audio/video camera and audio recorder were shown to the parent and their use explained. The procedures for supplying and preparing the food were described and the willingness of the parent to offer the food to the infant while the researcher concentrated on

the making of the recording confirmed. The parent was asked to make available whatever spoon they planned to use, or imagined they might use, for feeding their infant.

A date and time was agreed for the second visit, to take place when the infant was between five-and-a-half and seven months old, the exact date in each case being dependent on the parent's estimation of the infant's likely readiness to begin solid foods. The parent was asked to suggest a day and time when the infant could be expected to be awake, alert and happy: for example, not immediately following an immunisation or when a nap would usually take place. This was to maximise the likelihood that the infant would be interested in engaging with the food and able to concentrate on the activity. It was also important that the infant not be in need of a milk feed at the time chosen for the Observation, since an infant who has no experience of solid foods has not yet learned to rely on those foods to assuage his hunger; the infant would therefore be less, not more, likely to engage with solid foods if he or she were feeling hungry. Where possible, it was agreed that a second caregiver would be available to take over the care of the infant following conclusion of the Observation, so that Interview #1, the parent's experience of the food, could proceed without distractions.

The parent was encouraged to telephone the researcher if the arranged appointment became unsuitable because of other commitments, or through a change in the infant's health, sleep pattern or general demeanour, or if the parent wished to bring forward or postpone the introduction of solid foods. Provided it could still take place within the defined five-and-a-half to seven months window, with the infant developmentally able to sit up and handle the food, the visit could be rescheduled accordingly.

Consent to take part in the study

Towards the end of the Introductory Visit, once all relevant issues had been discussed and the parent's questions answered, such that both they and the researcher were satisfied that they fully understood what participation would involve, formal written consent to participate in the study was sought. The parent was asked to sign two copies of Consent Form #1 (Appendix VII), one of which was left with the parent and the other retained by the researcher. The parent was reminded that they were free to withdraw from the study at any stage, without needing to give a reason, and that, if they chose to do this, they would not be contacted further by the researcher and any data already held concerning them or their infant would be destroyed. Finally, the parent was thanked for their time, and for their willingness to participate in the study.

2.9.4 The second visit

The second visit comprised the making of the audio/video-recording that would constitute the Observation of the infant's first encounter with food, followed by Interview #1, the parent's experience of the food.

Observation of the infant's first encounter with food

Prior to the visit the food to be used was purchased and prepared by the researcher. A head of fresh, organically grown broccoli was washed and cut into single florets, each with 5 to 7cm of stalk, making them theoretically easy for the infant to grasp. The florets were steam-cooked for approximately 12 minutes, until sufficiently soft for the infant to be able to bite and chew, but not so soft as to disintegrate when grasped. Half of the batch was made into a smooth purée using a hand-held electric food blender, with a small amount of the cooking water added if necessary to provide a smooth consistency; the remaining florets were left whole.

On arrival at the infant's home the following information was checked with the parent, in order to confirm the appropriateness of proceeding with the Observation:

- that the infant was displaying signs of developmental readiness for solid foods, i.e. that he or she was:
 - able to sit upright with minimal support;
 - actively reaching out for toys and other objects and taking them to his or her mouth;
- that the infant had not thus far had the opportunity to handle or eat any solid foods;
- that the infant had had no experience of spoon use (for example for the administration of medicine) since any recorded during the Introductory Visit;
- that the infant was familiar with the chair to be used;
- that a suitable spoon was available for use with the puréed food;
- that the infant was not sleepy or likely to be hungry during the Observation.

The number of teeth currently erupted was recorded on the Background Data Form.

The procedure to be followed for the Observation was again outlined to the parent and their consent confirmed verbally. The initial assent of the infant was assumed provided he or she appeared happy. The parent was reminded that they should alert the researcher if they considered that the infant was becoming bored or distressed during the Observation. If disengagement occurred with the food in the first format the second format would be offered, in an attempt to re-engage the infant's attention. Alternatively, if the infant needed to

be comforted the Observation would be interrupted to allow for this. If the infant's distress were irresolvable through a change of activity or focus, the Observation would be abandoned and the visit concluded. In this case a further attempt to carry out the Observation would be made on another day. If the same response occurred a second time the infant would be withdrawn from the study.

Positioning and use of furniture and equipment

A number of decisions had to be made in relation to the recording equipment. Most were pertinent only to the audio/video-recording but issues of sound management were relevant to the audio-recording of Interviews #1 and #2 as well.

The camera was held 1.5 to 2 metres from the infant, slightly above the line of the infant's eyes, with the field of view confined to the infant's face and upper body and the high chair tray. This permitted a clear view of the infant's face and hands, enabling capture of his or her facial expressions, and allowing for reasonable side-to-side movement and arm gestures, while ensuring that the infant's own hand movements did not obscure the camera's view of his or her face. It also allowed all but the quietest sounds to be picked up. The camera was held in as still a manner as possible unless movements of the infant or parent necessitated an adjustment to the angle, for example on the rare occasion when the parent's arm or hand threatened to obscure the view of the infant's face, or when the infant leaned over the edge of the chair. The biggest drawback of this arrangement was that the camera and researcher were clearly within the infant's field of view throughout the recording and thus presented a ready source of distraction. In order to minimise this effect, the researcher dressed in muted colours and un-fussy clothing with no jewellery, remained silent as far as possible and kept her movements to a minimum.

Lighting was an important consideration. While modern audio/video cameras rarely need to be assisted by spotlights, the ambient light needed to be sufficient to enable detail to be recorded clearly. Where possible, the Observations were carried out during daylight hours, so that natural light was available. Where this was not possible, the presence of a suitably bright but diffuse light source was established. The infant's chair was positioned such that the infant's face would be well lit, but without a light shining directly into his or her eyes. In particular, care was taken to avoid back-lighting, which would have produced a silhouette effect and made facial expressions difficult to distinguish.

The floor under the infant's chair was covered as previously agreed with the parent. To enable the smooth running of the Observation and optimise the quality of the recording, distractions and extraneous sources of sound were eliminated as far as possible, without causing disruption to the home or making the situation too contrived. For example, efforts

were made to exclude pets from the room, to switch off washing machines, televisions, radios and mobile telephones, to close windows, and to move toys and mirrors out of the infant's immediate field of view. Care was also taken to ensure that anything that might identify the family, such as visible photographs or documents, was removed from the area of observation. Any additional people present, such as other family members, were invited to remain in the room if they wished but were asked to position themselves well away from the infant, preferably outside his or her field of view, and to remain as still and quiet as possible while the recording was in progress.

Heath *et al* (2010) suggest carrying out a video sweep of the setting prior to the commencement of an observation, in order to establish the context and to enable accurate interpretation, later, of behaviours relating to something occurring outside the scope of the camera – for example, someone entering the room. However, it was felt that this benefit was outweighed by the need to respect the family's privacy and maintain confidentiality, and that unexpected distractions could be adequately recorded through field notes.

Conduct of the Observation

The infant was placed in the chair and the audio/video camera tested to confirm the appropriateness of the angle of view, the lighting and the background. The parent was asked to sit at right angles to the infant at his or her side – on the infant's right if the parent was right-handed, on the infant's left if left-handed – in order to allow easy manipulation of the food and spoon. The food was placed within easy reach of the parent but out of sight of the infant. The parent was briefed on the protocol for offering the food (Appendix I) and advised which format was to be offered first, according to the alternating scheme devised by the researcher. The parent was encouraged to focus on the infant during the Observation, maintaining as far as possible their usual style and tempo of interaction with him or her, so ensuring that the first encounter with food represented, from the infant's point of view, a relatively normal interaction with the parent. This stipulation also minimised the chances of the parent making eye contact with the researcher or offering concurrent comments, which might have distracted them both, as well as having the potential to influence the researcher's subsequent analysis of the recording.

Audio/video recording commenced when the infant was seated and happy and the parent was ready to begin, and continued until the Observation was concluded. The infant was offered the food in the first format, followed by the second, for approximately four minutes each. This timing was based on the researcher's assessment, from professional experience, that it would be sufficient to allow a variety of behaviours to emerge without risking the infant's becoming too tired to engage fully with the food in the second format. The researcher monitored the timing and indicated when the first format should be discontinued.

A slight overrun was permitted to avoid interrupting the infant if he or she appeared to be engrossed; equally, in some cases the first format was terminated a few seconds early, at a convenient point between mouthfuls or when the food had been dropped. The researcher remained in position and the camera continued running while the infant's face and tray were cleaned between formats, in order not to disrupt or delay the changeover. If the infant was disinterested in, or indicated clear dislike of, the encounter before the end of the four-minute period, the format was changed or the Observation concluded at that point.

Interview #1: The parent's experience of the food

Interview #1 examined the parent's experience of the food and took place immediately after the Observation of the infant's first encounter with food, using broccoli from the same pre-prepared batch. Where possible, care of the infant was passed to a second caregiver following the Observation, to allow the participating parent to focus more easily on their own experience of the food. Where a second caregiver was not available, the infant was settled with a toy or a milk feed, so that the Interview could proceed. The small, portable battery-operated audio recorder was placed on the table between the parent and the researcher and recording started when the parent confirmed their readiness to begin.

The offering of the food to the parent mimicked the protocol used during the Observation of the infant (Appendix I) and followed the same order. The parent sat in a chair of their choosing and assumed the infant's role. The puréed broccoli was presented by the researcher, on a spoon, and the parent was invited to use their fingers to pick up the individual broccoli florets. While handling and eating the food, the parent was asked to describe as fully as possible the sensations they were experiencing, paying particular attention to the appearance, smell, texture and taste of the food, and to the mouth movements required to eat it, using the schedule for Interview #1 (Appendix II). The time spent with each format was determined by how long the parent took to give as full an account as possible of their experience of that format, rather than following the four-minute 'rule' applied to the infant. At the end of the Interview a date and time was agreed for Interview #2 and the parent was thanked for their time and cooperation.

2.9.5 The third visit

The third visit took place approximately one week after the second visit. Its purpose was to conduct Interview #2 and to seek the parent's consent to the use of the audio/video-recording for teaching purposes and to inform future research.

Interview #2: The parent's review of the infant's first encounter with food

Where possible, the presence of a second caregiver had been pre-arranged so that the participating parent could concentrate on watching the audio/video-recording and on offering

comments prompted by it. Before the Interview began, the written transcript of Interview #1 was shared with the parent, so that they could draw on their own experience while reviewing their infant's encounter with the food. The parent was shown the recording at normal playback speed, so that the unfolding behaviour could be observed as it had occurred. They were invited to comment on what they saw and to offer their own interpretation of it, according to the schedule for Interview #2 (Appendix II). They were advised that the audio/video-recording could be rewound and repeated after the initial viewing, if necessary. The parent was also invited to provide additional comments at the end of the viewing.

The Interview was recorded using the same audio-recorder as for Interview #1. The 'record' button was pressed at the same time as the audio/video 'play' button, so that the parent's comments could later be accurately ascribed to specific behaviours of the infant. Whenever necessary, the researcher also made written notes to ensure correlation, later, with the relevant segment of the recording. This process was aided by the visible presence on the screen of a timer, whenever the audio/video-recording was in playback mode.

Consent to the use of audio/video footage

Having had an opportunity to view the audio/video-recording of their infant, the parent was asked to provide written consent for its use in the dissemination of the research findings, using Consent Form #2 (Appendix VII). As before, two copies were signed, one of which was retained by the parents and one by the researcher.

At the conclusion of the visit the parent was asked whether they had heard of baby-led weaning (BLW) and, if yes, what they knew about it. This information was added to the Background Data Form. In order to avoid parents who answered 'no' being left confused by the question, and to provide them with a broader understanding of the context for the research, the opportunity was then taken to give a brief explanation of the BLW approach, along with details of where further information could be obtained. Finally, the parent was thanked for their time and cooperation.

2.10 Outline of data analysis

The analysis was computer-assisted and proceeded along qualitative lines, with an element of quantification aimed at bringing additional clarity and insight to the interpretation. The main focus was on the analysis of the Observations, with the Interview data contributing to it at various stages. The analysis is described in detail in Chapter 3; this section presents an overview of the process.

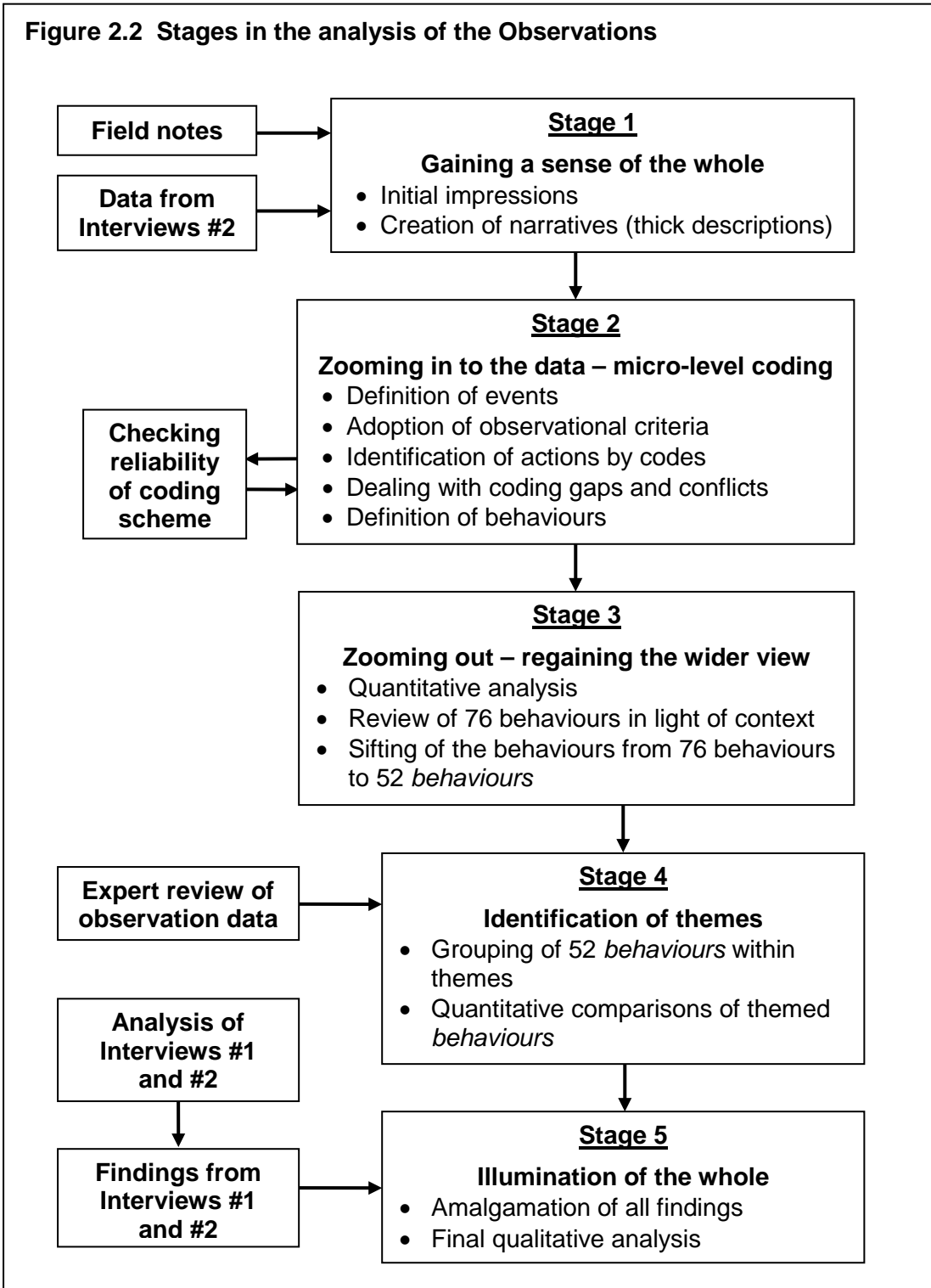


Figure 2.2 shows the five stages of the analysis of the Observations, as informed by the data from Interviews #1 and #2. Analysis of the data for each parent-infant pair began immediately after the Observation and Interview #1 had been conducted and subsequently expanded to overlap with the analysis of data from the other parent-infant pairs. The initial focus was on the Observation data, into which were incorporated essential data from Interview #2. Towards the end of Stage 3, input was sought from a small group of experts in

the field of Early Years Education, which led directly to the identification of major themes within this data. As analysis of the Observation data neared completion, attention turned to the analysis of the data from Interview #1, the parent's encounter with the food, and to the further analysis of Interview #2, so that the findings from these could inform Stage 5.

2.11 Chapter summary

This chapter has outlined the theoretical basis for the study and explained why phenomenology was chosen as the methodology to inform the enquiry. The rationale for using observations and interviews has been explained and the implementation of the two methods described. The measures taken to ensure validity, reliability and ethical soundness in the research have been outlined and the research design and procedures detailed, together with the sampling and piloting processes. Finally, an overview has been provided of the methods used to analyse the data. The next chapter presents details of the analysis and the findings of the study.

Chapter 3 – Analysis and Findings

Chapter 2 has described the study methods and outlined the approach taken to data analysis. This chapter begins with a description of the study participants. This is followed by an account of the analysis of the data from the Interviews and Observations and the presentation of the findings in relation to the study's objectives. Finally, the integration and interpretation of the combined findings is described.

3.1 The study participants

Over the course of ten weeks, from April to June 2011, twenty-one parents responded to the online 'call for help' (Appendix IV) by emailing or telephoning the researcher. Twelve of the respondents did not meet the inclusion criteria. The remaining nine were sent the Parents' Introductory Letter (Appendix V) and the Parents' Information Sheet (Appendix VI), following which eight responded a second time, confirming their willingness to participate. All represented mother-infant pairs. Two were allocated to the pilot study, following completion of which the remaining six were enrolled in the main study. The request for volunteers was repeated in January 2012, when analysis of the data from the first six infants suggested that the sample should be increased because there was no evidence thus far that all possible behaviours had been seen. On this occasion five mothers responded, all of whom were eligible to take part in the study. All five were enrolled with their infants but one was subsequently ruled out at the second visit, when it became clear that the infant was not able to sit up sufficiently well to handle food. No further recruitment took place, since substantive saturation was achieved with these ten mother-infant pairs, all ten of whom completed the study. *Since no father-infant pairs were recruited, the term 'mother' is used in preference to 'parent' in the reporting and discussion of the analysis and findings, below.*

All the infants and their mothers were Caucasian. Seven of the infants were girls and three were boys. Five were firstborn, two had one older sibling and three were their parents' third child. Their ages at the time of the Observation ranged from 24 weeks and one day to 28 weeks and one day. Eight infants had no erupted teeth, one had one visible tooth and one had four incisors. The mothers' educational attainments ranged from NVQ Level 2 to Master's degree, and their ages from 25 to 38 years. The profile for each mother-infant pair can be found at Appendix IX.

On entering the study the infants were assigned alternately to be presented first with the piece (piece-first infants, or PFIs) or the spoon/purée (spoon-first infants, SFIs). Because recruitment took place over a period of time, with saturation of the data determining the

sample, it was not possible to ensure equal allocation of male/female infants. By chance, all the male infants were assigned to the spoon-first group.

3.2 Eliciting the parent's experience

Objective (i) was *to elicit the parents' accounts of their experience of a food when presented to them as a piece and when spoon fed to them as a purée*. Data relevant to this objective were derived from Interviews #1, the parent's experience of the food. The full transcript of two examples of these Interviews can be found at Appendix XI.

3.2.1 Interview #1: The parent's experience of the food

Analysis of Interviews #1 formed part of the qualitative element of the analysis. For each mother, the audio-recording was transcribed as soon as possible after it had been completed, and always within 24 hours, so that the researcher's memory of it would be fresh. This helped to minimise potential errors arising from inaudible words. As suggested by Richards and Morse (2007), the researcher made her own transcriptions, which allowed her to 'get inside' the data. A bespoke transcription scheme was developed (Appendix X). This allowed the emphases and rhythm of each mother's speech to be represented and kept the voices 'live' in the researcher's head. It also facilitated accurate interpretation of positive and negative comments, jokes, asides, and so on.

The transcripts were analysed inductively, as described by Silverman (2006) and Bryman (2012), using a system of coding similar to that first devised for use in Grounded Theory (Glaser and Strauss, 1967). Coding involves the application of 'codes' to elements of data, a code being a unique word or phrase that identifies a discrete element. The use of codes enables raw data to be manipulated and prompts the identification of commonalities, leading to later grouping of first-level codes under higher-level codes, representing themes and sub-themes that run across and through the data (Strauss and Corbin, 1998; Richards and Morse, 2007).

As explained, the rationale for interviewing the infants' parents was not to compare their individual experiences, nor to develop theory based on the emergent themes, but rather to gather their collective responses as a means of expanding the researcher's own insight into the possible lived experiences of all the infants. The mothers' status was thus similar to that of 'informants' in an ethnographic study (Spradley, 1980), with their evidence being used to throw light on the central data, rather than being subjected to in-depth analysis in its own right. Accordingly, the themes identified were largely descriptive and no attempt was made to weight the occurrence of similar comments or to identify which, if any, themes were expressed by all the mothers. Rather, the focus was on gaining a sense of the range and

richness of the ways in which they described the experience of interacting with the food and on gathering any insights offered, whether isolated or repeated, in order to assist the analysis of the Observations.

Table 3.1 Themes and sub-themes emerging from the data from Interview #1

Major theme	Sub-theme or attribute of food		Mentioned (✓) or not (X) in connection with	
			Piece	Purée
Physical aspects of the experience – extra-oral	Appearance of the food	Colour	✓	✓
		Shape	✓	X
		As predictor of experience	✓	✓
		Eating appeal	✓	✓
	Smell of the food		✓	✓
	Texture of food as experienced on the skin	Haptic properties	✓	X
		Feel on lips	✓	X
Physical aspects of the experience – intra-oral	Texture of food as experienced in the mouth		✓	✓
	Flavour of the food	Overall	✓	✓
		Interplay with texture	✓	✓
	Noise generated during eating		✓	✓
	Behaviour of the food in the mouth		✓	✓
	Oral motor actions required to eat the food		✓	✓
Preferential responses	Positive comment: pleasure/preference		✓	✓
	Negative comment: displeasure/dislike		X	✓
Reflections based on prior experience	'Realness' vs. 'manufacturedness'		✓	✓
	Acknowledged expectations		✓	✓
	Surprise discoveries		✓	✓
	Sense of agency		✓	✓
	Insights offered		✓	✓

Table 3.1 shows the four major themes identified within the data for Interviews #1, together with their sub-themes. These are explained in detail, below. The right-hand two columns indicate whether the comments were offered in response to one format only, or to both.

The major themes related to the physical experience of the food, both before it was taken into the mouth and afterwards, to expressions of like and dislike, and to additional reflections based on each mother's prior experience of broccoli, and of eating in general. While no attempt was made to quantify the mothers' responses according to the food format, a brief overview reveals that the majority of the comments referred to both the piece and the purée. This is not surprising since the mothers were aware that part of the purpose of the research was to compare the two. Comments relating to the physical aspects of the mother's experience were largely descriptive, and were to some extent prompted by the researcher's questions. Comments that reflected the themes of preferential responses and reflections based on prior experience, on the other hand, were more likely to be abstract and spontaneous, and to suggest the meaning the food held for the mother.

Physical aspects of the experience – extra-oral

The mothers commented on the physical attributes of the food as they experienced it before taking it into their mouth, highlighting its appearance, smell and texture. Their narratives were much richer in relation to the piece than to the purée, the opportunity (or need) to handle the piece seeming to prompt them to examine it in a way they did not attempt to do with the purée.

Appearance of the food – colour

Mothers commented on the colour of the broccoli, especially the fact that the two formats were not the same colour and that there was a colour differential present in the piece that was absent in the purée.

The **piece** was generally considered to be more appealing:

"I suppose the first thing is it's bright – quite colourful." (Mother of Infant K)

"With that you've got the natural dark green to light green." (Mother of Infant F)

"Colour-wise the whole broccoli looks more inviting because there's more depth of colour." (Mother of Infant G)

In contrast, the mothers said of the **purée**:

"That's quite vivid because it's been puréed." (Mother of Infant F)

"With the purée it's just all the same all the way through; there's no variation." (Mother of Infant G)

"The colour isn't appealing in a purée form." (Mother of Infant H)

Appearance of the food – shape

Shape was mentioned only in relation to the **piece**:

"I always thought broccoli looks a bit like trees." (Mother of Infant K)

This highlighted the fact that the purée had no shape of its own but instead conformed to that of the bowl in which it was presented.

Appearance of the food – as a predictor of experience

Some mothers indicated that the appearance of the food gave them information – albeit not always reliable – about the food itself, and about what the eating experience would be like.

For example, in relation to the **piece**:

"It's actually easier to swallow than it looks. If I look at that visually I would say that doesn't look like it's going to be easy to eat." (Mother of Infant D)

The appearance of the **purée** was of little help, or even actively misleading:

"It's green, so it's probably a vegetable." (Mother of Infant E)

"Visually it's very green and quite vivid but the flavour doesn't match that."
(Mother of Infant F)

"It's quite dry, even though to actually look at it it's quite moist."
(Mother of Infant J)

Appearance of the food – eating appeal

The broccoli's appearance contributed to, or detracted from, the mother's desire to eat it. Of the **piece** the mothers said:

"It looks more appetising whole." (Mother of Infant H)

"If I had that on a plate and that on a plate I would go for that because it just feels like there's more variety in the whole broccoli as opposed to the purée. On their appearance I would definitely pick the whole rather than the purée."
(Mother of Infant G)

Whereas their thoughts on the **purée** were:

"It tastes nicer than I thought it was going to." (Mother of Infant D)

"It just doesn't feel as inviting." (Mother of Infant G)

Thus, the appearance of the food represented an important feature for the mothers.

Smell of the food

Most of the mothers had commented informally on the strong smell of broccoli that emerged when the containers were opened immediately prior to the commencement of the Observation, and which was still present in the room throughout Interview #1. However, a

few also commented during the Interview on a difference in odour between the purée and the piece. Most comments were triggered by the smell of the **purée**:

“The smell I found was more potent there.” (Mother of Infant F)

“The smell is much more apparent with that.” (Mother of Infant C)

One mother hinted at the connection between odour and flavour:

“The smell sort of comes through your nose when it goes in your mouth.”
(Mother of Infant C)

Another speculated as to the reason for the difference in smell, suggesting that it may be a feature of the blending of the different parts of the floret into a homogenised whole:

“They even smell slightly different. Not entirely sure why but I don’t know if it’s just because different parts maybe smell different.” (Mother of Infant G)

This was in spite of the fact that this mother had not identified any difference in odour between the stalk and the tip during her experience of the **piece**:

“Smell-wise it all smells the same – it all smells of broccoli.”
(Mother of Infant G)

Smell was therefore a feature of the broccoli, and especially the purée, of which the mothers were aware.

Texture of the food as experienced on the skin – haptic properties

None of the mothers attempted to touch the purée with their fingers, with the result that the texture of the food as part of the extra-oral experience was commented on only in relation to the **piece**. A few of the mothers offered comments about its texture when held in the hand:

“The stalk feels quite rubbery in your hand and quite firm.”
(Mother of Infant A)

“When you’re just touching it with your fingers it feels quite springy.”
(Mother of Infant K)

One used this information to gain a picture of whether the broccoli had been prepared to her liking:

“I expected it to fall apart but actually it’s not doing it. It stays in one piece, which is good. That means it’s well cooked – not too much.”
(Mother of Infant E)

Texture of the food as experienced on the skin – feel on lips

None of the mothers deliberately touched the purée to their lips but two made a point of touching the piece in this way because they had seen their infant do it. A third was prompted to do so by the researcher, who reminded the mother that her infant had done this. They described their experience with the **piece** as follows:

“It’s quite pleasant. Just doing that ’cause that’s what D did. [I was] wondering what it feels like for her. Quite tickly, when you get the top of the broccoli on your lips. Mmm, it’s like a sponge.” (Mother of Infant D)

“The bobbly end bit [...] moves against the mouth, so it’s sort of quite soft. It’s not as hard as the stalk.” (Mother of Infant G)

One compared the feel of the stalk with that of the tip:

“Texture-wise it’s firmer. Both [ends] feel firm but the bobbly bit gives. You can feel the texture more over the lips, as opposed to just the part that is touching the lip on the stalk, because the softer bits move.” (Mother of Infant G)

Another compared the texture as experienced on the lips with that felt in the mouth:

“It’s weird ’cause to put it on my lips it feels quite bristly – almost like your toothbrush – but when you actually put it in your mouth it doesn’t taste like that.” (Mother of Infant J)

The extra-oral texture of the piece thus appeared to be a feature of interest to the mothers, but not that of the purée.

Physical aspects of the experience – intra-oral

The mothers described in some detail the physical aspects of their experience with the broccoli after they had put or accepted it into their mouth. As requested by the researcher, and occasionally when prompted by her, they talked about the texture and taste of the food, the noise generated during eating, the behaviour of the food and the action required to eat it.

Texture of the food as experienced in the mouth

Many different adjectives were used to describe the texture of the two food formats as experienced inside the mouth. The **piece** as a whole was described as: *moist, watery* and *wet*. However, most of the comments about its texture revolved around differences between the stalk and the tip, with the tip described as: *soft, hairy, grainy, bobbly*, like *tiny pips* or *little bubbles*, and the stalk variously as *firm, fibrous, crunchy, chewy* and *smooth*. Mothers often made direct comparisons between the two parts:

“It’s kind of chewy but [...] whereas the top kind of mashes down when you chew it, the stalk goes into, like, more kind of like – not shards, ’cause that sounds sharp, but yeah, it kind of just goes into pieces instead of mushing down.”

(Mother of Infant A)

“You’ve got the little, what feels like little tiny pips but is just obviously the floret, and then [...] the stalk] tastes quite slimy inside but it’s sort of ... It’s not crispy but it’s tougher. And then you get through to, like, slime; like watery slime.”

(Mother of Infant B)

“The stalk’s a bit more crunchy. It’s got a different texture. It’s a bit more chewy, I’d say.”

(Mother of Infant D)

“The trunk is kind of more fibre content – different texture compared to the bush thing. When I’m eating the top part it feels more filling, whereas the trunk bit goes quicker.”

(Mother of Infant E)

“Whereas the stalk’s quite firm and hard, the bobbly bits at the end, they’re softer. And you can feel them more around the mouth.”

(Mother of Infant G)

One mother explained how the consistency of the piece changed as it was chewed:

“The texture’s changing in the mouth. Obviously, at first, biting it from the broccoli, it’s quite firm. But then after a bite you can feel the texture changing each time. [...] There’s a bit of everything but you sort of can feel different bits in different parts of the mouth. So, on this side of the mouth I can feel like the little end bits, but then I can feel on the other side of my mouth that it’s firmer, you know.”

(Mother of Infant G)

This textural variation added to the pleasure of eating:

“There’s more textures in that, so it’s more interesting to eat.”

(Mother of Infant F)

In contrast, the **purée** was described as: *dry, crumbly, mush, creamy, slimy, gloopy, sticky, squidgy, bitty and gritty*. It was also said to be:

“Really watery, like, but with lumps in – like little tiny, like, beads.”

(Mother of Infant B)

“A little bit like having soft sand in your mouth – but not sharp, if that makes sense, just a bit gravelly.”

(Mother of Infant D)

“It was a very sort of full, heavy texture.”

(Mother of Infant J)

“Just a solid lump.”

(Mother of Infant C)

The purée was noted to be relatively homogenous in nature, compared with the piece:

“With the broccoli it has got very different distinct textures and flavours in different bits of it. Eating it all together – even eating, like, a bit of the stalk and a bit of the end, on the whole broccoli there’s still a distinction in flavour between different parts of the mouth. Whereas with the purée it’s just one lump of food.”

(Mother of Infant G)

“It’s funny the way the broccoli is built. These little things are quite funny on the tongue, which I guess you would lose – you do lose it on the mush.”

(Mother of Infant E)

In all, then, there was an emerging sense that the varied and changing texture of the piece as experienced intra-orally provided a more interesting eating experience than did the purée.

Flavour of the food – overall

The terms ‘flavour’ and ‘taste’ were used interchangeably by the mothers. A common view was that the flavour of the purée differed from that of the piece. For example, two mothers, one of whom was offered the piece first and the other the purée, commented, on tasting the second format:

“It’s got a totally different flavour.”

(Mother of Infant J)

“It tastes completely different – almost like a completely different food.”

(Mother of Infant K)

Opinions varied, however, as to which had the stronger flavour:

“It’s got more flavour.”

(Mother of Infant B, referring to the piece)

“It’s not overpowering – it’s a much nicer taste.”

(Mother of Infant J, referring to the piece)

“It’s very strong in flavour.”

(Mother of Infant J, referring to the purée)

“It doesn’t have as much taste.”

(Mother of Infant K, referring to the purée)

The **piece** was described as tasting: *bitter, green, and fresher, more natural and more potent* than the purée. One mother struggled to find the right word:

“Hmm. It’s got quite a mild flavour but it definitely has got a flavour. I’m not very good at explaining. Is it a slightly nuttiness?”

(Mother of Infant H)

A key feature of the piece was that it did not present a single, uniform flavour. Mothers described this variously as a difference in sweetness/bitterness or strength/freshness:

“Different parts of the broccoli taste ever so slightly different. It’s still broccoli but the stalk is slightly sweeter than the ends, which are a little more bitter.”

(Mother of Infant G)

“The stalk’s sweeter than the top bit, so if you eat the top bit on its own it doesn’t taste quite as sweet.”

(Mother of Infant D)

“The stalk is quite tasty. It has a different taste to the florets – the bobbly bit. It tastes kind of fresher, it’s not as strong. I like that end.”

(Mother of Infant A)

“The stem’s a lot stronger in flavour.”

(Mother of Infant J)

Most descriptions of the flavour of the **purée** compared it with that of the piece, or with the remembered flavour of broccoli from having eaten it in the past. Some mothers found the purée wanting:

“That tastes really bland.”

(Mother of Infant H)

“Well, that doesn’t taste like broccoli that I know. That tastes like a broccoli-flavoured mush. It’s almost like watered-down broccoli. [...] There’s an intense smell there but the taste was diluted.”

(Mother of Infant F)

“It tastes really watery.”

(Mother of Infant B)

One description was more graphic:

“I feel like I’m eating the garden [...] like an earthy taste [...] like eating mud.”

(Mother of Infant J)

Some mothers were pleasantly surprised to find they enjoyed the flavour of the purée:

“It tastes nicer than I thought it was going to. [...] The puréed stuff almost tastes sweeter.”

(Mother of Infant D)

Others lamented the lack of differentiation of flavour:

“There’s differences in the taste in different parts of the thing. Like, the stalk’s different to the end part. Whereas with that it’s all mixed in. So, whereas the stalk was slightly sweeter in the whole broccoli, there’s no distinction between them. It’s just all the same.”

(Mother of Infant G)

“I only get sort of one taste.”

(Mother of Infant K)

Flavour of the food – interplay with texture

Some mothers used textural imagery, of smoothness and moistness, to describe flavour, hinting at the interrelation between these two features. For example, in relation to the **piece**:

“The stalk’s sort of more smoother flavour than the actual floretty bit.”

(Mother of Infant K)

“The bobbly bits have a broccoli taste but then the interior of the trunk has quite a smooth moist taste.”

(Mother of Infant F)

Some described how the interplay between taste and texture added to the pleasure of eating the piece:

“I would say, for me, the stalk actually is more tasty. But I prefer the sensation of eating the top bit.”

(Mother of Infant D)

“I prefer the floret [...] there’s more of a taste. [...] It’s got different depths and different textures and different flavours.”

(Mother of Infant K)

“You can taste each individual little, like, little bubbles. Yes, it’s weird, like, you know, the little sticky bits – you can taste each individual one. [...] When you bite into the broccoli you can taste the juice.”

(Mother of Infant K)

“Even eating, like, a bit of the stalk and a bit of the end on the whole broccoli, there’s still a distinction in flavour between different parts of the mouth.”

(Mother of Infant G)

In contrast, comments linking the flavour and texture of the **purée** reflected its homogeneity:

“It’s creamier.”

(Mother of Infant K)

“This just tastes of mush.”

(Mother of Infant A)

“The purée just tastes like green mush.”

(Mother of Infant K)

Some mothers speculated on the mechanism by which texture contributes to flavour, and on the possible effect of the puréeing process in this regard:

“It tastes stronger because there’s no gaps in the texture of it. [...] Where there’s space in between the bits of the floret there’s no gaps [in the purée] – it’s a lump. So maybe that’s why it concentrates the flavour a little bit more.”

(Mother of Infant C)

“Maybe that’s why the purée tastes sweeter, because you’ve got more of the stalk mixed in.”

(Mother of Infant D)

“It is a different taste between the parts of broccoli, definitely, and perhaps that’s why it’s so dilute in the purée because it’s all mixed together. Well it will be, won’t it?” (Mother of Infant F)

“The texture of that is strange. It’s a broccoli-ish flavour – I wouldn’t even say it completely tastes like broccoli. Very odd.” (Mother of Infant F)

“The shape of it just makes it taste different. It must be that.” (Mother of Infant H)

“If I were eating it for the first time, whilst they taste the same I wouldn’t necessarily think that they were the same thing. [I’d think] they were a different variety of vegetable because the sensation isn’t the same.” (Mother of Infant G)

“I think it must be the texture of it ruins the flavour.” (Mother of Infant H)

In all, while the mothers’ descriptions of the nature of the difference in flavour between the broccoli in the two formats varied, the sense that a difference existed was evident in all their accounts. Their comments also highlighted the link between texture and flavour, and the importance of this for the appeal of the food.

Noise generated during eating

A few of the mothers commented on the noise generated by biting and chewing the **piece**:

“It’s noisier.” (Mother of Infant D)

“You’ve got the noise from the crunch as well.” (Mother of Infant F)

“It’s quite squeaky, so you put it through and it squeaks. And it’s – again, you’ve got the little, what feels like little tiny pips but is just obviously the floret, and then – yeah that’s what’s squeaking, when you go [demonstrates chewing]. And a crunch where you’ve obviously got to get the floret off the main stalk ... Like I say, it’s a lot louder because you’ve got the squeaky noise.” (Mother of Infant B)

In contrast, the element of noise was conspicuously absent when eating the **purée**:

“[With the purée] you didn’t have the squeaky noise, you just had like a – like the noise of your tongue, really, no noise of the food.” (Mother of Infant B)

Thus, a difference was apparent between the two formats in relation to the noise produced during eating.

Behaviour of the food in the mouth and oral motor actions required to eat it

The behaviour of the food in the mouth was closely linked to the oral motor actions needed to eat it, such that many of the mothers' comments referred to both aspects. The overall sense was that the eater had a greater degree of control over the behaviour of the **piece** than that of the purée, and that this directly influenced the movement of the food:

"I can feel it moving around the mouth as I'm chewing." (Mother of Infant G)

"When you use your tongue to squeeze the top bit the water comes out."
(Mother of Infant D)

"The green stalky bits kind of come off in your mouth – the bobbly bits, yeah – they kind of separate." (Mother of Infant H)

"If I pay attention on my mouth movement I keep bouncing the thing back and forward, left and right, and then eventually I move it back towards the throat only at last, when it's processed." (Mother of Infant E)

"It's not sticking everywhere. Once it's chewed you just swallow it and it's gone." (Mother of Infant B)

"It doesn't spread around your mouth like it does with the purée."
(Mother of Infant J)

A fair amount of work was required to 'process' the piece ready for swallowing, leading to its spending longer in the mouth than the purée:

"I really, really, have to chew, though – I have to engage my mouth. My mouth has to chew and function." (Mother of Infant F)

"I'm using my teeth, which I wasn't even using with the mushy thing. And now I need to chew ... A very different feeling, actually." (Mother of Infant E)

"You're kind of biting down on it to begin with and then you're – it's going round your mouth more, I suppose. And it gets in between your teeth and round your gums, and you're getting ... I dunno – it's in there longer."
(Mother of Infant K)

This need for active chewing was seen as something positive, not an inconvenience:

"I feel like [...] I'm doing something with it." (Mother of Infant E)

Chewing was easier if the mouthful contained stalk as well as the top of the floret, because the stalk formed a pulp and helped to contain the 'bits':

"You have to work quite hard at getting it all into one bit to go down. The stalk is quite wet and is easier to chew, and it's much easier to eat when there's

more stalk than the end bits [...] The overriding thing I've got is the bits that spread quite a lot, and it's hard to then swallow them all together. It's not hard but it takes a little bit more work than when there's a lot more stalk."

(Mother of Infant C)

Descriptions of the **purée**'s transit through the mouth were, on the surface, conflicting, with some mothers indicating that its tendency to cling to the mucosal lining made it difficult to shift and others complaining that it was swallowed too quickly. Sometimes the same mother made contrasting comments. Overall, however, there was the sense of a lack of control over the food in purée format, and of its tendency to behave erratically, apparently of its own volition:

"It sort of sticks to your lips and your tongue. [...] It's staying on my tongue quite a long time."

(Mother of Infant D)

"When you're eating the purée the bobbly bits sort of hang around a little bit at the end."

(Mother of Infant H)

"Even now there's little bits in my mouth that I can feel, that I feel like I can't move about because they're mushy."

(Mother of Infant G)

"It's gone where I didn't mean it to. [...] Bits were everywhere and without my control."

(Mother of Infant E)

"It sort of spreads round the whole mouth so you can't control where it's going. [...] It just sort of slides everywhere."

(Mother of Infant J)

"It really spreads – it's sticky."

(Mother of Infant C)

"It kind of just hits my tongue and then down my throat."

(Mother of Infant K)

The purée required less work than the piece:

"The purée you just kind of, like, mush it round your mouth with your tongue a bit and then swallow it down."

(Mother of Infant A)

"With the purée I didn't need to engage with it at all – it was, almost, I just literally had to swallow."

(Mother of Infant F)

"The mush went straight through."

(Mother of Infant E)

This lack of opportunity to engage with the food in a satisfying way made the purée experience disappointing:

"It feels like I'm not really eating anything because [...] it just sort of dissolves as soon as it touches the mouth, rather than me being involved in the physical process of eating it." (Mother of Infant G)

"I don't feel like I'm getting as much out of the purée, in the sense that I'm not working my mouth and I'm not really doing anything. It's just going on the back of my tongue and that's it – it's gone. [I'm] not really exploring the flavour as much." (Mother of Infant K)

"I feel like I'm missing out on something because it goes too quick." (Mother of Infant E)

"It doesn't feel like I'm eating, really. It's just, there, and it's gone." (Mother of Infant H)

"It's just definitely more interesting eating it whole." (Mother of Infant H)

Some mothers tried to use a chewing movement with the purée and found that this caused it to adhere to the inside of their mouth, such that specific movements were required to dislodge it:

"I moved it to the top of my mouth and then it gets all stuck in the top of your mouth. You have to move it with your tongue – sort of pull it out with your tongue – and then it's still in my teeth, and down the side of my teeth [...] so I'm needing to move it all out with my tongue to get rid of it all and then swallow it. Really quite a lot you need to do with it, to be fair – more than you realise." (Mother of Infant B)

"I need to wipe my mouth internally with my tongue in a different way than I would do if it was solid, I think." (Mother of Infant E)

One mother found this especially unpleasant:

"When it was in there it was, I sort of, I didn't want to gag, as in, that dramatic I was going to be sick, but I thought 'Ugh, I don't like that in there'. [...] I couldn't really move it around very much it was sort of all this 'Ooh, I need to get rid of it.' Yeah, didn't like that." (Mother of Infant C)

Some mothers reported that the inability to control the way the purée behaved inside their mouth gave them little choice about whether or not to swallow it:

"It feels like I'm in control of what I'm doing [with the piece], so if I don't like it I can still spit it and spit it all. Whereas if I had to spit out the mushy thing I could not. I would have not been able to do it completely because bits were everywhere and without my control." (Mother of Infant E)

"I feel like I've got to eat it. It's surprising how much it takes to move it to the back of the mouth, especially when it's not very nice." (Mother of Infant J)

In general, then, the mothers' experience was that the piece and the purée behaved differently inside the mouth and required different actions to manage them. Although the mother of Infant E commented, jokingly, that *"it was quite convenient to have [the purée] already chewed"*, she, like many of the others, spoke of a preference for engaging with the food via active oral movements.

Preferential responses

Responses reflecting the mother's preferences were both positive and negative, and ran through the majority of their comments. Some took the form of a simple statement of preference:

"I much prefer this. I could eat this all day."
(Mother of Infant J, referring to the piece)

"It's nice." (Mother of Infant E, referring to the purée)

"That's really unpleasant." (Mother of Infant C, referring to the purée)

However, most concerned a specific attribute of the food. For example, in relation to the **piece**:

"Actually, yeah, I like the fact that it gets smushed in my teeth."
(Mother of Infant E)

"It feels quite nice when you're touching it." (Mother of Infant K)

"It's quite bitter and crunchy, but it's a nice crunch. It's not a having-to-bite-hard crunch, it's nice to bite into." (Mother of Infant G)

"There's more textures in that, so it's more interesting to eat."
(Mother of Infant F)

"Even though like the inside of the stem is quite soft it's still a much nicer softness than the purée." (Mother of Infant J)

"It's got a much nicer flavour than what it has in the purée."
(Mother of Infant J)

and to the **purée**:

"Taste-wise it's nice." (Mother of Infant E)

"It's actually quite nice." (Mother of Infant D)

“It’s not a nice texture at all.”

(Mother of Infant C)

Some mothers expressed a dislike of being fed with a spoon, which was an integral part of their experience with the purée:

“It’s just not very pleasant being fed from a spoon really.” (Mother of Infant A)

“I didn’t really want to clear the spoon.” (Mother of Infant C)

Overall, no negative comments were identified in relation to the piece, whereas negative statements outweighed positive ones concerning the purée.

Reflections based on prior experience

Some of the mothers’ comments derived specifically from the adult perspective they brought to the experience. They revealed ways in which prior knowledge of broccoli and lack of familiarity with eating it as a purée coloured their expectations, and in which being fed by someone else provided a new perspective. The resulting realisation prompted some useful insights.

‘Realness’ vs. ‘manufacturedness’

Mothers commented on the relative quality of ‘realness’, or ‘naturalness’, over ‘manufacturedness’ of the food. There was a sense that the **piece** represented how things *should* be:

“It tastes like broccoli, for starters. Tastes a lot fresher and a lot more natural [...] whereas [the purée] appears manufactured – because it is, isn’t it?”

(Mother of Infant F)

“[The purée] doesn’t even have, like, a proper taste to it. [...] You don’t get, like, you don’t get the proper texture that you do ... you can’t ... it doesn’t feel like broccoli should feel in your mouth.”

(Mother of Infant A)

“The whole broccoli looks like food, whereas the purée just doesn’t. It doesn’t look like proper food; it looks wrong.”

(Mother of Infant G)

Two mothers recognised their view of the **purée** as being derived from their own past experience of broccoli:

“I’m not sure I’d know I was eating broccoli if I didn’t know it was broccoli; my brain would be quite confused as to what it was.”

(Mother of Infant H)

“My focus is on trying to understand what it is because the consistency doesn’t help me.”

(Mother of Infant E)

Overall, the prospect of eating 'real' food, or food that was recognisable, appeared to hold more appeal for the mothers than that of eating something 'manufactured' or unfamiliar.

Acknowledged expectations and surprise discoveries

A few of the mothers indicated that the experience of eating the food did not fit the expectations they brought to it, for example:

"It's actually stronger tasting than I thought it would be."

(Mother of Infant C, referring to the piece)

"It's sweeter than I expected."

(Mother of Infant E, referring to the purée)

Some suggested that adjusting their expectations might make the reality of eating the **purée** more acceptable:

"It doesn't help that it's cold, but obviously I know that's not really important."

(Mother of Infant C)

"I thought I wasn't going to like the squidgy stuff but it's actually quite nice ... I don't normally eat purée."

(Mother of Infant D)

"With the puréed broccoli, to start with, it didn't quite feel right because it was cold and I felt like it should be hot [...] because normally I don't have broccoli cold. But then when I started to think about it as a pâté, and if someone had served it to me as a vegetarian pâté that would be cold, I actually thought that would be completely acceptable. So, obviously, I've got an idea in my mind of how broccoli should be that, when I try to think of it in a different way, it was actually quite – it almost made it taste nicer."

(Mother of Infant D)

Some were surprised or puzzled by one or more aspects of their experience with the **piece**:

"It's strange because, having not really picked up food – usually using a fork – the first thing is the texture."

(Mother of Infant G)

"You expect that bristly feeling [of the tip of the floret] to be on your tongue and it's not."

(Mother of Infant J)

"It's just a different part of the same food, which is interesting to find out."

(Mother of Infant E, on comparing the stalk and tip)

These comments pointed to a link, for these mothers, between their familiarity with food, their willingness to eat it and their subsequent experience of it.

Sense of agency

Some of the mothers commented that it felt strange to them to be fed by someone else, as happened with the **purée**:

“As an adult the act of being fed feels completely surreal.” (Mother of Infant G)

“[It] felt a bit odd being almost, you know, made to ‘Here you go – feel this’. Feels a bit odd, but then I s’pose for an adult used to feeding yourself it does feel a bit odd somebody else feeding you.” (Mother of Infant K)

There was an implication that an infant might not feel this way, although one mother clearly thought differently:

“It’s quite intimidating having a spoon coming towards me. [...] I imagine as a baby that’s going to be about ten times bigger and that’s probably quite threatening.” (Mother of Infant F)

There was a sense of not being in control while being fed by spoon, which in turn restricted the choice of whether or not to eat:

“It’s just not very pleasant being fed from a spoon really, ‘cause you’ve got no control over it. It’s like being force fed, isn’t it?” (Mother of Infant A)

“When it went in it almost felt like there was too much of it and I didn’t really want to clear the spoon. It was a bit too much. It felt like it there was too much going in my mouth.” (Mother of Infant C)

One mother suggested that being spoon fed limited her physical interaction with the food, thereby affecting her enjoyment of it:

“I’m a bit uncomfortable being fed. [...] The sensation is that it goes too fast for me. If I’m feeding myself it takes longer, whereas this is quite an instant [thing] because the only moment I’m in touch with the thing is the moment it goes into my mouth – and then it’s in my mouth, so it’s something different.” (Mother of Infant E)

This contrasted with the experience with the **piece**, which was characterised by positive control over whether or not to eat, and over the pace of the encounter:

“It is a little tree, which is nice. I can touch it. I quite like actually to take the time to study it.” (Mother of Infant E)

“Obviously, I had choice, so I’m engaging with it, so it’s not threatening at all because I either engage with it or I don’t. Whereas obviously the spoon is ...

[you] don't have much choice: you either don't or you ... yeah."

(Mother of Infant F)

There was also the suggestion that a slower eating pace might be beneficial in terms of appetite control and satiety awareness:

"It's good 'cause I know I can stop at any time. I'm not being force fed."

(Mother of Infant J)

"I guess it gives me time to decide whether I have had enough or not."

(Mother of Infant E)

The mothers' accounts thus pointed to differences between self-feeding and spoon feeding in terms of the subjective sense of their ability to exercise agency.

Insights offered

As well as the suggestions, described above, concerning the possible effect of puréeing on flavour, the mothers' comments revealed other insights and new knowledge they had gained as a result of participating in the study. These included specific information about broccoli and an awareness of the interaction of taste and texture, as well as a recognition of the novelty of solid food for an infant and a sense of disconnection from the food as being a feature of spoon feeding:

"I didn't realise broccoli was sweet."

(Mother of Infant E)

"It just makes me realise that taste is much more than just a taste – that the texture makes a difference to that as well."

(Mother of Infant H)

"I've never felt [cooked] broccoli before. [...] It's strange thinking about food differently for the first time because, obviously, broccoli's just broccoli – but to G it's something new."

(Mother of Infant G)

"Before [the spoon is put into my mouth], it's not touching me in any way because I'm not touching the spoon myself. So [contact with the food] is a matter of an instant, which is weird."

(Mother of Infant E)

These insights appeared to be valuable to the mothers themselves, as well as providing illumination of the infants' experience, as hoped for by the researcher.

3.2.2 Summary of the parents' experience of the food

The mothers offered a number of perspectives and insights prompted by their experience of eating the broccoli as a piece and as a purée, from which themes emerged relating to both the physical aspects of the experience and the meaning it held for them. The extra-oral features of appearance and texture affected the mothers' response to the food and their

wish to engage with it. The smell of the two formats was largely obscured by the general odour of broccoli present in the room in the aftermath of the Observation of the infant's first encounter with the food; nevertheless, some mothers detected a difference in the smell of the purée as compared with the piece.

Once inside the mouth, the features of the broccoli mentioned by the mothers were its texture and flavour, and the links between the two, together with the noise generated during eating, the behaviour of the food in the mouth and the oral motor actions required to deal with it. The mothers expressed preferences for one or other format and offered reflections based on their own prior experiences. These related to the 'realness' of the food and to the expectations they brought to the encounter. They also revealed surprises and insights resulting from the experience of eating the food in the two formats, including the discovery of aspects of the food or of eating of which they had not previously been aware, such as the different flavours and textures within a single broccoli floret, the interaction between flavour and texture, and the pleasure to be gained from chewing.

Control and agency were themes seen in the mothers' comments about the behaviour of the food inside their mouth, and the ease or otherwise with which they were able to manoeuvre it, but they also featured in their reflections on self-feeding as compared with being fed by spoon.

The mothers' view of the piece

Self-feeding provided an opportunity for the mothers to study the piece before taking it to their mouth. The varied colour and distinctive shape of the piece tended to make it more interesting to look at and the prospect of eating it more appealing. The texture as felt on the fingertips and the lips was a point of interest, with some mothers highlighting a difference in feel between the tip of the floret and the stalk. This textural difference was also experienced intra-orally, where it was accompanied by variations in taste between the two component parts.

The piece and the purée were noted to taste different from one another, although opinions were divided as to which had the stronger flavour. Overall, the piece was perceived as moist, and its flavour as being fresh and natural. The flavour was noted to vary between the stalk and tip, with the stalk perceived as sweeter and the tip more bitter. There was some recognition of the interplay between texture and taste, and of how the texture of the food affected the experience of its flavour.

Eating the piece required biting and chewing actions, which generated a variety of noises. Although requiring the food to spend more time in the mouth, this 'processing' was a source

of pleasure in that it that allowed the different aspects of texture, flavour and noise to be experienced, and provided a sense of engagement with the food.

The mothers' view of the purée

The mothers commented on the uniform and vivid colour of the purée but their accounts were notable for their lack of reference to its shape or extra-oral texture. None attempted to touch the purée with their fingers, or speculated on what it might feel like to do so, and none opted to touch it to their lips. Similarly, even though they had been told that the purpose of the research was to compare self-feeding with spoon feeding, rather than broccoli as a piece with broccoli as a purée, it is notable that their focus was mainly on the physical attributes of the food itself: Only one mother commented on the spoon, which she said must seem larger to the infant; none commented on the spoon's colour, texture or smell.

In terms of the intra-oral aspects of the experience, the purée was commonly perceived as dry – even though, if anything, it contained slightly more water than the piece. Both the texture and the flavour were noted to be uniform throughout, with the flavour not being an exact match for that of either the stalk or the tip of the floret. One mother found that the expectation of flavour generated by the smell of the purée was not consistent with the reality of that flavour. There was some speculation about how puréeing a food might alter flavour, thereby making food more or less appealing. None of the mothers commented on the feel of the spoon inside their mouth.

Both the appearance and the flavour of the purée contributed to a sense, based on the mothers' previous experiences, that puréed broccoli was not 'right'. These attributes suggested something manufactured rather than natural, such that the purée lacked appeal for them. However, some mothers acknowledged that their prior experience had given rise to expectations that affected their perception of the food and that they were able to feel differently about it if they set those aside.

When it came to the actions required to eat the food there was a sense that the purée, while requiring less effort to process than the piece, was not necessarily easier to move around inside the mouth. Chewing was found to be an ineffective action for this purpose and the movements required to gather the purée for swallowing were experienced as less rewarding. The 'mouth time' of the purée was perceived differently according to whether it was liked or not: on the one hand mothers reported that it was gone from the mouth too quickly to be enjoyed and on the other that it was difficult to get rid of – either by swallowing or by spitting out.

Being fed by someone else was highlighted as a strange experience for an adult, although it was not clear whether this was intended to mean it would not be so for an infant. There was

a recognition that the person being fed lacked control over the interaction and was to some extent compelled to eat, and to do so faster than she might have wished. There was a suggestion that this might not allow satiety to be recognised promptly.

Contribution of the parents' accounts to the research

It was clear that the mothers each brought their unique prior experience to the situation and that they were therefore not approaching it identically, nor as their individual infants had done. Nevertheless, the data they provided fulfilled the aim of offering a perspective on the infants' experiences during their first encounter with solid food that was different from her own. Of particular note were, firstly, the variety offered by the piece, in terms of appearance, texture, flavour and the nature and effects of the oral motor activity required to eat it, as contrasted with the relative uniformity and paucity of interaction offered by the purée; secondly the relationship between the consistency of the purée and eating enjoyment; thirdly, the sense of control – or lack thereof – in relation to both the feeding and the behaviour of the food once inside the mouth. These provided food for thought to take into the analysis and discussion of the Observations of the infants' first encounter with solid food.

3.3 Examining the infants' behaviour and the parents' behaviour

Objective (ii) was *to examine infants' behaviour in response to being presented, for the first time, with a piece of food, versus being offered the same food puréed on a spoon*. Objective (iii) was *to examine parents' behaviour according to whether they present their infant with his or her first solid food as a piece, or puréed on a spoon*. Data contributing to meeting both these objectives were derived from the Observations of the infants' first encounter with food and Interviews #2, the parent's review of their infant's first encounter with food.

3.3.1 The Observation of the infant's first encounter with food

The raw data relating to each Observation comprised the audio/video-recording and accompanying field notes, together with some of the data from Interview #2, the parent's review of the infant's first encounter with food. The overall analytical approach taken was inductive, in that the starting point was the data themselves, and it proceeded along qualitative lines, albeit with an element of quantification. The observed behaviour of both the infant and the mother were analysed in the same manner.

As shown in Figure 2.2 (p.123), the analysis began with the viewing of each Observation in its entirety, followed by a 'zooming in' to examine the minutiae of the infant's encounter with the food from various perspectives. This was followed by a 'zooming out' to consider the data thereby uncovered in the context of the wider picture, and the whole in light of the

detail. Some key themes emerged, three of which were then subjected to a further quantitative analysis. Stages 1 to 4 of the analysis are now described in detail.

Stage 1: Gaining a sense of the whole – initial impressions and creation of narratives

Within 24 hours of the Observation, in order to maximise memory of the 'live' event, the audio/video-recording was transferred from the camcorder's memory card to the researcher's computer and copied into the NVivo file. It was then played back several times in its entirety, at normal speed, to gain an overview of the unfolding action and to allow a sense of the gross patterns of behaviour and interaction to emerge (Bakeman and Gottman, 1997). Following this, a detailed written narrative was created of the Observation, using the stop, start, pause and rewind facilities of the computer's media programme, to enable the minutiae of the observed behaviours to be identified. This allowed the researcher to 'get into' the data and gain a sense of 'what was going on' (Richards and Morse, 2007). Field notes made immediately following the Observation were used to augment the narrative with information not evident from the recording itself. For example, "the infant looks towards the door" became "the infant looks at the cat, which has just come into the room through the door".

Incorporating data from Interview #2

The data from Interview #2, the parent's review of the infant's first encounter with food, were subjected to a two-phase analysis, the first phase of which formed part of Stage 1 of the analysis of the Observation. The purpose of this phase was to gain clarification and confirmation that the researcher's interpretation of the audio/video-recording was an accurate reflection of what had taken place. Within 24 hours of completion of the Interview, the audio-recording was replayed simultaneously with the audio/video-recording of the infant during the Observation. The soundtrack of the infant's recording was muted to enable the Interview to be heard.

The Interview data reflected the mothers' interpretation of what they saw their infant doing:

"Opened her mouth straight away, didn't she, for it?" (Mother of Infant J)

"It went straight in her mouth." (Mother of Infant C)

"She's licking the top of it." (Mother of Infant D)

"He's still actually munching before he's put the broccoli in."
(Mother of Infant B)

"He was definitely grabbing it and turning his head away from it."
(Mother of Infant F)

"She's watching the bits that she's dropped on the table." (Mother of Infant K)

"Now she's distracted with something out the window." (Mother of Infant D)

"She's not looking at me – no eye contact. She's looking at the spoon. Sort of fidgeting and turning to the side." (Mother of Infant H)

The data also reflected what the mothers felt their infant was conveying through his or her behaviour:

"She's saying, 'I don't want it in my mouth.'" (Mother of Infant H)

"He's probably a bit tired now." (Mother of Infant E)

"She's making some excited noises." (Mother of Infant H)

"Oh, what's that? Am I allowed to pick this up, Mum?" (Mother of Infant J)

"That must be the juices hitting, 'cause she's chomped down on it now, and she's looking like, 'Oh, that's a bit different.'" (Mother of Infant K)

"She's looking a little bit unsure to start with, like, 'I've never tasted this before.'" (Mother of Infant A)

"That was a face saying, 'I'm not sure about this.'" (Mother of Infant G)

Additionally, the mothers described and explained their own actions:

"I'm pulling the spoon up to try and get it into her mouth, because she's not taking it off the spoon and I don't know how to get it in. So I'm sort of trying to wipe it on top of her teeth or top gum." (Mother of Infant H)

"She's not really opening her mouth up at all – I'm having to coax it in!" (Mother of Infant D)

Where necessary, the researcher was able to ask direct questions, for example:

Researcher: *"Are you holding his arm there?"*

Mother of Infant F: *"No – I think I was pushing the towel back in, wasn't I, because just then he'd thrust his hips up. Yeah, he's come back again – yeah."*

The interview data thus provided clarification of actions, sounds or facial expressions whose nature or meaning was not immediately clear to the researcher, permitting correction or confirmation of her initial interpretation. Accordingly, during the simultaneous playback the written narrative was augmented or amended, so that it constituted as complete a description as possible of the Observation. The final narrative in each case constituted a 'thick description', which served to *"show the different and complex facets"* of the encounter

(Holliday, 2002, p.78). The creation of a thick description is also a useful way of bringing the event alive for the reader (Ponterotto, 2006) and it is with this in mind that two excerpts from these narratives are presented as 'vignettes' (Grbich, 2007) in Appendix XII. Following this, the audio recordings were set aside, to be revisited following Stage 4 of the analysis of the Observations, as described in Section 3.3.4, below. They were deliberately not transcribed during this first phase in order to minimise familiarity with the mothers' interpretations and speculations, thereby reducing the risk of the micro-analysis being influenced by them.

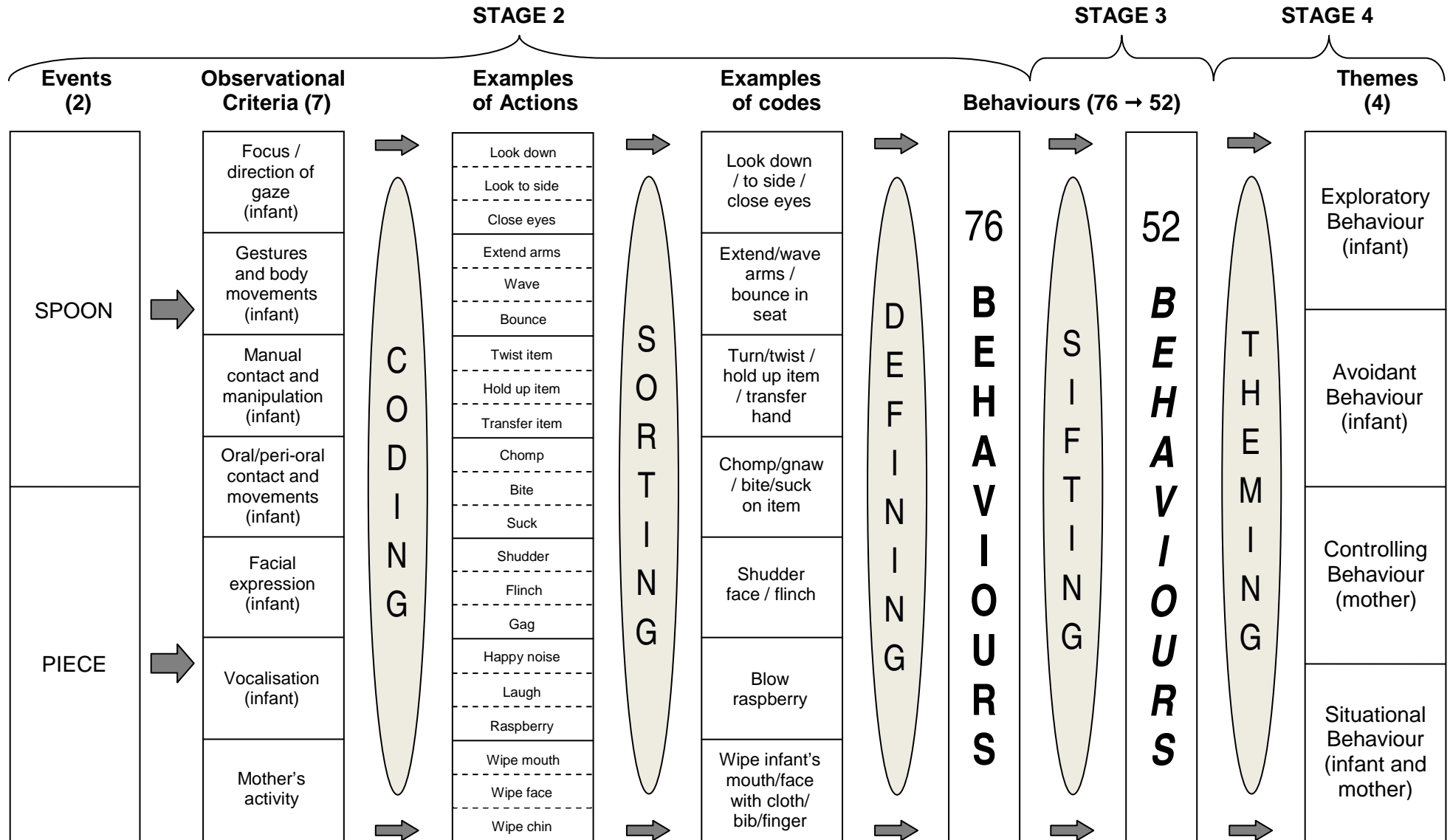
Stage 2: Zooming in to the data – micro-level coding

Stages 2 and 3 of the analysis were to a certain extent cyclical, with repeated zooming in to focus on the detail of the Observation, followed by zooming out to regain a sense of the overall context. The intention behind focusing on the detail was to 'fracture' the data (Richards and Morse, 2007), that is to reduce it to its smallest component parts, as a means of minimising the inevitable bias that a researcher brings to an enquiry (Spradley, 1980; Charmaz, 2008) and of ensuring that no potentially important elements were overlooked. Accordingly, Stage 2 deliberately employed a more positivist, quantitative approach, in that the search was for reality and actuality, as far as possible, rather than for meaning (Punch, 2005). At the same time, however, the focus was always on the data themselves, with as far as possible no *a priori* expectations about what would be seen and with repeated excursions outside the detail to view it as part of the whole. In this way the overall approach remained inductive (Grbich, 2007). Figure 3.1 (p.151) illustrates the steps involved in Stages 2, 3 and 4 of the analysis of the observation data. These are now explained in detail.

Identification of events

The basis of the analysis was event sampling, as described by Bakeman and Gottman (1997). This involves selecting a portion of data according to its content rather than, as in time sampling, by its duration. The 'event' to be studied is identified by the researcher; it is 'something that happens'. The definition of this 'something' allows it to be discernible, usually by its beginning and end, within the data from each participant, whether or not it lasts for the same length of time in each case. Two **events** constituted the data for each infant: his or her encounter with the broccoli as a floret, or piece – the 'piece' event – and that with the puréed broccoli offered by spoon – the 'spoon' event. The length of the piece event ranged from 3 minutes 10.4 seconds to 4 minutes 43.2 seconds, with the average being 4 minutes 8.7 seconds. The spoon event varied between 1 minute 39.3 seconds and 4 minutes 45.6 seconds, with an average of 3 minutes 22.3 seconds. Three of the spoon events were terminated prematurely because the infant either indicated increasingly clearly, by actions such as turning the head and pushing the spoon away, that he or she did not wish to engage with the spoon/purée, or became visibly distressed.

Figure 3.1 Steps in sorting and grouping the Observational data, by stage of the analysis



Adoption of observational criteria

The decision not to use a pre-designed tool reflected the phenomenological framework of the study, in that, *“phenomenologists do not prejudice the freshness and ‘whole cloth’ of lived experience by deciding understanding in advance using preconceived categories”* (Danaher and Briod, 2005, p.219). In addition, Spradley (1980) has pointed out that what we see depends to a large extent on what we look for, meaning that a pre-designed tool has the potential to limit what is noticed. However, it quickly became clear that working inductively without any structure at all meant that it was easy to miss small gestures and fleeting expressions, especially when several things were happening at once.

The initial overview of the audio/video-recording for Infant A showed that both infant and mother performed a multitude of different activities, of varying duration, many of which co-occurred or overlapped, and the isolation of individual movements from the ‘noise’ of the general jumble of activity could therefore not be guaranteed. The first challenge, therefore, was to unpick this complexity. In order to gain the maximum amount of information, and to reduce the researcher’s potential disregard for certain actions in favour of others that were more prominent or had been anticipated, a pragmatic solution was adopted. This involved viewing the recording several times from beginning to end using a series of **observational criteria** devised by the researcher. This allowed her to focus on just one aspect of the overall activity at a time, thereby making the identification of more subtle or fleeting movements easier and more comprehensive.

Table 3.2 Observational criteria used in the analysis of the audio/video-recordings

Observational criterion	Activity encompassed
Focus / direction of gaze (infant)	The apparent focus of the infant’s gaze as suggested by the direction of his or her vision
Gestures and body movements (infant)	Movements of the infant’s head, arms and/or hands, and/or larger movements involving the whole body
Manual contact and manipulation (infant)	Manual contact with, and/or manipulation of, the spoon/purée or piece by the infant
Oral/peri-oral contact and movements (infant)	Contact of the food with the infant’s mouth or the area of the face around the mouth, or movements of the infant’s mouth (other than for vocalisation)
Facial expression (infant)	The expression visible on the infant’s face
Vocalisation (infant)	Vocalisation by the infant, as audible within the audio/video-recording
Mother’s activity	Actions of the mother, as visible in the audio/video-recording

Table 3.2 shows the seven observational criteria created to assist with the analysis of the Observations. The first six relate to the infant and the seventh concerns the mother. It will be seen that, for the infant, the criteria incorporated facial expressions and vocal sounds as well as gross and fine movements. However, the decision to use a single video camera, with only a very basic integral audio recording facility meant that, for the most part, the actions of the mother were neither visible nor clearly audible. As a result, only her active physical intervention in the feeding process was able to be scrutinised, while any other interactions, such as encouraging comments or facial expressions, were not. No attempt was therefore made to document or analyse the mother's activity except where her hand or arm was involved and visible.

Identification of actions by codes

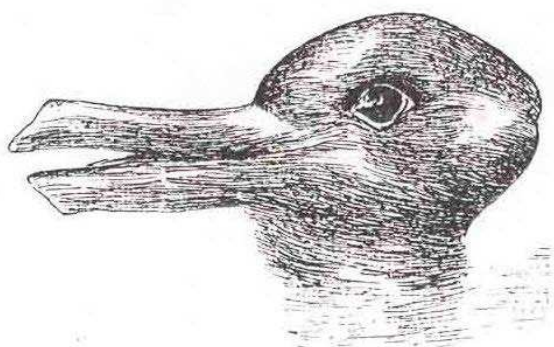
An **action** was defined as the smallest unit of observable activity, whether gross or fine movement, vocalisation or facial expression, displayed by the infant or the mother. These units needed to be identified in a way that would make them manageable (Bryman, 2012). This was achieved through the application of **codes**. This enabled the raw data to be translated into individual items of secondary data that could then be compared quantitatively (Richards and Morse, 2007). Codes were devised intuitively by the researcher; however, unlike the thematic codes applied to Interviews #1, the codes used in the analysis of the Observations were descriptive, and related only to what the researcher saw.

Bryman (2012) maintains that it is important, when coding raw material, to ensure that each dimension is discrete and that the overall scheme is exhaustive. Accordingly, to begin with, each new action was assigned a unique code, such as 'Pleasure face' or 'Turn head'. This code was then applied to all repetitions of the same action. Whenever a potentially new action was identified it was checked against existing codes to see whether it fitted that description. If the fit was not good, a new code was created. The same word, 'item', was used to denote either the piece or the spoon/purée so that the same set of codes could be applied to both events, with the events themselves being distinguished by two unique overarching codes. Care was taken to describe the actions in objective terms, rather than in terms that would imply meaning, in order to force the setting aside, as far as possible, of the researcher's own preconceptions. Thus, an action initially identified as 'Reach towards food' was, on reflection, renamed (temporarily, at least) 'Extend hand/arm towards item' – a term more descriptive in nature and less suggestive of intention.

Analysis began with the Observation of Infant A and proceeded via repeated viewing of the audio/video-recording, using each of the observational criteria in turn, until no 'new' actions were seen. The Observation of Infant B was then treated in the same way, with any actions

not previously identified being added to those noted in relation to Infant A. The recording of Infant A was then re-examined to look for these additional actions, with the expectation that they may be present but have been overlooked. This process of constant comparison was then applied to subsequent Observations. The analysis continued in this manner until three successive Observations had revealed no new actions, signalling that saturation had been achieved (Flick, 2009). This point, which coincided with what Richards and Morse (2007) describe as the sense, from the researcher's point of view, that she has 'seen it all', was reached, in retrospect, after the seventh Observation, with those of the eighth, ninth and tenth mother-infant pairs producing only actions that had been identified within the first seven. Recruitment was consequently terminated after the tenth infant.

Each successive viewing sought to identify actions *not* already noted, through attempting to ignore anything seen previously, thereby allowing new actions to come to the fore. This process was reminiscent of the way one adjusts one's perception of the image below, in order to see either a duck or a rabbit, both of which are there, but only one of which can be seen at any one time.



Duck/rabbit image, attributed variously to Ludwig Wittgenstein (1889-1951) and Joseph Jastrow (1863-1944)

The pilot study had shown that, since the infants had little or no prior experience of spoons, and since the purée was only ever offered on a spoon, it was not possible to determine in each case whether the infant was responding to the spoon itself or to the puréed food on it – nor even whether he or she saw the two as separate entities. Indeed, since the broccoli floret and the spoon-purée combination were equally unfamiliar, with both being of a non-uniform appearance and able to be 'taken apart', it was quite possible the infants viewed them both in the same light. It was therefore decided to make no attempt to differentiate between their responses to the spoon and to the purée, except when the purée alone was in the infant's mouth.

The programme used for the analysis, NVivo 9, allowed the audio/video-recordings to be played at 50%, 60%, 70%, 80% and 90% of full speed, and to be moved forwards and backwards by tenths of a second. This enabled the start and end times of the various

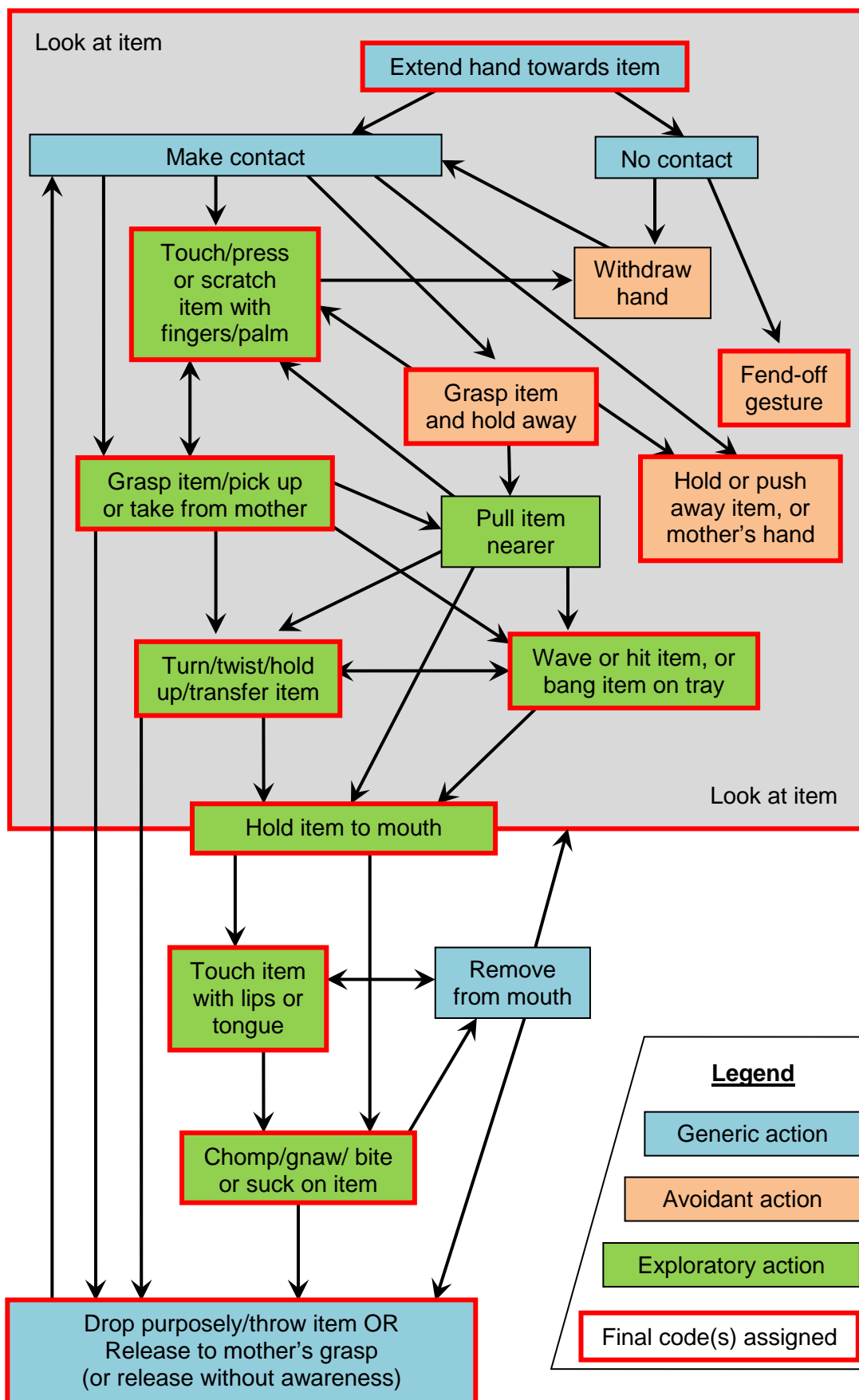
actions to be logged and instances lasting as little as 0.5 second to be identified. As the researcher experimented with the best way to capture the information, it became apparent that vocalisations were distorted at anything less than full speed, and that certain movements, such as chewing, were similarly difficult to identify correctly at slower speeds. Repeated viewing of small segments of the recording at different speeds ensured that all the actions were identified as accurately as possible, while rigorous adherence to the use of the observational criteria enabled the researcher to maintain an objective focus on describing only what she saw. As far as possible, what Flick refers to as a state of “*evenly suspended attention*” (Flick, 2009, p.91) was maintained throughout, in order to reduce the risk that unexpected data, or their possible significance, would be overlooked.

Refinement and sorting of codes

Comparisons were repeatedly made between the actions identified by the various codes, both within each recording and across the Observations, for each of the seven observational criteria. On several occasions, one or more actions were identified as being variants of one another, or as forming part of a small group of actions that appeared to be interchangeable. This prompted the amalgamation in each case of two or more codes, so that a single code could be applied to all the variants. For example, waving the item, hitting it with the hand, and banging it on the tray appeared to form a discrete series of actions that was distinct from turning or twisting the item by moving the wrist, holding it up, and transferring it to the other hand, which together formed a separate series. The former were assigned the code ‘Wave or hit item, or bang item on tray’ and the latter ‘Turn, twist or hold up item, or transfer hand’. Conversely, actions that had previously been assigned the same code were sometimes found to contain subtle context-based differences. In these instances, two or more codes were created from a single code. The most complex example of this process was the unpicking of what was originally identified as a single action and assigned the code ‘Reach and grasp item’.

Figure 3.2 (p.156) shows the variety of actions that were identified as comprising or following on from the seemingly simple concept of ‘Reach and grasp item’, together with the wording of the codes eventually used to identify them. The colour coding reflects that used to denote *exploratory* and *avoidant behaviours*, as defined later in this thesis. Progressively closer examination of the data relating to this group of actions revealed that the infant’s extending the hand towards either the piece of food or the spoon/purée did not necessarily mean that he or she was intending to grasp it. At times this action resulted in an open-handed gesture that appeared to be an attempt to ‘fend off’ the item, or in an active pushing away. At other times the infant appeared to change his or her mind and withdraw the hand, or chose to touch the item lightly with fingers or palm rather than grasp it. Even when the item was grasped, this was not necessarily followed by its being pulled nearer; sometimes it

Figure 3.2 Expansion of action initially coded as 'Reach and grasp item'



was held away from the infant's body. Once grasped and pulled towards the infant, the item might be subjected to investigative manipulation, such as twisting or banging, or it might be taken directly to the mouth, where it could be touched with the lips or tongue and/or gnawed, bitten or sucked. The infants tended to look at the item until they brought it to their mouth, when visual inspection became impossible. Sometimes the item was deliberately removed from the mouth, apparently so that it could be looked at once more; at other times it was dropped or thrown, either purposefully or accidentally, or released into the mother's hand.

This detailed analysis of what was at first presumed to be a single action gave an early indication that gestures that appeared similar might in fact have different intentions behind them. It also showed that the researcher's decision to strive to avoid assigning intent or meaning to the actions of infants and mothers during the coding stage of the analysis, on the basis that these had the potential to lead premature conclusions about what was happening, was sound, and that intentionality would, in any case, reveal itself once the minutiae of the actions were viewed in the context of the whole.

Bakeman and Gottman (1997) point out that there is a danger in submitting video-recordings, which are necessarily detailed, to this type of in-depth scrutiny, in that the wealth of material it is possible to create can be overwhelming in terms of the possibilities for analysis that it presents:

“For any child, mother-infant pair, couple, animal or group one might want to study, there are an infinite number of behaviors that could be coded [...] many investigators [...] seem tempted to include more and more separate codes, and make ever finer distinctions, simply because it is possible [...].”

(Bakeman and Gottman, 1997, p.16)

Similarly, they maintain that rigorous application of an overly detailed coding scheme, in the hope of removing the need for the observer to make any judgements about intentionality, can hamper the study of what might otherwise turn out to be very interesting behaviour. They argue that in some cases a broader, 'socially-based' scheme is more meaningful. With this in mind, refinement of the coding included adjustments made to accommodate differences between the infants that were not the focus of the research. For example, the grouping, under a single code called 'Look at tray/bib/clothes/ harness', of actions involving the infant looking at various items of his or her clothing reflected the fact that the infants were not dressed identically, nor seated in the same type of chair. The point of interest lay in the fact that they were either distracted from the food or choosing to look elsewhere in their immediate environment, rather than in the relative attributes of that environment. There was thus considered to be an equivalence between the tray and the infant's bib, clothes or harness that did not exist between, say, the tray and the mother, such that the former group

could be considered a single entity. It was similarly decided that there would be no advantage in attempting to micro-analyse the infants' facial expressions in the manner of research such as that of Fogel *et al* (2000) and Messinger *et al* (2001), which examined infants' smiles and categorised them into various types. To do so would have added a level of complexity that may have obscured the aim of the research, which was to gain an overall picture of the differences and similarities between spoon feeding and self-feeding.

Decisions about the allocation of codes, the creation of new codes and the amalgamation of existing codes were made throughout the coding process. Some of these decisions were straightforward while others were revised many times. This back and forth process of constant comparison, in which the data and codes are visited and revisited until all potential groupings and differentiation have been exhausted, and in which the analysis becomes progressively more detailed, is typical of qualitative research (Silverman, 2010). It is described by Bryman as a “*constant of potential revision and fluidity*” (Bryman, 2001, p.392) and by Papatheodorou and colleagues as the need “*to keep things in a state of flux*” (Papatheodorou *et al* 2011, p.116).

Dealing with coding gaps and conflicts

As the analysis unfolded and the tally of codes fluctuated, the researcher made a point of zooming out occasionally, to view each Observation as a whole and regain a sense of the integration of the emerging behaviours. In the latter stages of the analysis, this had the additional benefit of revealing coding discrepancies in the form of gaps, overlaps and conflicts. An aid to identifying such discrepancies was the visual mapping available within the NVivo programme.

Figure 3.3 Example of NVivo screen

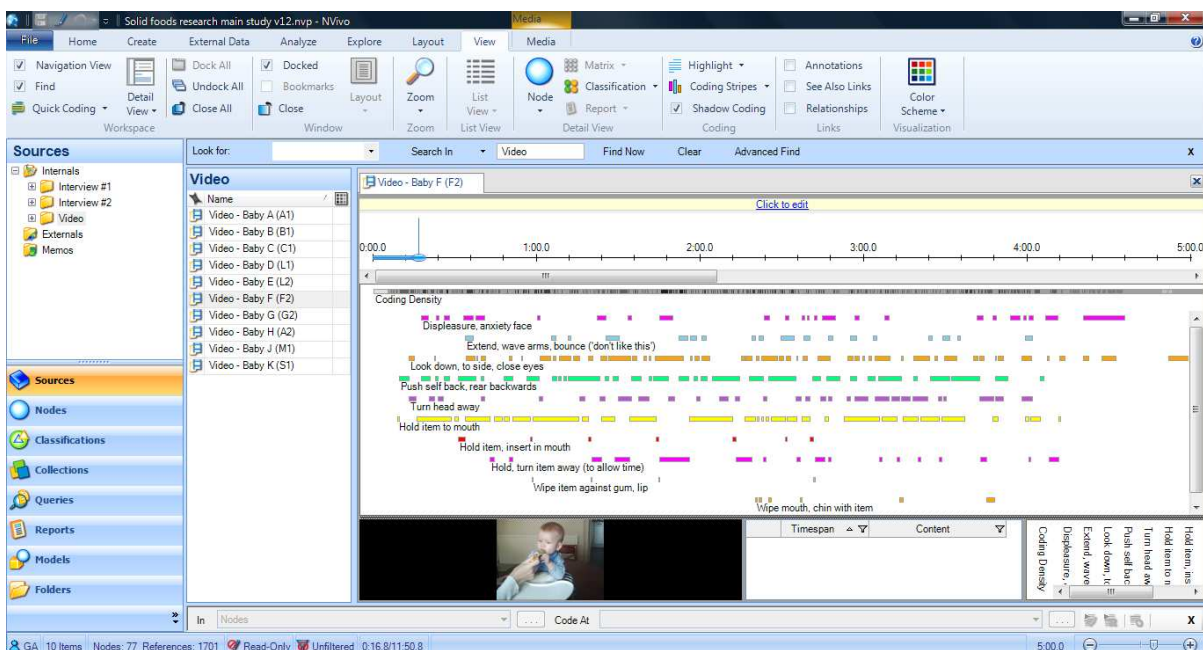


Figure 3.3 shows an example of work in progress on a five-minute section of a recorded Observation. The coloured stripes visible in the central area of the screen provide a visual map of the individual codes so far applied to this section of the recording. This view allowed multiply coded segments to be identified and provided an additional means (along with playing back of the recording) of identifying repeated sequences of behaviours.

As the majority of each recording became progressively multiply coded, some sections were found to lack coding for one or more of the observational criteria. Reviewing these gaps confirmed that each infant and mother did indeed display occasional brief periods of inactivity. It also exposed actions that were present but had been missed by the researcher. In particular, it was noted that the infant's visual focus must necessarily always be on something, unless his or her eyes were closed, and therefore that no gaps were possible within the observational criterion *focus/direction of gaze*. This realisation prompted the creation of the code 'Look miscellaneous', for use when the infant's focus could not be determined. Meticulous application of this code not only identified and dealt with gaps in the coding for this criterion but forced a detailed scrutiny of the whole recording, as an additional means of identifying and eliminating gaps within the other six criteria.

Repeated scrutiny of the recordings also revealed coding conflicts, where codes had been misapplied, as well as areas of overlap between coded sections. For example the applied codes sometimes indicated that an infant was simultaneously displaying two incompatible actions, such as holding the food to his or her mouth while also pushing it away. Such conflicts were resolved through meticulous stopping and starting of the recording, and playback at slow speed, to ensure accurate documentation of what appeared to be taking place. This level of attention to detail was important not only to eliminate gaps and errors but also to ensure the internal validity of the quantitative element of the analysis.

Checking reliability of the coding scheme

The list of codes assigned to actions and groups of actions comprised the coding scheme. Because of the bespoke nature of this scheme and its development by a single researcher, its reliability could not be assumed. Accordingly, a colleague of the researcher, who was aware of the aim of the research but who had not been party to the analysis, was asked to watch segments of the accumulated audio/video footage and to identify actions occurring within those segments, according to the coding scheme. The results were then compared with those achieved by the researcher. This test of reliability was carried out once the researcher's coding had been completed, on the understanding that the scheme would be refined and re-applied to the data if it was found that the colleague's use of it produced different results from those already obtained.

Evaluation of a 5% sample of the total data, selected at random, was considered feasible for the test, given one day of the colleague's time. Fifteen seconds was chosen as the length of the segments of audio/video-recording to be used. This was deemed long enough for individual actions to be seen in context while being short enough to produce a large number of segments, so providing a reasonable chance that the sample selected would include data from the majority of the infants and offer a representative snapshot of the full range of actions that characterised the Observations.

The audio/video-recordings were divided into 288 fifteen-second segments, with 20 shorter segments left over – one at the end of each event for each infant, ranging in length from 0.6 seconds to 14.8 seconds. Taking a pragmatic approach, in which a decision would be made about how to manage these shorter segments if they were randomly selected, each segment, of any length, was assigned a number: 308 in all. Fifteen numbers within the range 0-308 were then randomly generated, using appropriate computer software, and the segments corresponding to these numbers became the sample to be tested. Two of the 'leftover' segments were selected by this process, one 14.8 seconds in length and the other 11.5 seconds. The decision was made to include both in the sample since, at over ten seconds, they were likely to be of usable length; no apparent problems resulted. The researcher's colleague was asked to familiarise herself with the coding scheme and was then trained in its application, using segments of the recordings that did not form part of the randomly selected sample. She was then asked to note the occurrence of each action within each segment selected for the test, and to identify any actions that she was unable to assign to a code.

Certain codes were excluded from the test, for a variety of reasons: Any code relating to an action of which either the tail end was seen only at the beginning of the segment or the initiation only at the end was excluded, since such actions could not be identified accurately. The colleague was asked to ignore the code 'Look miscellaneous', since this was a device used by the researcher to ensure full and accurate coding rather than representing a purposeful action. Vocalisations by the infant did not form part of the reliability test, either, because most were not audible without headphones, which were not available on the day of the test. Allowing for these exclusions, agreement between the colleague and the researcher was of the order of 73% initially, rising to 80% following debriefing of areas of confusion – a result considered acceptable. Following the test, minor amendments were made to the coding scheme, so that actions to be included and excluded under each code were more clearly defined. No actions were identified that did not fit the coding scheme once amended. The finalised coding scheme can be found at Appendix III. The final tally of codes was 76. These codes were assigned a total of 5,479 times across all the Observations.

Table 3.3 The 76 behaviours, grouped by observational criteria, showing behaviours discarded and theming of the remaining 52

Focus / direction of gaze (infant)	Manual contact and manipulation (infant)	Oral/peri-oral contact & movements (infant)	Mother's activity
Look down / to the side or close eyes	Grasp item – pick up or take from mother	Hold item to mouth	Hold item to infant's mouth
Look at crumbs / smears on tray	Touch/press/scratch item with fingers/palm	Touch item with lips/tongue	Jiggle item against infant's lips
Look at mother's body / movements	Turn/twist / hold up item, or transfer hand	Chomp / gnaw / bite / suck on item	Hold item, insert in infant's mouth
Look at researcher	Wave / hit item or bang item on tray	Hold mouth open around item	Wipe item against top lip/gum
Look at item	Poke at / push / pick up crumbs/smears	Pout / push against item with lips	Insert item in infant's hand
Look at tray / bib / clothes / harness	Grasp item and hold away	Protrude tongue (no contact with item)	Touch infant's hand or item in infant's hand
Look at mother's face	Hold/push away item / mother's hand	Possible purposeful sniff	Hold / turn away item (to allow time)
Look at other	Simple hold (in control, attention elsewhere)	Chewing movements / lip-smacking (mouth empty)	Take item from infant, or hold out of reach
Look up (to high point or 'into space')	Hold item passively, mother controls	Chewing / munching (food in mouth)	Restrain infant's arm
Look miscellaneous	Drop purposely / throw item	Unstick/eject movement	Use item to move food on tray
	Release item to mother's grasp	Gag / cough	Wipe infant's mouth/chin with item
	Two-handed reach/touch	Open mouth (anticipation/reflex)	Wipe infant's mouth/face with cloth/bib/finger
	Manipulate bib / clothes / harness	Suck/gnaw on fingers/hand	Wipe infant's clothes/hands with cloth/bib/finger
		Suck/gnaw on bib / clothes / harness	Retrieve dropped/out-of-reach item
			Hold passively, infant controls
			Rest hand on tray/arm of infant's chair
			Hold item, offer hand
			Reach towards item, then withdraw hand
			Straighten/adjust infant's clothes/bib
			Touch infant to comfort

Gestures and body movements (infant)	Vocalisation (infant)	Facial expression (infant)
Turn head away from item	Distress noise	Displeasure/anxiety face
Extend/wave arms / bounce in seat	Audible lip-smacking	'Shudder face' / flinch
Push self back/up / arch back / rear backwards	Blow 'raspberry'	Pleasure face
Fend-off gesture	Murmur, conversational	
Fold-in gesture	Sigh	
Lean head towards item	Miscellaneous vocalisation	
Extend hand towards item		
Reach towards mother		
Wave / bang empty hand/bib on tray		
Yawn / rub eyes		

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Legend: Exploratory behaviours Avoidant behaviours Controlling behaviours Situational behaviours Discarded behaviours

Definition of behaviours and quantitative analysis

Once coding was complete, and for the purposes of reporting the findings and of discussion, each action or group of actions assigned to a single code was defined as a **behaviour**.

Table 3.3 (p.163) lists the 76 behaviours identified at the end of Stage 2 of the analysis of the Observations. Fifty-six behaviours were displayed by the infant and 20 by the mother. Colour-coding shows which behaviours were discarded during Stage 3 of the analysis (see below), and how the remaining 52 were organised by theme (Stage 4).

Figures for both the incidence and the duration of all the behaviours were transferred to a series of Excel spreadsheets. In total, 20 events had been analysed, two for each of the ten infants. In order to overcome the difficulty presented by the fact that the events were not of a uniform length, the percentage duration of each behaviour during each event was calculated, thereby allowing meaningful comparisons to be made between the infants and permitting calculation of the combined duration of any one behaviour by all the infants.

Table 3.4 Quantitative analysis – Infant E

Event →	PIECE			SPOON		
↓ Behaviour	Incidence	Duration (secs)	Duration as % of total event (256.2secs)	Incidence	Duration (secs)	Duration as % of total event (247.2secs)
Grasp item – pick up or take from mother	13	12.7	5.0	3	3.6	1.5
Touch/press/scratch item with fingers/palm	15	61.0	23.8	16	74.9	30.3
Turn / twist / hold up item, or transfer hand	15	71.4	27.9	5	22.8	9.2
Wave/hit item or bang item on tray	12	26.9	10.5	3	10.4	4.2
Poke at / push / pick up crumbs/smears	6	22.8	8.9	3	9.7	3.9
Grasp item and hold away	2	2.6	1.0	1	0.8	0.3
Hold / push away item / mother's hand	1	3.0	1.2	1	2.6	1.1
Simple hold (in control, attention elsewhere)	5	18.3	7.1	1	4.2	1.7
Hold item passively, mother controls	0	0.0	0.0	1	5.3	2.1
Drop purposely / throw item	2	2.1	0.8	0	0.0	0.0
Release item to mother's grasp	0	0.0	0.0	1	0.8	0.3
Two-handed reach/touch	12	66.0	25.8	16	106.0	42.9
Manipulate bib/clothes/harness	1	1.4	0.5	1	4.1	1.7

Table 3.4 shows an excerpt from the Excel calculations relating to Infant E, for whom the piece event lasted 4 minutes 16.2 seconds and the spoon event 4 minutes 7.2 seconds. This illustrates how the percentage duration of each behaviour in each event was calculated. These data were combined with similar data from the other nine infants to enable totals to be produced for all the infants. This allowed the data to be viewed in the broader context of each and all the Observations, so that they could inform the qualitative analysis. In addition, totals were calculated for the infants who were offered the piece first (piece-first infants, or PFIs) and those who were offered the spoon first (SFIs), in case analysing the data in this way might reveal additional findings of interest.

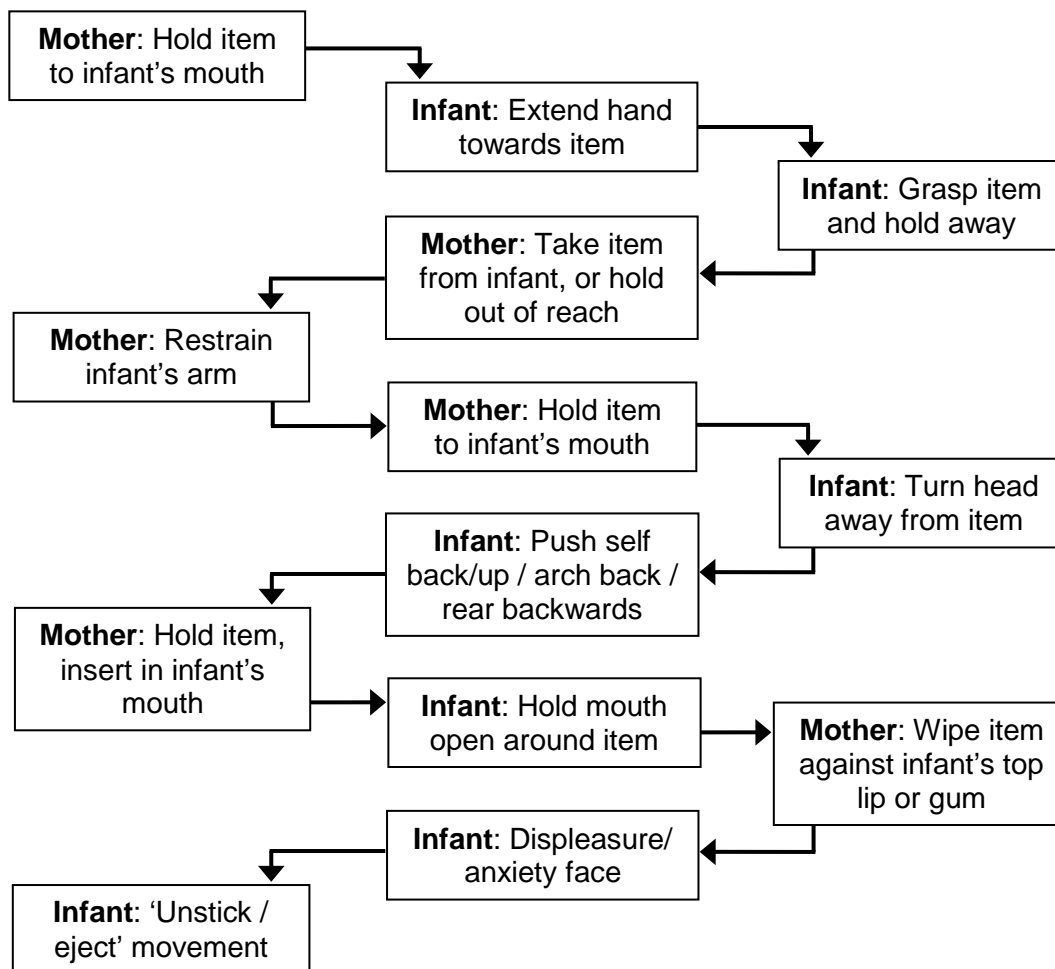
The combined numerical data were scrutinised for any marked differences between the piece event and the spoon event, and between the first and second event. Because of the interpretive nature of the study and the small number of participants, no attempt was made to apply analytical techniques capable of showing statistical significance. Instead, an approximate doubling or more in the incidence or duration of a behaviour in one event as compared with the other was taken as evidence of a difference warranting attention. The use of the word 'significant' in relation to differences in the prevalence of behaviours in the reporting of the study refers to this level of variation.

Stage 3: Zooming out – regaining the wider view

Following completion of the micro-level coding, the Observations were reviewed again as a whole – both that of each mother-infant pair and all ten as a group – in order to regain a wider perspective on the data. Following this, the visual mapping of the coding applied to each Observation, as illustrated in Figure 3.3 (p.158), was used to help identify co-occurring and sequential behaviours and to confirm or refute the 'gut feelings' of the researcher concerning which behaviours appeared to coincide with one another. This enabled the beginning of the identification of repeated patterns and sequences within the data.

Figure 3.4 (p.164) provides an example of a sequence of behaviours seen in the spoon event. Sequences similar to this were common to most of the infants. For simplicity, this Figure presents the behaviours as consecutive occurrences; however, there was commonly overlap between the cessation of one behaviour and the onset of the next, with some combinations continuing concurrently for several seconds. The 'item' referred to in this example is the spoon/purée.

Figure 3.4 Example sequence of behaviours seen in the spoon event



Sifting of the behaviours: 76 to 52

The emergence of patterns of sequential and co-occurring behaviours prompted consideration of the possible triggers for those behaviours and the purpose behind them. This, in turn, led to a search for commonality of response and apparent intent. As a result, a number of behaviours were revealed that appeared not to be consistently linked to other behaviours, such that inferences could not be drawn as to a consistent cause or intention behind them. Some seemed to be the result of idiosyncratic situations or events unique to an individual infant. Others were seen only, or predominantly, during whichever event happened to occur first or second, suggesting tiredness or boredom as a possible cause. Yet others were simply hard to distinguish with any confidence, for example because of limitations in the audio element of the recordings. Consideration of the apparent intentional nature of the behaviours was then combined with the results of the quantitative analysis in order to identify those behaviours that appeared relevant to the research question. This sifting process produced 24 behaviours that, having been considered from all angles, were deemed not to be of value. These were discarded and played no further part in the analysis.

Table 3.5 Discarded behaviours, with reasons

Behaviour	Reason(s) for discarding
Look at item	Accompanied behaviours denoting both interest and wariness; inconclusive as a unique indicator of intent or mood
Look at tray/bib/clothes/harness	Possible similarity to 'Look down/to side or close eyes' but novelty factor of these items to the infant could not be discounted
Look at mother's face	Seen more frequently in infant's first event, suggesting need for reassurance in novel situation
Look at other	Relevant to unique circumstances, e.g. presence of pet cat
Look up (to high point or 'into space')	Infant appeared to be 'lost in thought'; no obvious co-occurring behaviours to suggest a consistent trigger
Look miscellaneous	Not a true behaviour; code created by researcher to help identify coding gaps and conflicts
Extend hand towards item	Followed equally by taking and by holding away; inconclusive as a unique indicator of intent or mood
Reach towards mother	Seen only in infant's second event, suggesting tiredness or boredom as a trigger
Wave / bang empty hand/bib on tray	Seen predominantly in infant's second event, suggesting tiredness or boredom as a trigger
Yawn / rub eyes	Seen only in infant's second event, suggesting tiredness or boredom as a trigger
Manipulate bib/clothes/harness	Novelty factor of these items to the infant could not be discounted
Open mouth (anticipation/reflex)	Followed by both oral contact and avoidance of same, suggesting an involuntary reflex, not indicative of intent
Suck/gnaw on fingers/hand	Occurred rarely; unclear if a mechanism for moving food in the mouth or a self-soothing gesture
Suck/gnaw on bib/clothes/harness	Incidence reflected individual clothing type and presence or positioning of harness
Pleasure face	Accompanied behaviours denoting both pleasure and need for reassurance; inconclusive as a unique indicator of intent or mood
Audible lip-smacking	Difficult to detect; visible equivalent found to be more reliable
Blow 'raspberry'	Displayed by only two infants, apparently for contrasting reasons of pleasure and boredom; inconclusive as a unique indicator of mood
Murmur, conversational	Detected rarely; not readily attributable to the feeding situation
Sigh	Difficult to detect; seen predominantly in infant's second event, suggesting tiredness or boredom as a trigger
Miscellaneous vocalisation	Indeterminate sounds, probably connected with chewing and swallowing; difficult to detect or interpret with certainty
Hold item, offer hand	Researcher gave no instructions re presentation of spoon; mothers may have inferred that offering it to infant to hold was not an option
Reach towards item, then withdraw hand	Occurred rarely; intention not clear; did not impact on infant's activity
Straighten/adjust infant's clothes/bib	Incidence dependent on need generated by individual configuration of clothes or bib
Touch infant to comfort	Unique to incidents of severe gagging in one infant

Table 3.5 lists the 24 behaviours that were discarded, with the reason(s), in each case, for rejecting them. Three behaviours were retained that did not meet the criteria of significance or commonality, for reasons considered justifiable; these are explained below. Following the sifting process, 52 behaviours remained. These are referred to from now on as *behaviours* (italicised). They comprised 36 *behaviours* for the infant and 16 for the mother.

Stage 4: Identification of themes

As evidence emerged concerning the infant's apparent intent, the 52 *behaviours* were subjected to a variety of possible groupings in which they were tried for 'fit' – a process referred to by Bakeman and Gottman (1997) as 'splitting and lumping'. This is similar to the more formal 'axial coding' described by Strauss and Corbin (1998) in relation to Grounded Theory. Experimenting with different ways of interpreting and categorising the *behaviours* enabled and encouraged the data to be seen in different ways, shining a light on patterns and inconsistencies that might otherwise have remained hidden. For example, it revealed that the mother's *behaviours* could not be divided easily into those that were 'supportive' and 'unsupportive' of the infant's efforts, a possibility that was briefly explored, since an apparent intention by the mother to provide practical support did not always appear to be received by the infant that way.

While this experimental re-organisation was in progress it was decided to share some of the audio/video-recordings with academic colleagues whose area of expertise was Early Years Education, and to invite their comments. This led directly to the recognition of four themes.

Table 3.6 Themes identified within the *behaviours*

Theme name	Theme consists of ...
Exploratory behaviour (infant)	<i>Behaviours</i> that reflect those seen when infants are engaged in exploratory play with objects
Avoidant behaviour (infant)	<i>Behaviours</i> that appear to be the infant's attempt to distance him- or herself from the food, or to avoid the mother's attempts at feeding
Controlling behaviour (mother)	<i>Behaviours</i> that interfere in some way, or to some degree, with the infant's interaction with the food or spoon, thereby dictating the nature or pace of the encounter with the food
Situational behaviour (infant or mother)	Other <i>behaviours</i> suggestive of differences between the infant's experience according to whether self-fed or spoon fed

Table 3.6 shows the four themes identified across the 52 *behaviours*, together with their definitions. Colour coding has been added for ease of cross-reference with later tables in this chapter and with the quantitative results tables at Appendix XIII. The reader is referred

to Table 3.3 (p.163) for clarification of the way in which the four themes straddled the data, and to Sections 3.3.2 and 3.3.3 for a full description of the *behaviours* that fell within each theme.

The theme of *exploratory behaviour* was identified first, when one of the expert colleagues noted that some of the infant *behaviours* were consistent with activities that commonly form part of infants' exploratory play with toys and other objects. In all, eight infant *behaviours* appeared to be exploratory in nature. This theme having been isolated, it was a short step to recognising that a further 12 infant *behaviours* appeared to be prompted by a wish to avoid the food or the actions of the mother. Segregation of these two groups of infant *behaviours* exposed the maternal *behaviours* to scrutiny, leading to the identification of 13 that could be considered controlling. This left 19 *behaviours*, 16 infant and three maternal, which were less easy to define as a group but which all appeared to be related to one or other of the two events and could therefore be considered 'situational' in nature. Second-level coding allowed the easy grouping of the 52 *behaviours* within these four themes.

Quantitative comparisons of themed behaviours

The concluding element of Stage 4 of the analysis consisted of submitting the numerical data associated with each of the *behaviours* that fell within the first three key themes, *exploratory behaviour* (infant), *avoidant behaviour* (infant) and *controlling behaviour* (mother), to a series of simple calculations in order to identify quantitative differences between the piece event and the spoon event, by theme, and according to whether the infant's first experience was with the piece (PFIs) or the spoon (SFIs). The percentage duration was adjusted to accommodate the co-occurrence of multiple behaviours within the same theme, so that the total in each case remained 100%. These findings are now explained.

3.3.2 The infant's behaviour – quantitative findings

Objective (ii) was ***to examine infants' behaviour in response to being presented, for the first time, with a piece of food, versus being offered the same food puréed on a spoon.*** Thirty-six *behaviours* were identified in relation to this objective, each of which fell within one of the three themes, *exploratory behaviour*, *avoidant behaviour* and *situational behaviour*.

Exploratory behaviour (infant)

Eight *behaviours* displayed by the infants consisted of actions relevant to exploring the food and/or spoon. Five consisted of manipulation of the food or spoon, accompanied by visual attention, and the remaining three involved the use of the mouth.

Table 3.7 Exploratory behaviours (infant)

BEHAVIOUR	Measure	PIECE EVENT			SPOON EVENT		
		Lowest (single infant)	Highest (single infant)	Total (all infants)	Lowest (single infant)	Highest (single infant)	Total (all infants)
Grasp item – pick up or take from mother	Incidence (n)	2	14	80	0	12	42
	% Duration	0.9	8.8	4.0	0	7.3	2.4
Touch, press or scratch item with fingers or palm	Incidence (n)	0	19	115	0	16	51
	% Duration	0	51.3	19.0	0	30.3	8.0
Turn, twist or hold up item, or transfer hand	Incidence (n)	2	24	139	0	12	32
	% Duration	2.0	40.9	24.6	0	12.2	4.4
Wave or hit item, or bang item on tray	Incidence (n)	0	12	47	0	3	5
	% Duration	0	10.5	3.7	0	4.3	1.1
Poke at, push or pick up crumbs or smears	Incidence (n)	0	11	39	0	3	6
	% Duration	0	27.3	7.2	0	3.9	0.7
Hold item to mouth	Incidence (n)	5	23	133	0	18	46
	% Duration	2.5	63.7	25.6	0	29.2	8.9
Touch item with lips or tongue	Incidence (n)	4	20	108	0	14	71
	% Duration	1.0	26.7	8.6	0	21.2	8.8
Chomp, gnaw, bite or suck on item	Incidence (n)	0	14	38	0	11	44
	% Duration	0	44.0	12.7	0	11.9	4.4
All exploratory behaviours	Incidence (n)	31	101	699	2	80	297
	% Duration	55.5	93.4	74.1	1.5	57.2	27.8

Table 3.7 lists the eight *behaviours* that appeared to relate to a desire to explore the food, as displayed by the infants in relation to both the piece and the spoon/purée. It shows the lowest and highest incidence and the lowest and highest percentage duration (the proportion of time spent displaying the *behaviour*) for each *behaviour* in each event. The last two rows show the overall incidence of all *exploratory behaviours* and the percentage duration of any such *behaviours* across all ten infants. Comparison of the two grey-shaded columns highlights the relative prevalence of each *behaviour* in each of the two events. For short-lived and fleeting *behaviours*, such as ‘Grasp item – pick up or take from mother’, the incidence will be seen to offer a better comparator than the duration, while for *behaviours* such as ‘Chomp, gnaw, bite or suck on item’ the percentage duration provides a more meaningful picture of what was observed. Findings for individual infants can be found at Appendix XIII.

Grasp item – pick up or take from mother

Grasping or taking the spoon or piece with the apparent intention of bringing it nearer in order to investigate it was considered an *exploratory behaviour*, as distinct from grasping the

item and holding it away in an apparent attempt to avoid contact with it, which was considered avoidant. All the infants grasped the piece at least once with apparently positive intent but only seven grasped the spoon/purée in this way. Overall, positive spoon grasping happened half as often as positive piece grasping.

Touch, press or scratch item with fingers or palm

All but one infant used his or her fingertips or the open palm of the hand to explore the broccoli floret and all but two examined the spoon/purée in this way. Overall this *behaviour* occurred over twice as often and lasted for twice as long in the piece event, compared with the spoon event. Five infants spent more than 20% of the piece event touching, pressing or scratching the floret, with one doing so for over 50% of the time. By contrast, this same infant spent only 4.1% of his time with the spoon/purée touching it in this manner.

Turn, twist or hold up item, or transfer hand

Turning, twisting and holding up the item, and transferring it to the other hand, formed a group of apparently interchangeable, connected actions, which were considered a single *behaviour*. All the infants displayed this *behaviour* with the piece and, of the six who also examined the spoon/purée in this way, all but one did so for considerably less time than they did with the piece. Overall, both the frequency and the percentage duration of this *behaviour* were greater by a factor of more than four in the piece event than in the spoon event.

Wave or hit item, or bang item on tray

Waving the food in the hand, hitting or slapping it, and banging it on the tray appeared to be interchangeable actions, the relative occurrence of which may have reflected the infant's maturity and/or the characteristics of the surface on which the food was placed (Thelen, 1981; Bourgeois *et al*, 2005). Eight infants waved, hit or banged the piece but only two did this with the spoon/purée. In all, this *behaviour* was seen 47 times in the piece event and five times in the spoon event.

Poke at, push or pick up crumbs or smears

Seven infants poked, pushed or picked up crumbs or smears of food from the tray in the piece event, two of whom also did so in the spoon event. This *behaviour* occupied 7.2% of the piece event overall, and 0.7% of the spoon event.

Hold item to mouth

'Hold item to mouth' was identified whenever the piece or the spoon/purée was within approximately 1cm of the infant's mouth, suggesting that exploration by the mouth or nose was intended. This *behaviour* tended to co-occur with 'Touch item with lips or tongue', 'Chomp, gnaw, bite or suck on item' and/or 'Possible purposeful sniff'. Holding the food to the mouth was displayed by all the infants in the piece event and was evident for over 25%

of its duration. In contrast, only seven infants held the spoon/purée in this way, with the *behaviour* displayed for only 8.9% of the total time in that event.

Touch item with lips or tongue

'Touch item with lips or tongue' referred to the occasions on which the infant appeared to choose to touch the food or spoon to his or her mouth voluntarily, as opposed to when he or she complied with the mother's apparent wish to initiate this. Although its prevalence in the piece event was less than double that in the spoon event, this *behaviour* commonly occurred in conjunction with other *exploratory behaviours*; its inclusion within this theme was therefore felt to be justified.

Chomp, gnaw, bite or suck on item

Chomping, gnawing, biting and sucking formed another apparently interchangeable or connected group of actions. This *behaviour* was distinguished from 'Chewing movements or lip-smacking (mouth empty)' and 'Chewing or munching (food in mouth)' in that it took place while the spoon or piece was being held to the mouth, rather than following the biting-off or clearing from the spoon of a mouthful. This justified its definition as an *exploratory behaviour* rather than as an integral part of eating. Discrete bouts of chomping, gnawing, biting and/or sucking occurred slightly more frequently in the spoon event but the *behaviour* was displayed for significantly longer overall in the piece event.

All exploratory behaviours

All eight *exploratory behaviours* occurred more frequently and/or extended over a greater period during the piece event than with the spoon, seven of them significantly so. In total, the incidence of *exploratory behaviour* during the piece event was more than double that in the spoon event, and the percentage duration was almost three times as great. The difference is more striking still in the data for some of the individual infants, as seen in the tables in Appendix XIII. For example, Infant A spent 93.4% of her time with the piece exploring it manually and/or orally but she did this for only 3.3% of the spoon event.

Avoidant behaviour (infant)

Twelve *behaviours* displayed by the infants consisted of actions that appeared to be designed to avoid either immediate or any contact with the food. One was a movement of the eyes, one a facial expression and one a vocalisation; two involved the mouth and the remaining seven involved gross body language ranging from small gestures to larger movements of head, limbs and/or trunk.

Table 3.8 Avoidant behaviours (infant)

BEHAVIOUR	Measure	PIECE EVENT			SPOON EVENT		
		Lowest (single infant)	Highest (single infant)	Total (all infants)	Lowest (single infant)	Highest (single infant)	Total (all infants)
Look down or to the side, or close eyes	Incidence (n)	0	10	20	1	48	161
	% Duration	0	9.3	1.6	0.3	49.1	19.7
Turn head away from item	Incidence (n)	0	0	0	0	29	64
	% Duration	0	0	0	0	26.3	9.9
Extend or wave arms, or bounce in seat	Incidence (n)	0	1	3	0	18	50
	% Duration	0	2.4	0.3	0	60.8	11.4
Push self back or up, or arch back or rear backwards	Incidence (n)	0	2	2	0	34	92
	% Duration	0	2.5	0.2	0	45.5	15.2
Fend-off gesture	Incidence (n)	0	1	1	0	16	48
	% Duration	0	0.4	<0.1	0	34.5	4.8
Fold-in gesture	Incidence (n)	0	0	0	0	2	2
	% Duration	0	0	0	0	1.8	0.6
Grasp item and hold away	Incidence (n)	0	2	2	0	7	22
	% Duration	0	1.0	0.1	0	25.6	3.4
Hold or push away item, or mother's hand	Incidence (n)	0	2	3	0	11	27
	% Duration	0	1.5	0.3	0	9.6	2.5
Hold mouth open around item	Incidence (n)	0	1	1	0	19	40
	% Duration	0	0.5	0.1	0	23.1	4.6
Pout or push against item with lips	Incidence (n)	0	0	0	0	18	18
	% Duration	0	0	0	0	6.6	0.9
Displeasure / anxiety face	Incidence (n)	0	12	31	0	24	129
	% Duration	0	27.8	4.9	0	49.1	20.5
Distress noise	Incidence (n)	0	1	2	0	4	7
	% Duration	0	0.7	0.1	0	5.0	0.7
All avoidant behaviours	Incidence (n)	0	18	65	5	191	660
	% Duration	0	27.9	6.6	2.7	84.6	51.9

Table 3.8 lists the 12 behaviours that appeared to relate to a desire to avoid the food, as displayed by the infants in relation to both the piece and the spoon/purée. It shows the lowest and highest incidence and the lowest and highest percentage duration for each behaviour in each event. The last two rows show the overall incidence of all avoidant behaviours and the percentage duration of any such behaviours. Comparison of the two grey-shaded columns highlights the relative prevalence of each behaviour in each of the two

events. For these *behaviours*, the incidence and the percentage duration provide similar evidence of the difference between the two events, with all *avoidant behaviours* occurring more frequently and lasting for longer in the spoon event. Findings for individual infants can be found at Appendix XIII.

Two of the *avoidant behaviours*, 'Fold-in gesture' and 'Pout or push against item with lips', were each unique to just one infant. However, both *behaviours* appeared to indicate a clear intent on the part of the infant and it seems reasonable to assume that, had they not displayed these gestures, these two infants would have made other avoidant gestures in their place. The inclusion of these *behaviours* in this category was therefore considered justified in spite of their idiosyncratic nature.

Look down or to the side, or close eyes

Looking down or to the side, or closing the eyes, was the only *behaviour* related to the direction of the infant's gaze that appeared to convey an unequivocal sense of his or her intent. It strongly suggested a desire to escape the current situation. All the infants displayed this *behaviour* in the spoon event and five did so in the piece event. The overall frequency in the spoon event was eight times that in the piece event, and the percentage duration 12 times. Five of the infants spent more than 25% of the spoon event with their eyes cast down or closed; for one the figure was 49%.

Turn head away from item

Turning the head away from the food appeared to be an alternative to casting the gaze down or to the side. Eight of the infants turned their head away from the spoon/purée but none did so in response to the piece. Two spent more than 25% of the spoon event with their head turned away.

Extend or wave arms, or bounce in seat

Figure 3.5 (p.173) shows the normal, attentive stance of one of the infants when displaying an interest in the food. Figure 3.6 (p.173), by contrast, illustrates the *behaviour* 'Extend or wave arms, or bounce in seat'. This consisted of a small group of apparently interchangeable gestures of the arms and whole body that seemed to convey a general sense of "I don't like this". Eight of the infants showed this *behaviour* at least once, with a total frequency of 53 times, 50 in the spoon event and three during the piece event. One infant spent more than 60%, and another more than 30% of the spoon event behaving in this way.

Push self back or up, arch back or rear backwards

This *behaviour*, in which the infant pushed his or her body backwards, or upwards, away from the food, is also illustrated in Figure 3.6 (p.173). Ninety-four instances were identified: 92 during the spoon event and two during the piece event.

Figure 3.5 Example of attentive stance



Figure 3.5 shows Infant K in the relaxed, attentive stance she adopted when engaging with the food.

Figure 3.6 Example of avoidant stance

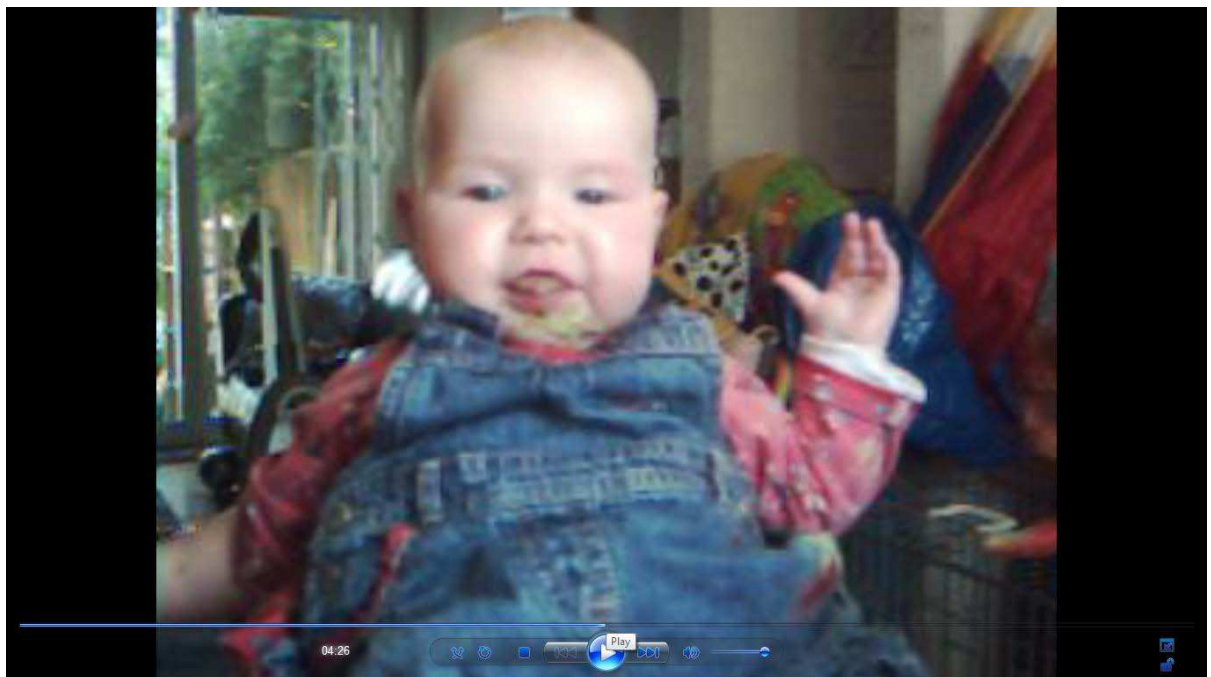


Figure 3.6 shows Infant K displaying a combination of the 'Extend or wave arms, or bounce in seat' gesture and the 'Push self back or up, arch back or rear backwards' gesture.

Figure 3.7 The 'fend-off' gesture

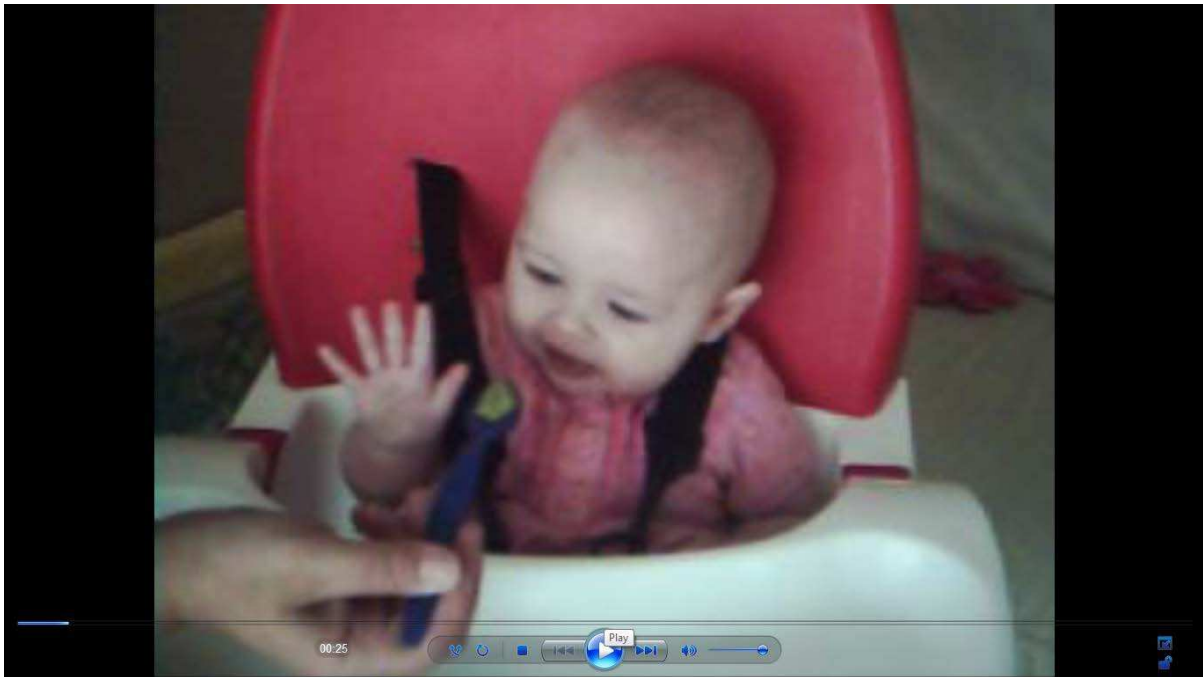


Figure 3.7 shows Infant J displaying the 'fend-off' gesture.

Figure 3.8 The 'fold-in' gesture



Figure 3.8 shows Infant H displaying the 'fold-in' gesture.

Fend-off gesture

'Fend-off' gesture' was the code used to denote a *behaviour* in which the infant's outward-facing palm was aimed directly at the food or spoon while the item was within the infant's view. It was distinct from a holding or pushing away gesture in that the infant's hand was not in contact with the item. The gesture is shown in Figure 3.7 (p.174). Six infants displayed this *behaviour* in response to the spoon/purée, one of whom also did so in response to the piece. In all, it was seen 48 times in the spoon event and once during the piece event. The 'fend-off' gesture was not always easy to distinguish from 'Extend or wave arms, or bounce in seat' because of the constraints on the infant. For example, the mother of Infant F held the spoon close to his mouth most of the time, making a visually focused 'fend-off' gesture almost impossible for him to execute, with the result that his attempts manifested themselves as arm waving.

Fold-in gesture

Figure 3.8 (p.174) shows the 'fold-in' gesture, which involved folding the arms across the front of the body and lowering the chin to the chest, in a way that effectively eliminated all manual, oral and visual contact with both the mother and the food. This *behaviour* was unique to Infant H and appeared to be an attempt to shut out her surroundings. She displayed it twice, both times during the spoon event, on each occasion following a gagging episode.

Grasp item and hold away

Six infants grasped the spoon and then held it away from their body; one also responded to the piece in this manner. Overall, this *behaviour* was seen more often and for longer during the spoon event. Infant A spent more than 25% of this event holding the spoon away from her. Infant E was the only infant to display this *behaviour* with the piece, doing so for longer during that event than he did with the spoon.

Hold/push away item, or mother's hand

This *behaviour* described the situation in which an infant who had previously grasped the item chose to push it away, or, if the mother was holding it, pushed the mother's arm away. Seven infants displayed this *behaviour* in the spoon event, two of whom also did so in the piece event. The *behaviour* occurred more often and for longer in the spoon event.

Hold mouth open around item

This referred to the infant's holding his or her mouth in an open position around either the floret or the spoon, rather than closing the mouth to chomp or suck on the item, or to bite off or otherwise take a mouthful. Nine infants displayed the *behaviour* a total of 40 times during

the spoon event but it occurred only once during the piece event. Infant H spent 23.1% of her time with the spoon/purée holding her mouth open around it.

Pout or push against item with lips

This *behaviour* consisted of closed, pursed lips pushed outwards towards the food when the food was in contact with, or approaching, the infant's lips. It was unique to Infant F, who displayed it 18 times in response to the spoon/purée but not at all during the piece event.

Displeasure / anxiety face

'Displeasure / anxiety face' described any puckering of the forehead or lowering and drawing-together of the eyebrows. One infant did not display this *behaviour* at all; five displayed it in both events and four in the spoon event only. Overall, this facial expression was seen approximately four times as often and for four times as long in the spoon event, compared with the piece event.

Distress noise

None of the infants actively cried but four made a noise that indicated some degree of distress or displeasure at least once. In all, the *behaviour* was observed seven times during the spoon event and twice with the piece.

All avoidant behaviours

All the *avoidant behaviours* occurred more frequently and/or extended over a greater period with the spoon than with the piece; three occurred exclusively during the spoon event. Considered together, the four *behaviours* 'Turn head away from item', 'Extend or wave arms, or bounce in seat', 'Push self back or up, arch back or rear backwards' and 'Fend-off gesture' were seen just six times in relation to the piece but a total of 254 times in relation to the spoon/purée. Overall, the incidence of *avoidant behaviour* during the spoon event was more than ten times that during the piece event, and the percentage duration was almost eight times as great. Individual differences again illustrate the extremes that occurred within these averages. For example, Infant F displayed one or other of the *avoidant behaviours* 191 times during the spoon event, spread over 82.2% of its duration, compared with just 16 times in 9.7% of the piece event.

Situational behaviours (infant)

Sixteen identified infant *behaviours* were not obviously either exploratory or avoidant in nature but their relative prevalence suggested fundamental differences in the infant's experience according to whether he or she was engaged in self-feeding or was spoon fed by the mother.

Table 3.9 Situational behaviours (infant)

<i>BEHAVIOUR</i>	Measure	PIECE EVENT			SPOON EVENT		
		Lowest (single infant)	Highest (single infant)	Total (all infants)	Lowest (single infant)	Highest (single infant)	Total (all infants)
Look at crumbs or smears on tray	Incidence (n)	0	16	58	0	2	5
	% Duration	0	39.1	12.4	0	4.2	0.9
Look at mother's body or movements	Incidence (n)	0	3	11	0	5	14
	% Duration	0	2.1	0.8	0	6.2	2.1
Look at researcher	Incidence (n)	2	22	105	4	21	114
	% Duration	0.9	33.6	12.3	5.2	34.1	12.8
Lean head towards item	Incidence (n)	0	4	7	0	6	13
	% Duration	0	8.9	1.1	0	12.6	2.0
Simple hold (in control, attention elsewhere)	Incidence (n)	1	15	45	0	7	13
	% Duration	1.3	33.8	7.2	0	12.8	3.0
Hold item passively, mother controls	Incidence (n)	0	0	0	0	6	32
	% Duration	0	0	0	0	18.5	5.5
Drop purposely or throw item	Incidence (n)	0	5	19	0	0	0
	% Duration	0	2.2	0.8	0	0	0
Release item to mother's grasp	Incidence (n)	0	1	1	0	9	28
	% Duration	0	0.3	<0.1	0	2.5	0.9
Two-handed reach or touch	Incidence (n)	1	20	148	1	19	78
	% Duration	1.4	62.3	31.9	1.5	42.9	16.9
Protrude tongue (no contact with item)	Incidence (n)	0	16	37	0	8	10
	% Duration	0	11.8	2.0	0	3.1	0.5
Possible purposeful sniff	Incidence (n)	0	11	55	0	7	8
	% Duration	0	3.8	1.8	0	3.7	0.5
Chewing movements or lip-smacking (mouth empty)	Incidence (n)	0	25	88	0	7	13
	% Duration	0	74.0	20.8	0	10.0	2.0
Chewing or munching (food in mouth)	Incidence (n)	0	15	37	8	20	108
	% Duration	0	33.1	8.6	16.0	79.9	39.0
Unstick/eject movement	Incidence (n)	0	3	3	0	18	53
	% Duration	0	3.7	0.4	0	14.1	4.8
Gag or cough	Incidence (n)	0	1	3	0	4	27
	% Duration	0	1.1	0.2	0	18.1	4.4
'Shudder face' or flinch	Incidence (n)	0	3	9	0	14	64
	% Duration	0	1.6	0.5	0	12.5	5.1

Table 3.9 lists the 16 *situational behaviours* displayed by the infants in the piece event and in the spoon event. It shows the lowest and highest incidence and the lowest and highest percentage duration for each of these *behaviours* in each event. Comparison of the two grey-shaded columns highlights the relative prevalence of each *behaviour* in each of the two events. As with the *exploratory behaviours*, in some cases the incidence will be seen to offer a better comparator than the duration, while for others the percentage duration provides a more meaningful picture. No combined totals are presented because these *behaviours* do not represent a single cohesive group. Seven of the *situational behaviours* occurred more often and lasted for longer during the piece event while seven were more prevalent in the spoon event. A further two occurred noticeably more frequently depending on the order in which the infants experienced the two events. Findings for individual infants can be found at Appendix XIII.

Look at crumbs or smears on tray

Seven infants were noted to look at crumbs or smears of food on the tray in the piece event and four in the spoon event. Overall, this *behaviour* was seen approximately ten times as frequently and lasted over 12 times as long with the piece as with the spoon/purée.

Look at mother's body or movements

Nine infants were noted to fix their gaze on their mother's body or to watch her movements. Five did so in both events, two in the piece event only and two in the spoon event only. Together, the infants spent over twice as much time displaying this *behaviour* during the spoon event as they did during the piece event.

Look at researcher

All the infants looked at the researcher during both events and a similar overall incidence and duration was seen in each. However, the *behaviour* was significantly more prevalent among infants whose first experience was with the piece (PFIs), with a total duration of 40.7% of the combined events, compared with 10.7% of the combined events for the SFIs.

Lean head towards item

Leaning of the head towards the piece of broccoli or the spoon/purée, prior to taking or accepting it into the mouth, was displayed by six infants in the spoon event and by two of the six in the piece event. Overall, this *behaviour* occurred almost twice as often in response to the spoon/purée as it did to the piece. It was also notably more evident among infants whose first experience was with the spoon (SFIs).

Simple hold (in control, attention elsewhere)

'Simple hold (in control, attention elsewhere)' described periods when the infant alone was holding the food or spoon, and was therefore in control of it, but did not appear to be actively

exploring or looking at it. It was distinct from 'Hold passively, mother controls', in which both the infant and the mother were holding the item but its movement and direction was being controlled by the mother. All the infants displayed this *behaviour* in the piece event and five in the spoon event. Overall, it was seen more than three times as often and lasted more than twice as long with the piece as with the spoon/purée.

Hold item passively, mother controls

This *behaviour*, in which the infant's hand was touching the food or spoon while the mother was controlling its movement, was displayed by eight infants and was seen only in the spoon event.

Drop purposely or throw item

Six infants purposefully dropped or threw the broccoli floret but none did this with the spoon/purée. Purposeful dropping or throwing, while potentially an *exploratory behaviour*, was not included within that theme for two reasons: first, at six months the normally developing infant is only just beginning to be able to do this intentionally (Gallahue and Ozmun, 2002), and second, in the researcher's professional experience dropping and throwing are as likely to be a sign of frustration or boredom as of exploration. A judgement was made on each occasion regarding the purposefulness of the action in order to facilitate the analysis.

Release item to mother's grasp

This *behaviour* described the voluntary release of the item to the mother's grasp. It was displayed by eight infants a total of 28 times in the spoon event but was seen only once in the piece event. As with dropping or throwing of the food or spoon, the voluntariness of the infant's action was difficult to identify with certainty because of the age of the infants; a judgement was therefore required in each case.

Two-handed reach or touch

A two-handed reach or touch constituted an occasional facet of other *behaviours*, both exploratory and avoidant, rather than existing as a *behaviour* in its own right. It was displayed by all the infants and was seen almost twice as frequently in the piece event as with the spoon/purée.

Protrude tongue (no contact with item)

'Protrude tongue (no contact with item)' described the infant's poking out of the tip of the tongue while observing or manipulating the food at a distance from his or her mouth. Four infants displayed this *behaviour* in the piece event, two of whom also showed it in response to the spoon/purée. In all, the *behaviour* was seen almost four times as often and lasted four times as long in the piece event, compared with the spoon event.

Possible purposeful sniff

A 'Possible purposeful sniff' was identified whenever the infant appeared purposefully to hold the food or spoon to his or her nose, albeit briefly. Unfortunately, the quality of the audio/video-recording did not allow any concurrent sniffing or intake of breath to be heard or identified visually, so the sniffing action was noted only as a possibility. Eight infants appeared to sniff the broccoli floret a total of 55 times. Two of the eight also demonstrated this *behaviour* with the spoon/purée, doing so eight times in all.

Chewing movements or lip-smacking (mouth empty)

The making of a chewing or lip-smacking movement while the mouth was empty appeared to be an anticipatory action, although it was not always followed by actual oral exploration. Since visual confirmation of whether or not the infant had food in his or her mouth was not possible, this *behaviour* was differentiated from 'Chewing or munching (food in mouth)' by reference to what happened either beforehand or immediately afterwards, for example, wiping of the spoon against the top lip or gum by the mother, to deposit food in the infant's mouth, or falling of food from the mouth. Eight infants displayed chewing and lip-smacking movements with an apparently empty mouth in the piece event and four of the eight did so in the spoon event. Overall, the *behaviour* was seen almost seven times as often in the piece event as with the spoon/purée and lasted ten times as long.

Chewing or munching (food in mouth)

All the infants appeared to chew food inside their mouth in the spoon event and four did so in the piece event. In all, this type of chewing or munching was seen during 39% of the spoon event, compared with only 8.6% of the piece event.

Unstick/eject movement

The 'unstick/eject' movement consisted of a lowering of the lower jaw and widening of the mouth opening, sometimes accompanied by a sideways movement of the jaw. It was reminiscent of the movements required to chew a sticky toffee and suggested an attempt to dislodge or eject the food. It appeared to be intentional and functional rather than a reflexive response to the bitter taste of the food, in that it was a series of small movements rather than a single facial expression. Six infants displayed this *behaviour* in the spoon event, of whom one was the only infant to do so in the piece event. Overall, the movement was seen 56 times in all, 53 of which occurred with the spoon/purée.

Gag or cough

All but one infant exhibited a gagging or coughing reflex, which occurred a total of 27 times during the spoon event. Infant H spent 18% of her time with the spoon gagging and/or vomiting. Three infants also gagged or coughed once with the piece. However, in the case

of Infant B, his brief bout of coughing appeared to be triggered by dribbling rather than by the presence of food, since he was not holding the piece to his mouth, nor did he have food in his mouth at the time.

'Shudder face' or flinch

The 'Shudder face' or flinch was an involuntary puckering of the face or twitching movement of the head, such as might be triggered by sucking on a lemon. This expression often coincided with a gagging episode. It was at times difficult to distinguish from the 'Displeasure/anxiety face' but was generally more sudden and fleeting, in keeping with a reflex action. Eight infants displayed this *behaviour* in the spoon event, of whom four also did so in the piece event. Overall, it was seen seven times as often with the spoon/purée as with the piece.

All situational behaviours (infant)

Of the 16 *situational behaviours* displayed by the infants, seven occurred predominantly in the piece event and seven in the spoon event. Looking at crumbs or smears, using a 'simple' hold, purposeful dropping or throwing of the food or spoon, a two-handed reach or grasp, protrusion of the tongue, an apparent purposeful sniff, and a chewing or lip-smacking movement while the mouth was empty were all seen more often and/or lasted for longer during the piece event. In contrast, watching the mother's movements, using a passive hold, releasing the food or spoon to the mother, chewing or munching on food inside the mouth, the 'unstick/eject' movement, the gag or cough reflex and the 'shudder face' or flinch were seen more frequently or for longer with the spoon/purée. The remaining two *behaviours* appeared to occur differently according to the order in which the infants experienced the two events, with SFIs leaning their head towards the food more frequently and PFIs spending more time looking at the researcher.

Summary of the infant's behaviour

Between them, the ten infants displayed eight *exploratory behaviours*, all of which occurred more frequently and/or extended over a greater period during the piece event. They exhibited a total of 12 *avoidant behaviours*, all of which were seen more frequently and for longer during the spoon event. A further 16 *situational behaviours* were identified, seven of which were significantly more prevalent in the piece event and seven in the spoon event; the remaining two appeared to be related to the order in which the events occurred for that infant. These findings point to the two events being experienced very differently by the infants.

3.3.3 The parent's behaviour – quantitative findings

Objective (iii) was ***to examine parents' behaviour according to whether they present their infant with his or her first solid food as a piece, or puréed on a spoon.*** Sixteen *behaviours* were identified in relation to this objective. These fell within the themes of *controlling behaviour* and *situational behaviour*.

Controlling behaviour (mother)

The mothers were notably more active during the spoon event than the piece event and between them they displayed 13 *behaviours* that were defined as controlling. These were *behaviours* that had the potential to intrude on, or change the course of, the infant's activity – a definition borrowed from Gurland and Grolnick's (2005) study of mothers and their school-age children. In practical terms, they had the effect of either initiating or directing the infant's interaction with the food or spoon/purée or of preventing it.

The mothers were not specifically asked to take an overtly active role in the spoon event but they may have assumed that the researcher intended them to do so. In a sense, this will have been a correct assumption, since the aim of the research was to compare self-feeding with spoon feeding as it is commonly interpreted, rather than to examine different ways of implementing spoon feeding. Thus, the possible motivation behind the mothers' tendency to maintain control of the spoon is of less interest in the context of this study than the ways in which this decision manifested itself.

Table 3.10 (p.185) lists the 13 maternal *behaviours* that in some way, or to some degree, appeared to direct or influence the infant's *behaviour*, in relation to both the piece and the spoon/purée. It shows the lowest and highest incidence and the lowest and highest percentage duration for each *behaviour* in each event. The last two rows show the overall incidence of all *controlling behaviours* and the percentage duration of any such *behaviours*. Comparison of the two grey-shaded columns highlights the relative prevalence of each *behaviour* in each of the two events. As with the infant *behaviours*, for some, such as wiping the food or spoon against the infant's top lip or gum, the incidence will be seen to offer a better comparator than the duration, while for others, such as holding the food to the mouth, the percentage duration provides a more meaningful picture of what was observed. Seven of the *controlling behaviours* occurred exclusively in the spoon event; four were more prevalent in the spoon event than the piece event and two occurred exclusively in the piece event. Findings for individual mothers can be found at Appendix XIII.

Table 3.10 Controlling behaviours (mother)

<i>BEHAVIOUR</i>	Measure	PIECE EVENT			SPOON EVENT		
		Lowest (single mother)	Highest (single mother)	Total (all mothers)	Lowest (single mother)	Highest (single mother)	Total (all mothers)
Hold item to infant's mouth	Incidence (n)	0	0	0	6	29	139
	% Duration	0	0	0	6.6	52.2	26.5
Jiggle item against infant's lips	Incidence (n)	0	0	0	0	2	3
	% Duration	0	0	0	0	3.3	0.2
Hold item, insert in infant's mouth	Incidence (n)	0	0	0	0	13	48
	% Duration	0	0	0	0	6.5	3.1
Wipe item against infant's top lip or gum	Incidence (n)	0	0	0	0	8	25
	% Duration	0	0	0	0	4.3	1.5
Insert item in infant's hand	Incidence (n)	0	1	3	0	0	0
	% Duration	0	1.6	0.3	0	0	0
Touch infant's hand, or item in infant's hand	Incidence (n)	0	3	10	0	1	1
	% Duration	0	22.6	2.4	0	0.6	0.1
Hold or turn away item (to allow time)	Incidence (n)	0	2	2	2	17	89
	% Duration	0	5.0	0.6	2.7	34.0	15.5
Take item from infant, or hold out of reach	Incidence (n)	0	1	1	0	9	23
	% Duration	0	0.3	<0.1	0	9.5	2.2
Restrain infant's arm	Incidence (n)	0	0	0	0	5	8
	% Duration	0	0	0	0	60.7	4.9
Use item to move food on tray	Incidence (n)	0	0	0	0	2	2
	% Duration	0	0	0	0	3.1	0.4
Wipe infant's mouth or chin with item	Incidence (n)	0	0	0	0	12	28
	% Duration	0	0	0	0	11.7	2.1
Wipe infant's mouth or face with cloth, bib or finger	Incidence (n)	0	1	1	0	4	7
	% Duration	0	0.4	<0.1	0	2.0	0.7
Wipe infant's clothes or hands with cloth, bib or finger	Incidence (n)	0	1	1	0	4	4
	% Duration	0	2.2	0.2	0	3.9	0.5
All controlling behaviours	Incidence (n)	0	6	18	22	68	377
	% Duration	0	23.8	3.5	20.6	98.0	52.4

Hold item to infant's mouth

None of the mothers held the piece to their infant's mouth but all displayed this *behaviour* with the spoon. In total, they spent over 26% of the spoon event holding the spoon/purée to their infant's mouth, with one mother doing so, on and off, for 52% of the time.

Jiggle item against infant's lips

None of the mothers jiggled the food against their infant's lips in the piece event but two mothers displayed this *behaviour* a total of three times in the spoon event. The purpose of the *behaviour* appeared to be to encourage the infant to open his or her mouth to accept the spoon.

Hold item, insert in infant's mouth

Holding the food or spoon and inserting it into the infant's mouth, whether or not the infant had opened his or her mouth in readiness, was unique to the spoon event, during which all but one of the mothers displayed the *behaviour* at least twice. Together, the infants had the spoon inserted into their mouth on a total of 48 occasions.

Wipe item against infant's top lip or gum

Wiping the spoon upwards against the infant's top lip or gum resulted in food being deposited inside the infant's mouth. This *behaviour* was displayed by six mothers and almost always followed insertion of the spoon by the mother. The exception was the mother of infant D, who took advantage, on three occasions, of D's having put the spoon into her mouth herself, to grasp it and wipe it against D's lip. The *behaviour* occurred a total of 25 times in the spoon event; no equivalent action was seen in the piece event.

Insert item in infant's hand

Three mothers inserted the piece in their infant's hand once; none did this with the spoon.

Touch infant's hand, or item in infant's hand

Touching the infant's hand, or the food or spoon in the infant's hand, appeared to be a way of communicating with the infant, or of gaining his or her attention. Five of the mothers displayed this *behaviour* a total of ten times in the piece event. One equivalent instance, involving a sixth mother, occurred in the spoon event.

Hold or turn away item (to allow time)

The *behaviour* 'Hold or turn away item (to allow time)' referred to the mother moving the item away from the infant's face, apparently in order to allow him or her to deal with the current mouthful, or to recover from gagging. This was distinct from 'Take item from infant, or hold out of reach', in which the mother's intention appeared to be to prevent the infant from grasping it. All the mothers held the spoon away from their infant to allow him or her time, and one did this with the piece. The total occurrence comprised 89 instances in the spoon event and two in the piece event.

Take item from infant, or hold out of reach

Six mothers took the spoon from their infant's grasp and/or held it out of the infant's reach.

This *behaviour* was seen a total of 23 times in the spoon event. One equivalent instance, involving a seventh mother, was seen with the piece.

Restrain infant's arm

None of the mothers restrained their infant's arm during the piece event but three did so in the spoon event. Two displayed the *behaviour* only briefly but the mother of Infant B spent over 60% of the spoon event restraining his arm, apparently to prevent him from intercepting her efforts to present the spoon to his mouth.

Use item to move food on tray

One mother twice used the spoon to move or gather a dollop of purée, apparently in order to scoop it up and re-present it. No equivalent *behaviour* was seen in the piece event.

Wipe infant's mouth or chin with item

Eight mothers used the spoon to wipe their infant's mouth or chin, as a means of scooping up food that was escaping or had escaped from the infant's mouth so that it could be offered again. No equivalent *behaviour* was seen in the piece event.

Wipe infant's mouth or face with cloth, bib or finger

Four mothers wiped their infant's mouth or face with a cloth, the infant's bib or their finger(s) at least once during the spoon event. One mother did so four times and one also displayed the same *behaviour* on a single occasion in the piece event.

Wipe infant's clothes or hands with cloth, bib or finger

Two mothers wiped their infant's clothes or hands with a cloth, the infant's bib or their finger(s). One did this four times, in the spoon event, and the other once, in the piece event.

All controlling behaviours

Of the 13 *controlling behaviours* identified, seven occurred exclusively in the spoon event: holding the spoon/purée to the infant's mouth, jiggling the spoon/purée against the infant's lips, inserting the spoon/purée in the infant's mouth, wiping the spoon/purée against the infant's top lip or gum, restraining the infant's arm, using the spoon to move food around the tray, and using the spoon to wipe the infant's mouth or chin. Four *behaviours* occurred in both events but were seen more often in the spoon event: holding the food/spoon away from the infant to allow him or her time, taking the food/spoon from the infant or holding it out of the infant's reach, wiping the infant's mouth or face, and wiping the infant's clothes or hands. Inserting the food/spoon in the infant's hand occurred exclusively, and touching the infant's hand, or the food in the infant's hand, almost exclusively, in the piece event.

In all, 18 instances of *controlling behaviour* were evident in the piece event, compared with 377 in the spoon event. Once more, an individual example provides a stark illustration: the

mother of Infant B displayed one or more of the *controlling behaviours* for 98% of the spoon event but showed none in the piece event.

Situational behaviours (mother)

Three identified maternal *behaviours* were not obviously controlling in nature but their relative prevalence suggested fundamental differences between the two feeding events. They therefore fell within the theme of *situational behaviours*.

Table 3.11 Situational behaviours (mother)

BEHAVIOUR	Measure	PIECE EVENT			SPOON EVENT		
		Lowest (single mother)	Highest (single mother)	Total (all mothers)	Lowest (single mother)	Highest (single mother)	Total (all mothers)
Retrieve dropped or out-of-reach item	Incidence (n)	0	8	38	0	2	2
	% Duration	0	5.6	3.1	0	2.1	0.3
Hold item passively, infant controls	Incidence (n)	0	0	0	0	14	66
	% Duration	0	0	0	0	46.8	18.5
Rest hand on tray or arm of infant's chair	Incidence (n)	0	5	11	0	4	7
	% Duration	0	57.7	10.3	0	31.5	4.9

Table 3.11 lists the three *situational behaviours* displayed by the mothers in the piece event and in the spoon event. It shows the lowest and highest incidence and the lowest and highest percentage duration for each *behaviour*. No combined totals are presented because these *behaviours* do not represent a single cohesive group. Two of the *situational behaviours* occurred more frequently and lasted longer in the piece event and the other was seen only in the spoon event. Findings for individual mothers can be found at Appendix XIII.

Retrieve dropped or out-of-reach item

Nine of the mothers retrieved the broccoli floret and returned it to their infant a total of 38 times. Of the nine, one twice retrieved and returned the spoon/purée.

Hold item passively, infant controls

'Hold item passively, infant controls' identified a situation in which both mother and infant were holding the item, but in which its movement and direction were being controlled by the infant. It was seen only in the spoon event. Eight mothers displayed this *behaviour*; four held the spoon passively for over 25%, two doing so for over 41% of the event.

Rest hand on tray or arm of infant's chair

Six mothers rested their hand on the tray or arm of the infant's chair, two doing so in both

events. Overall, this *behaviour* occurred more frequently and lasted more than twice as long in the piece event, compared with the spoon event.

All situational behaviours (mother)

In summary, of the three *situational behaviours* displayed by the mothers, two occurred predominantly in the piece event, while the other was not seen at all in that event. Mothers retrieved a dropped item and rested their hand on their infant's chair more often and for longer in the piece event, whereas a passive hold on the item by the mother was seen only in the spoon event.

Summary of the parent's behaviour

Between them, the ten mothers displayed 13 *controlling behaviours*, 11 of which occurred exclusively or predominantly in the spoon event. The remaining two were seen exclusively, or almost exclusively, in the piece event. A further three *situational behaviours* were identified, two of which occurred predominantly in the piece event and the other exclusively in the spoon event. These findings point to some significant differences in the behaviour of the mothers in the two events, which contributed to the events being experienced very differently by the infants.

3.3.4 Interview #2: The parent's review of the infant's first encounter with food

Objective (i) was ***to elicit parents' accounts of their experience of a food when presented to them as a piece and when spoon fed to them as a purée***; Objective (ii) was ***to examine infants' behaviour in response to being presented, for the first time, with a piece of food, versus being offered the same food puréed on a spoon***; Objective (iii) was ***to examine parents' behaviour according to whether they present their infant with his first solid food as a piece, or puréed on a spoon***. The purpose of these three objectives was to enable the infant's experience to be seen through alternative lenses, which would together allow a more complete understanding of the whole. The second phase of the analysis of Interview #2, the parent's review of the infant's first encounter with food, provided an additional perspective on both the infant's and the parent's behaviour and helped to consolidate the earlier findings.

Following Stage 4 of the analysis of the Observations, the audio-recordings of Interviews #2 were transcribed. Two examples of the transcriptions can be found at Appendix XIV. The content was then analysed in a similar way to that used for Interviews #1, to uncover themes that might contribute to the final qualitative analysis (Stage 5). Each mother drew on what she saw in the audio/video-recording, her knowledge of her infant, her own experiences of eating the food during Interview #1, her knowledge and experience prior to being involved in

the study, and what she had noticed about her infant's responses to food in the week since the Observation had taken place. The mothers' comments were of four broad types:

- **Clarificatory comments:** These were used to augment the written narrative of the Observation and have been described in Section 3.3.1, above.
- **Speculative comments:** These concerned the infant's imagined physical or psychological experience, based on the mother's knowledge of her infant.
- **Comments attributing intent or meaning:** These were suggestions offered by the mother as to the intent behind the infant's actions or the possible meaning of elements of the encounter for him or her.
- **Reflections and insights:** These were prompted by the mother's reflections on her infant's behaviour, as seen both during the Observation and via the recording of it.

Table 3.12 Themes and sub-themes emerging from the data from Interview #2

Major theme	Sub-theme	Sub-sub-themes
Discovery versus ingestion	Food as a novel object	Piece treated in same way as a toy or other object
		Different from anything previously encountered
		Spoon and purée both of interest
	The need to explore	
Eating as a multi-sensory experience		
The experience of being spoon fed	General dislike	
	Intra-oral sensations	Unpleasant taste and/or texture
		Oral skills lacking
	Control of the feeding process	Desire to wield the spoon
		Desire to set the pace
Confusion and uncertainty		
Insights and take-home messages	Degree of difference between spoon and piece	Difference in taste and texture
		Difference in infant's reaction
	Lack of awareness during feeding	
	The infant's right to autonomy	

Table 3.12 shows the three major themes that emerged from the Interview #2 data, together with their sub-themes and sub-sub-themes. The three major themes concerned: the issue of food as something to be explored and discovered rather than eaten, the overall experience of being spoon fed, and the insights and take-home messages gained by the mothers.

Discovery versus ingestion

The mothers noted that the infants appeared, in the recording, to be more interested in exploring the food than in eating it. They considered that its novelty prompted the infant to explore it:

“He’s inspecting the actual thing rather than eating it. He’s just feeling it all.”
(Mother of Infant B)

“I think he’s just thinking ‘Oh, this is interesting.’” (Mother of Infant E)

“She’s looking at it, like, ‘Wow! What’s this?’ Fascinated.” (Mother of Infant H)

Food as a novel object

The mothers highlighted the fact that the infants treated the food, whether piece or spoon/purée, in the same way as they would a new object or toy:

“It seems to be more like a toy than food.” (Mother of Infant G)

“She really looked at it; she really was quite interested in the shape and what it was.” (Mother of Infant C)

“It’s just like she’s playing.” (Mother of Infant H)

However, this new ‘toy’ was different from anything the infant had experienced before, and behaved in unexpected ways:

“Now here the novelty is the texture of the thing. [...] This is different from anything else [...] and there are bits coming out. [...] And now’s the time to taste it [...] and again, he will have a surprise that there is a funny taste to it – not plastic or metal or fur.” (Mother of Infant E)

“I think that was a bit of a surprise: Normally she’d put something to her mouth and nothing would come off it.” (Mother of Infant D)

“It feels different to everything else he’s ever felt. [...] He’s just learning what it is, ‘cause everything else he’s felt is, like, hard, really, or really soft – it’s not, like, in between. You either have soft toys or you have hard toys; he doesn’t have anything that’s, like, semi, you know?” (Mother of Infant B)

“She seemed really fascinated by all the little bits on the tray.”
(Mother of Infant C)

When presented with a spoonful of purée, the infants appeared to be at least as interested in the spoon as in the food:

“She seems to be more interested in the spoon than the broccoli (purée).”
(Mother of Infant G)

“She just wants to hold the spoon.” (Mother of Infant C)

“I think she’s more interested in the spoon than what’s on the spoon.”
(Mother of Infant J)

“She’s quite keen to put more in – or whether she’s just keen to hold the spoon, I don’t know [...] I’d say she’s more interested in grabbing it.”
(Mother of Infant D)

The need to explore

The mothers highlighted their infant’s eagerness to explore the broccoli floret and to learn about it:

“And now the stalk [is] going into the mouth. It’s – I don’t know – maybe she’s just trying to figure out both ends.” (Mother of Infant G)

“He’s studying on how better to hold it ... just trying.” (Mother of Infant E)

“She wants to pull it apart.” (Mother of Infant J)

“She’s licking it. I suppose the bubbles ... it must like ... you probably would lick it when you first start tasting it ’cause it’s weird, isn’t it, that weird texture? So she’s probably licking it to see.” (Mother of Infant K)

Some suggested that the infant’s efforts to gain control of the spoon may have been prompted by a wish to study it rather than a desire to reject it:

“She’s really pulled back, as if to have a sniff and a look at that.”
(Mother of Infant G)

“He wants to grab the spoon. [...] Whether he wants to feel it? To investigate it for himself? [...] [Or] possibly a defensive action.” (Mother of Infant F)

One mother alluded to a possible connection between haptic learning and the intra-oral experience of texture:

“When she’s touching the texture of it, [it’s] like she was exploring what it might be like when it goes in her mouth.” (Mother of Infant C)

Eating as a multi-sensory experience

The infant's apparent use of all his or her senses to explore the food was considered noteworthy:

"[She's] looking at it now – really taking in what it looks like and what it feels like." (Mother of Infant H)

"It's quite a colourful thing to look at, isn't it, broccoli?" (Mother of Infant K)

"The visual appears to be quite important to him." (Mother of Infant F)

"She seems to want to touch it – that's what it looks like to me, anyway. [...] Having a good little smell as well." (Mother of Infant G)

"Of course, the fun bit is making a noise!" (Mother of Infant E)

"She's really, I would say, only running her tongue across the top of it. [...] She's not putting it in her mouth at all. She's sticking her tongue out to put it on her tongue but she's not actually getting any broccoli inside her mouth." (Mother of Infant D)

"He wants to look at it, you know. He's not just ... he's feeling it with his hands, he's putting it against his face. So, presumably, he's exploring it with ... well, he's obviously smelling it because he's bringing it up to his nose and mouth, so he's smelling, tasting and feeling. So he's engaging all those senses, isn't he? As well as looking." (Mother of Infant F)

One mother hinted that the opportunity to taste food before taking a mouthful might be important:

"I think she's fine with the taste, now, 'cause she's, like, eating it – stuffing it right in!" (Mother of Infant A)

Two mothers summed up the fact that the infant appeared to view the food from a perspective that was not the mother's own:

"I suppose I just take it for granted. Looking at it from the outside, from a fresh point of view, through G's eyes and her experiences, it seems that she's more interested in learning about the food itself than eating it." (Mother of Infant G)

"It is one hundred percent clear to me that he doesn't understand 'food'. He understands 'play'." (Mother of Infant E)

The experience of being spoon fed

Many of the mothers' comments indicated that they considered their infant showed a general dislike of being spoon fed with the puréed broccoli. They highlighted issues of

control, agency, confidence and enjoyment, and pointed to evidence in the infants' behaviour of unpleasant intra-oral sensations associated with the purée.

General dislike

The majority of the mothers considered that their infant disliked the broccoli purée:

"She didn't do the arching thing with the [piece] until she'd had enough, until she got bored. But with this one she's arching straight away. She really doesn't want it." (Mother of Infant K)

"Yeah, not impressed at all. [...] She really doesn't seem to be too keen on the spoon at all. [...] She was pushing away to the back of the seat, trying to move away from it." (Mother of Infant A)

Only the mother of Infant D thought her infant enjoyed the purée:

"She hasn't retched or coughed or pulled a face, so I'm guessing she quite likes it." (Mother of Infant D)

In contrast, most of the infants appeared to their mothers to enjoy their encounter with the piece:

"Ah, she's really enjoying it. Her eyes are really bright and really interested." (Mother of Infant K)

"I think she's enjoying it; she seems happy." (Mother of Infant A)

"I think she really enjoyed that." (Mother of Infant C)

Intra-oral sensations

The majority of the mothers considered that their infant disliked having the purée in his or her mouth:

"She's closing her mouth now. No, she doesn't want it. [...] She's trying to get it out of her mouth as quickly as possible." (Mother of Infant K)

"She doesn't want to swallow it, she wants to spit it out, get it out of her mouth. She's not happy with it being there." (Mother of Infant J)

"To me, looking at that, she's not enjoying that, really. [...] She doesn't seem as comfortable with it as she did when she had the floret in her mouth." (Mother of Infant C)

Some took the taste to be the unpleasant element:

"Obviously she doesn't like the taste of it, with the face she's pulling." (Mother of Infant J)

“He clearly doesn’t like the taste – he keeps scrunching his little face up.”

(Mother of Infant B)

Others suggested that the texture may have been responsible, either because it was itself unpleasant or because the infant lacked the oral skills to deal with it:

“She doesn’t seem to like [the purée] in her mouth. I don’t know if it’s the texture of it ... it seems to be as soon as it goes in it’s coming back out – sort of pushing it out of her mouth.”

(Mother of Infant G)

“Straight away there’s a little bit of a gaggy effect. [...] [The purée] was in there and she didn’t know what to do with it.”

(Mother of Infant C)

“She’s not spitting it out but she doesn’t seem to quite know what to do with it. [...] It’s just sitting on her tongue – she hasn’t swallowed it.”

(Mother of Infant D)

One mother pointed to a possible dislike of the sensation of the spoon inside the mouth:

“She’s not treating [the spoon] in her mouth the same way she did the floret. [...] It doesn’t look like it’s so nice.”

(Mother of Infant C)

Another felt that her infant’s negative experience with the purée affected his later response to the piece:

“I think the taste of the purée put him off trying the other food.”

(Mother of Infant B)

Control of the feeding process

Many of the mothers’ comments reflected what they saw as their infant’s response to a lack of control while being spoon fed:

“It seems that she wants to control the spoon. She’s not letting me put it into her mouth. She wants to be the one to put it into her mouth.”

(Mother of Infant G)

“She wants to have the spoon. I’m not sure how happy she is about me putting it in her mouth.”

(Mother of Infant C)

“I don’t think he likes it [that] I’m putting things in his mouth.”

(Mother of Infant B)

“She’s not happy with me putting anything to her mouth – it’s like she wants to do it herself. [...] She’s determined for me not to get it in.”

(Mother of Infant J)

Most offered no direct assistance to their infant during the piece event but one mother who did noted that her infant was similarly resistant to her efforts in that event:

"[He's] not interested in being helped." (Mother of Infant B)

Two mothers described the spoon as 'coming towards' the infant, reinforcing the idea that this was something that happened to the infant and was outside his control:

"She's still quite interested, as every full spoonful comes towards her."
(Mother of Infant D)

One related her infant's response to her own experience during Interview #1, which she had described as 'threatening':

"Perhaps it's because – similar to my experience with the spoon coming towards my face – again, for him that's a very un- ... he's never had that before." (Mother of Infant F)

Another alluded to a three-way link between being in control, having a chance to look at the food, and learning which foods are safe to eat:

"Now she wants to have a look at it. [...] She doesn't trust what's going in her mouth. She's fluttering her eyes. It's like, 'Hang on a minute – I want to do this.'" (Mother of Infant J)

Confusion and uncertainty

The mothers detected a degree of confusion and uncertainty in the demeanour of their infants, almost exclusively during the spoon event:

"Hmm, funny little expression here. He's pulling a face that's, sort of, he's not sure what's going on, I don't think. [...] It's almost like he's trying to escape from the situation. He doesn't really know what's going on."
(Mother of Infant F)

"I think she sort of chewed on the spoon 'cause the spoon was going to be part of what it was she was going to eat. She didn't understand that she had to get it off the spoon." (Mother of Infant C)

"[She] keeps kind of going for the spoon and then pushing it away again, like she's not quite sure. And even when she tries to put it in her mouth, then she kind of seems to remember 'No', and takes it out again." (Mother of Infant A)

The only evidence of uncertainty highlighted during the piece event was the apparent need, in one infant, for reassurance in a strange situation:

"[I] get a couple of glances of reassurance – she looks up as if to say, 'Is this alright? Can I do this?'"
(Mother of Infant J)

In general, the mothers appeared to feel that their infant had enjoyed the piece event more than the spoon event, and that he or she felt more confident of what to do when in control of what was happening.

Insights and take-home messages

The mothers revealed insights that they had gained through taking part in the research, some of which would influence, or had already influenced, the way they subsequently offered food to their infant.

Degree of difference between spoon and piece

The differences between the two feeding scenarios made an impact on the mothers, both in relation to the nature of the food itself and to their infant's reaction to it:

"The flavours shocked me: the difference between the stalk and the bubbles, and the mush being so different."
(Mother of Infant K)

"The first thing I've learned is to taste what I'm going to offer my baby myself."
(Mother of Infant C)

"It was surprising how much of a difference there was because, you know, broccoli is broccoli."
(Mother of Infant A)

"Best insight was from my experience of eating the food. That was really enlightening. I got the opportunity to feel the difference and there is no comparison! In one word, the difference was the pace."
(Mother of Infant E)

"It's shocking how there's a difference [in her behaviour]. I noticed there was a difference on the day but I didn't notice she was arching as much."
(Mother of Infant K)

Lack of awareness during feeding

For several mothers, watching the recording meant that they saw aspects of their own and their infant's behaviour that they had been unaware of at the time, and which they regretted not having recognised:

"I feel awful giving it to her. [...] Looking at it now, when she's pulling the 'I'm not sure about this' face, and the fact that I've just gone for another spoonful of it and I'm trying to put it in her mouth!"
(Mother of Infant G)

"I think one thing that really stood out to me was when I saw it from the angle of the video camera. I could see, with the spoon feeding, that there was some

in her mouth, which I didn't realise from where I was sitting. And so I'd kept putting more in, which was obviously making the gagging worse, 'cause I'm thinking, 'I need to feed her, I have to feed her'. So now, having seen that, if I did that again I'd be more aware of maybe what was in her mouth."

(Mother of Infant H)

"She's getting quite upset now – I didn't notice that before. [...] I feel mean now. I didn't notice how unhappy she was, before."

(Mother of Infant K)

"It was surprising to watch: there was such a clear difference in how she reacted. [...] It's obvious from the video but you don't notice at the time because you're so caught up in trying to feed them."

(Mother of Infant A)

The infant's right to autonomy

Some of the mothers talked about a change in their approach to weaning, and perhaps a greater respect for their child in general:

"I've learned to trust her more. I think I worry that she can't manage so I want to intervene. Doing the research made me step back a bit."

(Mother of Infant C)

"I've learned that my child can make a choice. Regardless of her age, she knows what she wants, what she likes, and she wants to do it herself."

(Mother of Infant J)

"Four years ago, I just did it by the book – you just did it, you tried again and again, and eventually ... My mum said she'd read it usually takes a baby six to eight goes before they'll even eat it. Now I'm thinking, 'Ooh. Does that mean if you keep forcing someone enough they'll eventually give in? Or is it just that everything's new and [they] have to get used to it?' I don't know. Do I keep trying or do I just leave her? This time I'm definitely looking more at the baby and taking her responses on board."

(Mother of Infant D)

Overall, the mothers presented evidence of having discovered some key differences between broccoli offered as a piece and as a purée, and between self-feeding with the fingers and being fed with a spoon.

Summary of the parents' reviews of their infants' and their own behaviour, and contribution to the research

Overall, the mothers considered that their infants appeared to engage more readily with the piece than with the spoon/purée, and that their responses indicated a desire both to examine the food/spoon with all their senses and to be in control of what was happening.

They noted that the infants acted on the food in much the same way as they would any novel object, and that they appeared not to understand the function of the spoon any differently. Finally, the mothers reported having gained new learning, both from the opportunity to try the same food as their infants and from the chance to review their infant's encounter with the food from a perspective other than that of caregiver.

The findings of Interviews #2 confirmed a number of aspects of the findings of the Observations, as well as providing new insights. The overall concepts of *exploratory behaviour*, *avoidant behaviour* and *controlling behaviour* were supported by the mothers' comments, as was the finding that *exploratory behaviour* was more prevalent in the piece event and *avoidant* and *controlling behaviour* in the spoon event. The mothers' descriptions of the infants' 'not knowing what to do' with the purée inside their mouth resonated with the researcher's observations of the *behaviours* 'Hold mouth open around item' and 'Unstick/eject' movement', as well as with the descriptions, given by the mothers during Interview #1, of finding the purée difficult to manoeuvre intra-orally.

The mothers' comments reinforced the concept of food as a novel object and the infants' apparent need to examine both the food and the spoon before putting or accepting it into their mouth. New insights for the researcher came from the mothers' highlighting of the relative lack of confidence displayed by the infants in the spoon event and their recognition of their own lack of awareness of their infant's responses when they (the mothers) were engaged in the task of feeding. Also of note was the increased respect reported by the mothers for their infant's views and abilities, following their involvement in the study.

3.4 Integrating and interpreting the findings

The final part of the analysis consisted of integrating the findings from the Observations with the findings from Interviews #1 and #2, in order to examine the infant's first encounter with food from all perspectives. This enabled a qualitative sense to be gained of the overall experience as lived by the infant, and constituted Stage 5 of the analysis of the Observations, as illustrated in Figure 2.2 (p.123).

Stage 5: Illumination of the whole

Examination of the infants' activity alongside that of the mothers revealed that consideration of the context in which the *behaviours* occurred, and comparison with the concurrent *behaviours* of both infant and mother, were necessary for valid interpretation, since attention to the incidence or duration of single *behaviours* in isolation could give a misleading picture of what took place. Contextualising the infants' conduct in this way, and viewing it in the light of the findings from Interviews #1 and #2, provided clues as to the sensations that may have

prompted or accompanied each individual *behaviour*, which in turn led to the emergence of possible explanations for why the infants acted as they did and allowed the meaning of the experience for the infant to be inferred. This meant that a rich sense of the infant's lived experience was gained.

Five factors emerged that appeared to play a role in determining the conduct of either the mother or the infant, or both:

- The developmental maturity of the infant
- The inherent features of spoon feeding as compared with self-feeding
- The physical properties of the food
- The interaction of the behaviour of the mother with that of the infant
- The order of the two events.

The significance of these factors and their importance in relation to obtaining a valid interpretation of the infant's overall behaviour is now described. This is followed by a summary of what the findings suggest may be key differences between the two feeding events as experienced by the infant.

3.4.1 The developmental maturity of the infant

The infant's level of maturity in relation to fine motor control and hand-eye coordination in part determined the opportunity afforded him or her to enact specific *behaviours*. This in turn affected the incidence of those *behaviours*. For example, the adept and delicate manner in which three of the infants (A, G and K) handled the broccoli floret led to fewer crumbs being released than was the case with infants who banged it or handled it in a more immature way. This meant that these three infants had less opportunity than the others to look at crumbs or smears of food, and to poke at, push or attempt to pick them up. Similarly, the incidence and duration of exploratory manipulative *behaviours*, including the use of a two-handed reach or grasp, were in part a reflection of each infant's maturity.

The infant's dexterity also determined some of the *behaviours* of the mother. For example, Infant A hardly ever dropped the broccoli floret and, when she did, she was able to pick it up again easily from the tray. It rolled out of reach only once, such that her mother was required to retrieve it and re-present it only once. For this reason, direct comparisons of single *behaviours* between infants or mothers were considered unlikely to be meaningful.

3.4.2 The inherent features of spoon feeding

There are a number of features inherent in a caregiver spoon-feeding scenario that are absent when the infant is feeding him- or herself, as evidenced in this study.

In the spoon event the mothers were responsible for loading the spoon and using it to offer the broccoli purée to the infant. Because of this, the overall activity level of the mothers was inevitably greater during the spoon event than with the piece and their attention was, of necessity, repeatedly taken away from their infant. That this was the case was supported by the findings from Interview #2, the parent's review of the infant's first encounter with food, in which several mothers commented that they had not noticed the extent of their infant's reactions during the spoon event. The mother's need to refill the spoon also meant that there were periods of time when the infant's attention was not occupied directly by the food but tended to be drawn to the activity of the mother. This offers an explanation for why the infants were noted to spend more time watching their mother's movements during the spoon event than they did in the piece event. It also offers a possible reason for the difference, between the two events, in the incidence of the mother's removing the spoon or food from the infant's grasp, and of the infant's releasing the item to the mother, since in the piece event the infant did not need to relinquish the floret in order for another to be offered. The only infant who needed or chose to release the broccoli floret to her mother's grasp was Infant K, although whether she did so *in order* to allow her mother to reposition it more securely in her palm could not be determined. In contrast, only two maternal activities appeared to be required for the infant to feed him- or herself: holding the item so that the infant could take it, and retrieving it if it rolled, fell or was pushed out of reach. This meant that the infants inevitably spent a greater proportion of the piece event than the spoon event managing the food independently.

The presence of the spoon in the mother's hand appeared to invite its use. Thus, while the mother who twice used the spoon to move a dollop of purée on the tray may otherwise have chosen to do this with her finger, she appeared to find the spoon convenient for the task. Similarly, a spoon lends itself to wiping the infant's lips or chin in order to re-present food that has 'missed' the mouth or been expelled by the infant. Several of the mothers used the spoon to deposit food in their infant's mouth (as opposed merely to offering it), by wiping it upwards against the infant's top lip or gum; none attempted a similar move with the piece. The findings of Interviews #2 support the notion that the mothers felt obliged to do this in the spoon event, in order to ensure that eating took place. The mother of Infant H commented during the Observation, as documented in the researcher's field notes, that she did this because "I didn't know what else to do". This suggests that she did not interpret H's *behaviour* 'Hold mouth open around item' as an attempt to avoid the food – or, if she did, that she chose to override it. In all, it appeared that, once the decision had been made to insert the spoon in the infant's mouth, there was an expectation that it should not come out again without at least some food having been transferred.

The finding that all the mothers except one had occasion to retrieve a dropped piece of food but that only one needed to retrieve the spoon reflects the evidence that the spoon was handled and controlled primarily by the mother. The result was that the infants rarely had an opportunity to drop or throw the purée or the spoon. This also explains why smears of food on the tray were rarely evident in the spoon event, meaning that there were limited opportunities available to the infants in that event to 'Look at crumbs or smears on tray'.

The relative inactivity of the mothers during the piece event presented a possible explanation for the generally greater prevalence, in that event, of the mother's resting her hand on the tray or arm of the infant's chair. This action sometimes appeared tentative, as if the mother were not clear what her role should be. It suggested a desire to be involved in what was happening, or the anticipation of a need to assume control, rather than a willingness to sit back and let the event unfold. The exception was the mother of Infant F, who did not rest her hand on the chair at all during the piece event but did so for over 31% of the spoon event, sometimes while holding the spoon to F's mouth with the other hand. In her case this appeared to reflect her generally greater involvement in the spoon event.

3.4.3 The physical properties of the food and/or the spoon

While the food was equally new to the infants in both formats, and therefore potentially attractive in either format for its novelty value, they displayed more positive engagement with the piece than they did with the spoon/purée. The data from Interviews #1, the parent's experience of the food, point to physical attributes of the food that may help to explain this. The mothers highlighted the variations in the colour and shape of the broccoli floret, as compared with the relative homogeneity of the purée, albeit accompanied by a potentially interesting spoon. This suggests the prospect of a richer experience with the piece. The mothers also described a variety of tastes and textures inherent in the piece that was not offered by the purée.

The different consistencies of the broccoli floret and the purée may themselves have contributed to some of the *behaviours* seen. This notion is supported by the sub-themes identified within the data from Interviews #1 concerning the comparative movement of the food inside the mouth and the action required to eat it. For example, several mothers found the purée less easy to manoeuvre and control within their mouth, which may have a bearing on the marked difference in incidence of the *behaviour* 'Hold mouth open around item', the 'shudder face'/flinch expression and the gagging and 'unstick/eject' movements seen in the infants in the two events. This notion is supported by the findings of Interview #2. The consistency of the purée also made it observably more adherent to the infant's skin than the crumbs of the broccoli floret, which may have promoted the greater amount of wiping of the infant's mouth and face seen during the spoon event.

Infants F and G showed one or more *avoidant behaviours* when the spoon was held near their mouth, although the reason for this was unclear. Removal of the spoon resolved the displeasure but did not reveal the cause. While their actions may have been prompted by a wish to examine the food visually the remarks made by some of the mothers in Interview #1, to the effect that the odour of the purée was stronger than that of the piece, point to a dislike of the purée's odour as a possible cause. In addition, both the stronger odour of the purée, if true, and the mother's actions in holding the spoon close to the infant's mouth (and therefore the nose) would have made active sniffing unnecessary, offering a potential explanation for the apparent difference in this *behaviour* between the two events.

It seems likely that gnawing on the spoon was triggered by the texture of the spoon itself, since puréed food does not lend itself to this action. However, because the spoon always had at least some purée on it, this cannot be stated with confidence. Almost all the nine infants who chomped or gnawed on the spoon appeared to do so in an exploratory manner. The comment by some of the mothers in Interview #2, that their infant did not seem to understand the purpose of the spoon – namely, to deliver the food – supports the notion that these infants were demonstrating exploratory, rather than eating, behaviour. The exception was Infant F, who, on the two occasions he displayed the chomping/gnawing *behaviour*, was noted to push himself back and turn his head, either at the same time or immediately afterwards. Since his mother was, at that point, in control of the spoon and attempting to insert the tip into his mouth, it seems likely he was in fact closing his gums on it in an effort to prevent this from happening, in an alternative version of his 'Pout or push against item with lips' gesture. He did not demonstrate this *behaviour* with the piece.

Although none of the mothers attempted to touch the purée with their fingers or speculated on what it might feel like to do so, and none opted to touch it to their lips, some commented, during Interview #2, that their infant had done this, noting that this would have been a new sensation for the infant.

3.4.4 The interaction of the behaviours of mother and infant

Many of the infants' *behaviours* appeared to be a response to a *behaviour* of the mother, rather than to the food itself, while some of the maternal *behaviours* appeared to be either moderated or triggered by one or more *behaviours* of the infant. A key example was the maternal *behaviour* 'Hold item to infant's mouth', which tended to last longer if the infant did not readily open his or her mouth.

The mothers did not seek to hold the broccoli floret if their infant was holding it. This is reflected in the fact that a passive hold by the mother was seen only with the spoon. Indeed, apart from the very brief (uncoded) moments where the food was being transferred from one

grasp to the other, joint holding did not occur at all during the piece event. Thus, the marked amount of passive holding by the mothers of Infants C and G seen in the spoon event was as much a reflection of the greater amount of time, compared with the other mothers, for which they allowed the infant to hold the spoon at all, as of the duration of joint holding *per se*. Overall, these two mothers, and to a lesser extent the mother of Infant D, appeared to display a greater overall responsiveness to their infant's cues than the other mothers, especially during the spoon event. The researcher's sense that this was the case, gained through watching each audio/video-recording as a whole, combined with the quantitative results, suggested that the maternal *behaviour* 'Hold passively, infant controls' was a marker for reciprocity within the spoon-feeding activity.

A 'simple hold' of the piece, in which the infant had full control of it but was directing his or her attention elsewhere, ended when the infant either dropped the food or 'rediscovered' it in his or her hand and began to move it purposefully once more. By contrast, in the spoon event simple holding was usually terminated by the mother's taking control of the spoon. In addition, in the spoon event infants commonly changed a simple or passive hold to an active pushing or holding away, in direct response to the mother's attempt to move the spoon closer to the infant's mouth. This type of action-reaction was also evident in reverse, such that the restraining of her infant's arm displayed by the mother of Infant B appeared to be triggered by the infant's efforts to touch the spoon.

The absence of the *behaviour* 'Turn head away from item' during the piece event is not surprising, since the infant could simply put the piece down, or throw or push it away, if he or she wished to disengage from it; without the intervention of the mother, there was no need for the infant to turn away. In the same way, turning away was seen less frequently in the spoon event for those infants whose mothers did not persistently hold the food to their mouth. Pushing or rearing upwards or backwards was a similarly quasi-redundant *behaviour* in the piece event. Infant D was the only infant to display this *behaviour* in that event, once apparently as part of the action of throwing the piece and once while her mother was wiping D's clothes. On neither occasion did this action appear to be a way of avoiding contact with the food, in contrast with the apparent purpose of this *behaviour* for the same infant in the spoon event.

The infant's attempts to avoid the spoon occasionally led to controlling *behaviours* by the mother that were not directly concerned with the feeding itself – a distinction that was probably not evident to the infant. For example, there were several instances, notably for Infant F and his mother, where the infant's attempts to avoid the spoon resulted in his clothing becoming dislodged, such that his mother needed to straighten it – an action he

appeared to dislike. Thus, the infant's own response to being spoon fed may itself have contributed to the unpleasantness of the experience for him.

Holding the mouth open around the food or spoon appeared to be a means for the infant to avoid accepting food into the mouth without actively turning the head or pushing the food away. This, too, occurred predominantly with the spoon/purée and appeared to be a response to the mother having inserted the spoon in the infant's mouth. It was seen only once with the piece, when Infant J appeared to change her mind about chomping on the floret, opting instead to lick it; since she was holding the piece herself, she was able to withdraw it from her mouth in order to achieve this. In contrast, the *behaviour* 'Pout or push against item with lips' appeared to have been developed by Infant F as a way of resisting his mother's attempts to insert the spoon into his mouth, after his efforts to avoid oral contact with it by holding his mouth open, turning his head and pushing himself backwards had been largely unsuccessful. This interaction appeared to operate in reverse, too: the findings of Interviews #2 suggest that wiping of the spoon against infant's top lip or gum was a response by the mother to the infant's holding his or her mouth open around the spoon.

The maternal *behaviour* 'Hold or turn item away (to allow infant time)' was demonstrated by only one mother during the piece event. It occurred twice, prompted both times by Infant J's signalling, via the 'fend-off' gesture, that she was intent on investigating the broccoli crumbs on her tray and did not wish to engage with the piece. The 'fend-off' gesture in this case appeared to be a response to the mother's intervention rather than, as in the instances seen in the spoon event, to the food (or spoon) *per se*. Similarly, the infant *behaviour* 'displeasure/anxiety face' was frequently triggered by actions of the mother that were not directly connected with the food, for example wiping of the infant's mouth or adjustment of his or her clothes, suggesting that the infant was responding to what the mother was doing rather than to the food itself.

While being in part a reflection of the infant's level of dexterity, the variation in the incidence and duration of manipulative *exploratory behaviours* between infants during the spoon event appeared also to be related to the freedom to handle the spoon and/or purée afforded by the infant's mother. Thus, opportunities for the infant to grasp the spoon, to touch, twist, turn, wave or bang it, or to hold it to his or her mouth were necessarily limited whenever independent holding was restricted, such that a low incidence of those *behaviours* inevitably followed. This connection is underlined by the case of Infant D, who was allowed more freedom to explore the spoon/purée than almost all the other infants and who was the only one to spend more time turning and twisting the spoon than she did the piece. In the same way, while the immaturity of the infants prevented any conclusions from being drawn about whether, when they appeared purposefully to drop or throw the food, they were trying to

discard or reject it or merely to experiment with it, the fact that this *behaviour* occurred only during the piece event reflects the fact that the majority were not allowed sufficient control over the spoon to have enabled them to drop or throw it.

All the infants grasped the piece but three (H, J and K) did not grasp the spoon. At first sight this might suggest that they were less interested in the spoon than they were in the piece but examination of the context reveals that this, too, correlates with these infants being given few if any opportunities to take hold of the spoon. By contrast, Infant A was provided with many opportunities to grasp the spoon but declined to do so. Had she accepted it readily, there would have been less call for her mother to offer it.

'Protrude tongue (no contact with item)' was another *behaviour* that appeared to be related to opportunities for exploration, in that the only infants to display it during the spoon event (D and E) were the two whose mothers accorded them the most freedom to handle the spoon. Similarly, those infants who were given the opportunity to do so showed an inclination to 'test' the food with their lips and/or tongue before allowing it into their mouth; for others the mother's control of the spoon tended to take away this option. The findings of Interviews #2 support the apparently greater opportunity accorded the infants for this type of exploration in the piece event, and their keenness to indulge in it.

Chewing or munching movements appeared to be inevitable when there was food in the infant's mouth. The differentiation of this *behaviour* from 'Chewing movements or lip-smacking (mouth empty)' thus enabled it to be used as a marker for the presence of food inside the mouth. The greater prevalence of 'Chewing or munching (food in mouth)' in the spoon event may be related to the greater incidence in that event of the introduction of food into the mouth by the mother, through insertion of the spoon and the use of lip/gum wiping – techniques that were utilised sometimes in direct response to an apparent reluctance on the infant's part to accept the food voluntarily. Thus, the incidence of 'Chewing or munching (food in mouth)' may be an indicator of the overall level of maternal control rather than of the infant's purposeful engagement with, and willingness to eat, the food. Indeed, the apparent relative lack of ingestion of food in the piece event, in which the control lay almost entirely with the infant, is itself an interesting finding, and supports the suggestion made by some mothers, during Interview #2, that eating was not the infant's primary goal.

3.4.5 The order of the two events

Analysis of the quantitative data according to whether the infant's first experience was with the piece (PFIs) or the spoon (SFIs) revealed a number of differences. In view of the small sample size and the likelihood, as discussed, that some *behaviours* were a feature of, for example, the maturity of the infant, for this part of the analysis a difference between the two

groups was considered significant only if the *behaviour* was displayed by three or more of the five infants in at least one of the groups, and if the difference was of the order of at least three times the magnitude of either the incidence or the duration.

Table 3.13 Differences in behaviours by event order

		Piece-first infants (PFIs)		Spoon-first infants (SFIs)	
BEHAVIOUR	Event → ↓ Measure	PIECE	SPOON	PIECE	SPOON
Hold item to mouth (infant)	Incidence (n)	79	22	54	24
	% Duration	42.6	9.0	9.0	8.8
Chomp, gnaw, bite or suck on item (infant)	Incidence (n)	37	28	1	16
	% Duration	25.6	6.6	0.1	2.5
Look at researcher (infant)	Incidence (n)	84	74	21	40
	% Duration	20.8	19.9	3.9	6.8
Chewing or munching (food in mouth) (infant)	Incidence (n)	37	61	0	55
	% Duration	17.5	38.9	0	42.8
Wave or hit item, or bang on tray (infant)	Incidence (n)	11	0	36	5
	% Duration	1.8	0	5.4	2.1
Look down or to the side, or close eyes (infant)	Incidence (n)	2	59	18	102
	% Duration	0.1	16.0	3.1	22.9
Displeasure / anxiety face (infant)	Incidence (n)	7	59	24	70
	% Duration	1.4	18.6	8.4	22.1
Chewing movements or lip-smacking (mouth empty) (infant)	Incidence (n)	9	0	79	13
	% Duration	3.9	0	37.2	3.6
Touch, press or scratch item with fingers or palm (infant)	Incidence (n)	43	11	72	40
	% Duration	11.0	3.0	26.7	12.2
Lean head towards item (infant)	Incidence (n)	4	3	3	10
	% Duration	1.5	0.4	0.8	3.4
Look at crumbs or smears on tray Infant)	Incidence (n)	19	1	39	4
	% Duration	8.6	0.4	16.2	1.3
Take item from infant, or hold out of reach (mother)	Incidence (n)	1	1	0	22
	% Duration	0.1	0.1	0	4.0
Wipe infant's mouth or chin with item (mother)	Incidence (n)	0	3	0	25
	% Duration	0	0.3	0	3.6
Rest hand on tray or arm of infant's chair (mother)	Incidence (n)	7	0	4	7
	% Duration	7.0	0	13.4	9.1
Hold mouth open around item (infant)	Incidence (n)	0	29	1	11
	% Duration	0	8.4	0.1	1.4

Table 3.13 shows the 15 *behaviours* for which a significant difference was observed between the PFIs and the SFIs. Four were *exploratory behaviours*, three were *avoidant*, two were *controlling* and six were *situational*. Colour-coding for the *behaviours* reflects that used in earlier tables; yellow shading in the results columns denotes the data to which attention is drawn. Findings for all *behaviours* and for individual infants can be found at Appendix XIII.

Comparison of the two groups showed that, in the **piece** event, infants who had previously experienced the spoon (SFIs):

- spent less time holding the piece to their mouth;
- chomped, gnawed, bit or sucked on the piece less often and for less long;
- looked at the researcher less often and for less long;
- showed no evidence of having food in their mouth;
- waved, hit or banged the piece more often and for longer;
- looked down or to the side, or closed their eyes more often and for longer;
- displayed the 'displeasure/anxiety face' more often and for longer;
- made more chewing and lip-smacking movements while their mouth was empty.

In contrast, in the **spoon** event, infants who had previously experienced the piece (PFIs):

- made fewer chewing and lip-smacking movements while their mouth was empty;
- touched, pressed or scratched the spoon/purée less often and for less long;
- leaned their head towards the spoon less often and for less long;
- looked at crumbs or smears of food on the tray less often and for less long;
- had the spoon taken from their grasp or held out of their reach less often and for less long;
- had their mouth or chin wiped with the spoon less often and for less long;
- had their mother rest her hand on their chair less often and for less long;
- spent more time than did SFIs holding their mouth open around the spoon.

These findings point to differences in the conduct of both mothers and infants in relation to the order in which the food was presented, suggesting that experience in the first event may have influenced behaviour in the second. Some support for this possibility was provided by the mother who, during Interview #2, speculated that her infant's experience with the spoon/purée may have 'put him off' trying the piece. While the data are too few to allow any conclusions to be drawn, this finding points to the possible importance of the infant's first encounter with solid food in influencing both his own subsequent responses and those of his mother.

3.4.6 The two events as experienced by the infant

It seems reasonable to assume that each infant's actions were prompted by what he or she was experiencing and that their purpose was to utilise, enhance, redirect or alter the unfolding situation in some way. Thus, while the unique sensations and emotions of each infant can only be surmised, consideration of the varying combinations of co-occurring *behaviours*, together with the findings from Interviews #1 and #2, point to some compelling messages about the manner in which he or she was experiencing what took place, and/or about his or her intentions in relation to the event. Some of these messages were very clear, while interpretation of others was more speculative.

Overall comparison of the two events revealed that the prevalence of *exploratory behaviours* by the infant was greater in the piece event, while *avoidant behaviours* by the infant and *controlling behaviours* by the mother were more common with the spoon/purée. In both events, the infants appeared to want to examine the food visually and manually, and possibly through smell, before taking it to their mouth, and then to explore it with their lips, tongue and gums prior to, or instead of, accepting it inside their mouth. However, in the spoon event, the mothers tended to put food directly into their infant's mouth, which had the effect both of preventing this extra-oral experience and of inducing ingestion earlier than may have happened otherwise.

Pushing or holding the item away was seen much more often in the spoon event than the piece event. It strongly suggested that the infant did not want to engage, either with the food itself or with the spoon, or wished to resist the mother's efforts to direct what was happening. This was reinforced by the co-occurrence of other *avoidant behaviours*, notably a facial expression denoting anxiety or displeasure and a turning away of the head. Sometimes, however, there was no head turn, especially if the infant's efforts to hold the food at arm's length were successful. In such cases the orientation of the infant's head and gaze tended to remain fixed towards the spoon. This suggests either a wish to keep the spoon or food in view, which points to a sense of suspicion or mistrust, or a desire simply to examine the item before, or instead of, bringing it to the mouth. Which of these objectives was the case could not be reliably determined, not least because in many cases the mother did not subsequently allow the infant to achieve what he was trying to do. For example, Infant F gave the appearance, through his combined *behaviours*, of trying to 'fight off' the spoon whenever his mother held it near his mouth. However, while the overriding message that he was not enjoying what was happening was clear, it was impossible to determine whether his intention was to reject the spoon or food outright, or merely to gain time to look at it before proceeding, since his mother consistently overrode his efforts. Both he and Infant G, who also showed obvious displeasure when the spoon was held near her mouth, may

simply have disliked the food being held in a position which effectively prevented them from focusing on it visually, or which forced them to inhale its smell.

The notion that at least some of the infants who pushed away the spoon may simply have been wanting to inspect or examine it is supported by the observation that most spent time looking at or manipulating the broccoli floret before, or in preference to, mouthing it. It is further supported by the findings from Interviews #1, which highlighted the appearance, smell and haptic qualities of the food as features of potential interest, and by the suggestion put forward by some of the mothers, during Interview #2, that visual inspection of the food may have been their infant's aim. Some infants alternated mouthing of the piece with visual inspection. Both Infant E and Infant F made a deliberate movement, while holding the floret, to push it away from their mouth, simultaneously showing a look of displeasure. Both then changed their expression to one of neutral concentration while looking at the piece, as if seeking or establishing a connection between the taste or texture they had just experienced and the food's visual appearance. Both subsequently took the floret back to their mouth, suggesting that they were not, in fact, distressed by the oral experience but merely puzzled and seeking to understand. Further support for this idea comes from the finding that those infants who were allowed to examine the spoon and its contents visually and manually showed less *avoidant behaviour* in the spoon event than those who were prevented from doing so.

Tongue protrusion without oral contact with the food occurred predominantly while the infant was looking at the piece or the spoon/purée, that is, while it was being held by either the infant or the mother at a point too far away from the infant's mouth for contact to be made. It was reminiscent of the tongue protrusion and licking seen to occur spontaneously in human infants in the first hour after birth when placed near their mother's breast (Widström *et al*, 2011). It appeared to be an anticipatory action but, unlike the apparently reflexive 'Open mouth' *behaviour*, it was seen only immediately prior to oral contact. This points to the tongue protrusion being intentional in nature rather than reflexive, and to visual exploration of the food being a precursor to oral exploration. An alternative explanation is that the tongue protrusion reflex becomes conditioned in breastfeeding infants in response to food, suggesting that the study infants, although not hungry during the Observation, did indeed view the broccoli as potentially edible.

While the infants could not relay the sensations produced by the food inside their mouth, in Interviews #1 the mothers described a more complex experience with the piece than with the purée, with the extra mouth time required to process the floret allowing a range of textures and tastes to be discerned. This contrasted with the purée's homogenous and 'pre-chewed' nature. The purée was also reported by the mothers to respond awkwardly to

attempts to chew it and to be more difficult to dislodge from the cheeks and palate and gather together for swallowing or ejecting. The *behaviours* 'Hold mouth open around item' and the 'unstick/eject' movement suggest that the infants, too, may have found the purée unpleasant and/or difficult to process – a notion supported by the interpretation of those *behaviours*, by their mothers during Interview #2, as indicating dislike. Overall, then, it would seem that the purée may have offered a less rewarding experience than the piece, as well as requiring the use of different oral techniques.

The mothers spoke, during Interviews #1, of feeling compelled to eat the purée and of a lack of control over the pace of what was happening when being fed by spoon, suggesting that some of the infants' *avoidant behaviour* in the spoon event may have been an attempt simply to slow things down. Indeed, some of the infants were clearly seen looking at their mother while holding the spoon away, which suggests an attempt to communicate something to her, rather than merely to avoid oral contact with the spoon. This notion is further supported by the comments of several of the mothers, in Interview #2, that their infant seemed confused as to what was happening. Viewed in conjunction with the evidence that indicated that more food was consumed by the infants in the spoon event, and with the active depositing of food in the infant's mouth by some of the mothers during this event, this points to a mismatch between the infant's intentions or wishes and those of the mother.

Both the researcher and the mothers in the current study recognised the broccoli, in both formats, as a food. There is no reason to suppose, however, that the infants shared this understanding, since their frame of reference thus far for satisfying hunger was restricted to breastfeeding. Similarly, because the infants had no prior experience of handling or being fed with a spoon, it is unlikely that their perception of the spoon was as something with which to convey food to the mouth – or indeed as something separate from the purée itself. This notion is supported by the comments of some mothers, in Interview #2, that their infant did not seem to understand the purpose of the spoon. In many ways, therefore, the infants' starting point was not the same as that of either their mothers or the researcher. Bower has remarked that "*the world of infants is not quite like the world of adults*" (Bower, 2002, p.131). His topic is the understanding of spatial relationships, which infants have to learn about through experience, but his comment is a reminder that the setting aside of our own prior knowledge is a pre-requisite for understanding how an infant might experience his first solid food.

3.5 Chapter summary

This chapter has presented the analysis and findings of the study in relation to its objectives. The findings revealed many observable differences between a self-feeding scenario (the

piece event) and one in which the infant was spoon fed (the spoon event), and suggested others that may have formed part of the subjective experience of the infants in the two events. The apparently contrasting dynamics at play, and the disparate opportunities available to the infant, raise questions about whether the feeding method may have implications for the infant's later relationship with food. The next chapter further explores the possible nature and significance of the differences exposed by the study.

Chapter 4 – Discussion

Chapter 3 has presented the findings of the study, which point to a number of ways in which self-feeding and spoon feeding may have been experienced differently by the participating infants. This chapter compares the findings with the research questions and with existing knowledge. It looks at the appropriateness of the chosen methodological framework, the effectiveness of the research methods and the limitations of the study. The potential implications of the study are explored, for infant development and health, for infant feeding policy and practice, and for future research.

4.1 Answering the research questions

The overarching research question spanning this study was:

What can observing infants of around six months tell us about how their first experience of solid food differs according to whether the food is presented as a piece, for the infant to pick up, or as a purée, on a spoon held by the parent?

This incorporated six more specifically focused questions, which arose directly from the literature review:

1. Do infants of six months approach their first solid foods in the same way as they do other novel objects?
2. Do the visual, olfactory and haptic qualities of food appear to be important to them?
3. What impact, if any, does the format of the food have on the infant's response to it?
4. What impact, if any, does the feeding method have on the infant's response to the food?
5. What impact, if any, does the feeding method have on the interaction between infant and caregiver?
6. How might any observed or inferable differences between spoon feeding with a purée and self-feeding with graspable pieces of food affect the development of food preferences and/or common feeding problems?

The discussion will begin with the first five of these questions; the sixth will be considered in Section 4.3.2, which looks at the possible implications of the study for infants' longer-term relationship with food.

4.1.1 Food as a novel object

The study provided what appears to be a clear answer to the question, *Do infants of six months approach their first solid foods in the same way as they do other novel objects?* The Observations revealed *exploratory behaviour* to be a key characteristic of the infants' encounter with the food; this was especially so in the piece event, with the data suggesting that it would have been seen more in the spoon event had the infants been freer to handle the spoon. The *exploratory behaviours* displayed by the infants mirrored those that have been shown to be part of infants' exploration of novel objects (Ruff, 1980, 1984, 1986, 1989; Palmer, 1989; Rochat, 1989; Ruff *et al*, 1992); they also mirrored the behaviour of non-human primates in response to novel foods, as described by various researchers and compared by Power (2000). This suggests that human infants do indeed approach new foods in much the same way as they do novel objects, although whether this is primarily a survival technique (Gallahue and Ozmun, 2002) or simply part of their 'need to know' (Gibson, 1988) is not clear.

As has been pointed out, many foods offer combinations of properties similar to those found in sand, clay and paint (Hughes, 2010). The keenness of the study infants to explore the food reinforces the notion put forward by Goldschmied and Jackson (2004) and Duffy (2004), that handling food may provide a useful foretaste of play with this type of material. Indeed, if self-feeding represents the biological norm for human infants, as it does for non-human primates, it is possible that 'playing' with food, rather than being a foretaste of play with other 'messy' materials, is simply the natural precursor to it.

4.1.2 The importance to the infant of the various sensual qualities of the food

The study provided a series of answers to the question, *Do the visual, olfactory and haptic qualities of food appear to be important to infants of six months?* The infants were observed to poke and scratch the food, which matched the 'fine haptic scanning' described by Rochat (1989) and suggested an interest in the surface texture of the food. They also twisted and turned it, allowing them to inspect it visually from all angles and to assess its size and shape (Soska and Johnson, 2008; Soska *et al*, 2010). Hitting and banging were common in both events; however, the broccoli floret afforded little reward from this activity. In contrast, the infants who were free to bang the spoon were able to elicit a loud noise, with one infant apparently particularly keen to repeat this part of his examination. It can be inferred that the infants were deriving information about rigidity, weight and the possibilities for creating sound, as suggested by Palmer (1989), Bushnell and Boudreau (1993) and Bourgeois *et al* (2005), as well as about the visual appearance of the food. In addition, the observed licking, mouthing, gnawing, biting and sucking will have provided them with supplementary

information about size, shape and texture (Ruff, 1984), as well as allowing them to experience the temperature and flavour of the food – information useful in its own right and which may have assisted them to manage it intra-orally (Gibson and Walker, 1984).

In addition to exploring the food with their hands and mouths some of the infants also appeared to sniff it. This suggests that, like the young of other primates (Ueno and Matsuzawa, 2005), human infants use their sense of smell to gain information about food. In addition, since there is no reason to presume that the infants knew in advance that the broccoli constituted food, and since their other *exploratory behaviours* matched those they might be expected to use to explore novel objects, it seems likely that human infants routinely sniff all unfamiliar items. This conflicts with Power's (2000) conclusion that sniffing is not part of the repertoire of exploratory actions employed by human infants, while reinforcing the arguments of Goldschmied and Jackson (2004) and Keenan and Evans (2009), that odours are an important way for infants to learn about the world around them.

The role of odour in the detection of flavour is well established (Ganchrow and Mennella, 2003) but the current study provided an interesting additional insight into the interplay of the senses during eating. This was illustrated by the comment, made by two mothers in Interview #1, that the broccoli tasted 'green'. This echoes the study by Booth *et al* (2010), in which participants described a food's odour as 'green', and provides an interesting counterpart to the findings of Spence *et al* (2010), that colour affects the perception of flavour.

There was no evidence that the visual appearance, smell and haptic properties of the food were any less important to the study infants than its flavour or intra-oral texture. Indeed, they seemed to want to use these other senses to understand the food before allowing it past their lips. This raises the possibility that by-passing this exploratory stage by placing food inside an infant's mouth, as has been seen to be the usual procedure in many studies involving infants (e.g. Maier *et al*, 2007; Mennella *et al*, 2008; Nicklaus, 2011), and which appears to be the accepted norm during weaning, may increase the likelihood of his rejecting it. Ironically, while Schwartz *et al* (2013) maintain that the central aim of the weaning period should be to expose the infant to a range of flavours, according to Auvray and Spence (2008) the involvement of all the senses may be necessary if a full flavour experience is to be achieved.

In contrast to the infants' attention, when permitted, to the affordances of the piece and the spoon/purée, the absence of comments by the mothers (Interviews #1), on the potential haptic qualities of the purée and on the appearance, texture or other properties of the spoon, mirrored the impression gained during the literature review that purées and spoon

feeding are seen as a 'given' in the industrialised world, with their novelty and potential interest for the infant rarely acknowledged.

4.1.3 The impact of the format of the food on the infant's response to it

The combined findings from the Observations and Interviews offered several answers to the question, *What impact, if any, does the format of the food have on the infant's response to it?* First, its semi-solid texture meant that the purée was not able to be picked up for examination in the same way as the piece. This restricted the degree to which many of the infants' spontaneous *exploratory behaviours* could be applied to it, except in conjunction with the spoon. On the other hand, the spoon/purée combination offered more potential affordances related to smearing and banging than did the piece, albeit that few of the infants were accorded the freedom to discover these. Thus, the two formats offered two inherently contrasting experiences. The opinion of the mothers (Interviews #1) was that the attributes of the broccoli floret meant that it offered a more interesting, varied and pleasant experience than the spoon/purée. Given that other 'whole' foods differ from one another (and from broccoli) in size, shape and texture in a way that purées do not, it seems reasonable to predict that offering the majority of foods as graspable pieces may make weaning a more varied overall experience for infants than that available if only purées are used.

The 'unstick/eject' movement, the 'shudder face'/flinch expression and the gag reflex were all seen more often in the spoon event. They appeared to indicate a challenging or unpleasant oral experience, an interpretation that was supported by the comments of the mothers (Interviews #1) concerning the difficulty of manoeuvring the purée inside the mouth and of ejecting it, and the inefficacy of chewing as a mechanism for dealing with it. This tallies with Delaney's (2010) finding that purées appear to be less easy for older infants to manage than is generally believed, and with that of Waldron *et al* (2003) and Lucas *et al* (2004), that puréeing food alters its viscosity and causes it to adhere to the lining of the mouth. It may be that the ability to chew, present from around six months (Naylor, 2001) makes this the technique of choice for infants of this age, such that biteable foods are better suited to their skills – a notion supported by the evidence that lip-clearing of a spoon is a learnt rather than a spontaneous behaviour (Van den Engel-Hoek *et al*, 2014).

The mothers reported (Interviews #1) that they found eating the piece more rewarding than eating the purée because of the sense of engagement with the food and the opportunity to experience changing textures and variations of flavour. Chewing is known to permit the gradual release of flavours and allow them to be experienced for longer (Waldron *et al*, 2003; Zijlstra *et al*, 2009). This may, of course, be considered a disadvantage when a parent is trying to persuade a child to eat food he does not like, or is in a hurry to 'get the child fed',

but the use of food that does not need to be chewed effectively denies the child a potentially extended pleasant experience.

The findings from Interviews #1 suggest that the odour of the purée was stronger than that of the piece. Evidence from the Observations indicated that the infants did not like having the spoon held immediately under their nose, although this may have been for reasons unrelated to smell. A question remains, therefore, as to whether the effect of puréeing on the odour of food affects the way infants respond to it. The effect of puréeing on the flavour of the food may also have influenced the infants: while the mothers in the study disagreed about whether the purée or the piece had the more intense flavour, they tended to agree that the two were not the same. It is therefore possible that infants may prefer the flavour of one format over the other.

As discussed, puréed foods lend themselves to being fed by spoon. In addition, their semi-solid properties, coupled with the lack of lip-clearing ability in infants who have not yet been required to learn this skill (Delaney and Arvedson, 2008), means that they appear also to invite techniques such as wiping the spoon against the infant's top lip to deposit food in the mouth and using the spoon to collect ejected food from the area around the mouth – maternal *behaviours* that were seen in the spoon event, and which tended to trigger avoidant responses in the infants, but which had no equivalent in the piece event. This points to the impact on the infant of the format of the food being partially mediated by the mother's behaviour.

4.1.4 The impact of the feeding method on the infant's response to the food

The study offered some compelling answers to the question, *What impact, if any, does the feeding method have on the infant's response to the food?* The spoon event necessarily entailed greater activity on the part of the mothers, not least because of the need to refill the spoon. This appears to have led to the infants' spending more time watching their mother's movements and less time looking at crumbs or smears of food, as compared with the piece event. Similarly, the fact that the infants tended to have greater control over the piece than over the spoon/purée contributed to the reduced incidence, in the piece event, of their holding the food simultaneously with their mother (either passively or not) or releasing it to her grasp, and the increased incidence in that event of their holding the food while their attention was elsewhere ('simple hold'), of purposefully dropping or throwing the food and, the evidence suggested, of actively sniffing it. Thus, the basic level of maternal control inherent in spoon feeding – and consequent reduction in the degree of agency accorded to the infant – itself appears to have altered the nature of the infants' interaction with the food.

The spoon event was characterised by a predominance of both *avoidant* and *controlling behaviours* and a relative absence of *exploratory behaviours*. The *avoidant behaviours* exhibited by the infants suggested either a reluctance to engage with the spoon/purée or a wish to do so in a different manner or at a different pace from that dictated by the mother. There was a sense that the mothers' actions 'got in the way' of what the infants were trying to achieve, an interpretation that constitutes an interesting reversal of the situation as described by Chatoor (2012), who considered that the infants' actions impeded those of the mothers. Many of these *behaviours* mirrored those identified by researchers such as Bober *et al* (2001) as signs that an infant or young child is 'off task' while being fed. However, if the 'task', as seen from an infant's point of view, is to become acquainted with the food through exploratory play, and to discover what it affords, it follows that the mother's *controlling behaviours* are what Gopnik (2009) describes as "*competing sensations*", which must be 'tuned out'. On this account, actions such as turning the head and pushing away the spoon are evidence of the infant's being very much 'on task'.

The infants were freer, in the piece event, to focus on the food. This was evidenced not only by the greater amount of *exploratory behaviour* seen in that event but by the fact that they displayed little in the way of facial expressions denoting either pleasure or displeasure. This finding concurs with the separate dimension of focused attention described by Lewis (2002), and offers further support for the concepts of 'wallowing' (Bruce, 2004) and 'flow' (Nakamura and Csikszentmihalyi, 2002) in relation to infants' play. If infants' early interaction with food should rightly be allowed to accommodate exploratory play – as well as, or prior to, eating – it follows that the role of the adult is not actively to direct what the infant does but rather to be "*attentive*" (Goldschmied and Jackson, 2004), thereby enabling the infant to focus on the task at hand. This interpretation is in direct conflict with the principle of eye contact and face-to-face interaction, which is said to be a key element of responsive feeding (Chatoor *et al*, 1997; Mentro *et al*, 2002; PAHO, 2003) but which necessarily draws the infant's attention away from the food.

The tendency of the infants to hold their mouth open round the spoon, which was interpreted in the current study as an *avoidant behaviour*, brings to mind Delaney and Arvedson's (2008) finding that infants commonly open their mouth wider than necessary to take food from a spoon. It suggests that more than one interpretation of this phenomenon is possible, and that the action may be a deliberate attempt to avoid contact with the food, rather than being a sign of either immaturity or inexperience.

Both controlling parental practices and negative mood during mealtimes have been shown to contribute to the development, in young children, of dislike for the food being presented at the time (Koivisto *et al*, 1994; Fisher *et al*, 2002; Bante *et al*, 2008; Gregory *et al*, 2011; van

der Horst, 2012; Ystrom *et al*, 2012). If the same is true for infants, then the predominance of both *avoidant behaviour* by the infant and *controlling behaviour* by the mother, as seen in the spoon event, may indicate that spoon feeding itself has the potential to lead to the dislike of certain foods. Conversely, the infants' active engagement with the food in the piece event suggests that self-feeding may be a way to enhance infants' liking for a range of foods.

4.1.5 The impact of the feeding method on the interaction between infant and caregiver

The findings of the study offered several answers to the question, *What impact, if any, does the feeding method have on the interaction between infant and caregiver?* Key to the nature of the interaction between mother and infant was which of them was in control of the food. In the piece event this was predominantly the infant, while in the spoon event control lay chiefly with the mother.

Avoidant behaviour by the infants was seen more in the spoon event and appeared to be related to a loss of control and thwarting of goal achievement, in line with the manifestations of frustration, anger and sadness reported by Lewis and Ramsay (2005) as being common in such situations. Maternal *controlling behaviours* also predominated in the spoon event. Some of these, such as inserting the food or spoon in the infant's hand, may have been intended as supportive rather than controlling but they nevertheless ran counter to the infant's intentions. As such, they were reminiscent of the 'intrusiveness' described by several authors as being contrary to the synchrony that exists when mother and infant are attuned to one another (Kaitz and Maytal, 2005; Feldman, 2007; Barrett and Fleming, 2011). Although the mothers in the study were not asked the reasons for their *controlling behaviour*, their actions appeared to reflect Orrell-Valente *et al's* (2007) assertion that the goal of most parents is to maximise the amount eaten by the child. This, in turn, is supported by the small amount of evidence that more food was indeed ingested in the spoon event. In contrast, during the piece event the mothers rarely intervened in their infant's handling of the food except to bring the broccoli floret within reach when it had fallen or rolled away, thereby providing spontaneous 'scaffolding' (Wood *et al*, 1976) for the infant's own efforts.

In the spoon event, in order for food to be ingested the infants needed only to comply with their mother's feeding attempts. This involved little more than opening the mouth. Conversely, they had actively to resist her efforts, often using their whole body, if they wished to *avoid* eating. This contrasted with the piece event, in which the infants needed to assume the role of agent in order for eating to happen and in which disengagement with the food was the default situation if they simply did nothing. This compliant-active power dichotomy echoes the descriptions of (spoon) feeding situations in research such as that of Bober *et al* (2001) and Woods *et al* (2010a), in which the infant or child's behaviour is

described in relation to the caregiver's active attempts to feed him. At the same time, it reflects Brown and Lee's (2011b) findings that maternal control is lower when infants feed themselves. It also echoes the difference in the locus of control and amounts of food ingested noted to exist between breastfeeding, which is predominantly infant-led, and bottle feeding, which is largely carer-led (Wright *et al*, 1980; Li *et al*, 2010; Brown *et al*, 2011).

Contrary to the assertion of Harris and Booth (2006), that "*the age of approximately 12 months [...] marks the beginning of the age of autonomy*" (p.101), the findings from the current study suggest that infants as young as six months are capable of autonomous thought and action and that they exhibit *avoidant behaviour* and signs of distress when their agency is overridden. Further, the comparative lack of such behaviour in the piece event calls into question the assertion by Morawska *et al* (2014) that food refusal is a necessary part of the feeding of infants, suggesting instead that this may apply only when an infant is being actively fed by a caregiver. It is possible that, merely by assuming the active role, the parent may be unwittingly inducing either passivity or resistance (or both) in the infant.

Interrelation of the maternal and infant behaviours

The *behaviours* identified as belonging to three of the four themes identified in the analysis of the Observations appeared to be interrelated; this interrelationship may in part explain the observed impact of the feeding method on the maternal-infant interaction. Overall, compared with the piece event, the spoon event was characterised by:

- **less *exploratory behaviour*** by the infant
- **more *avoidant behaviour*** by the infant
- **more *controlling behaviour*** by the mother

The most noticeable feature of the interrelationship of these groupings was that the presence of maternal *controlling behaviour* appeared to be associated with that of *avoidant behaviour* by the infant. Powell *et al* (2011) found that parental pressure to eat predicted avoidant behaviour in three- to six-year-olds, suggesting that the controlling behaviour preceded the avoidant response. However, Pelchat and Pliner (1986) considered that controlling maternal behaviour was as likely to be a consequence of avoidant eating behaviour by the child as an antecedent of it. Dattilo *et al* (2012) concurred with the latter view, having found insufficient evidence to support a one-way causal relationship. The findings from the current study tend also to support this view, no clear chronological relationship having been identified between the two types of behaviour.

The findings indicate that *exploratory* and *avoidant behaviour* by the infant were incompatible, such that an increase in one was associated with a decrease in the other, and that a similar incompatibility existed between *exploratory behaviour* by the infant and

controlling behaviour by the mother. This suggests that the *avoidant behaviour* may have been a manifestation of frustration at being prevented from indulging in *exploratory behaviour*, rather than a direct response to *controlling behaviour*. Alternatively, if the *avoidant behaviour* was triggered by *controlling behaviour*, the decrease in *exploratory behaviour* may simply have been an inevitable side effect.

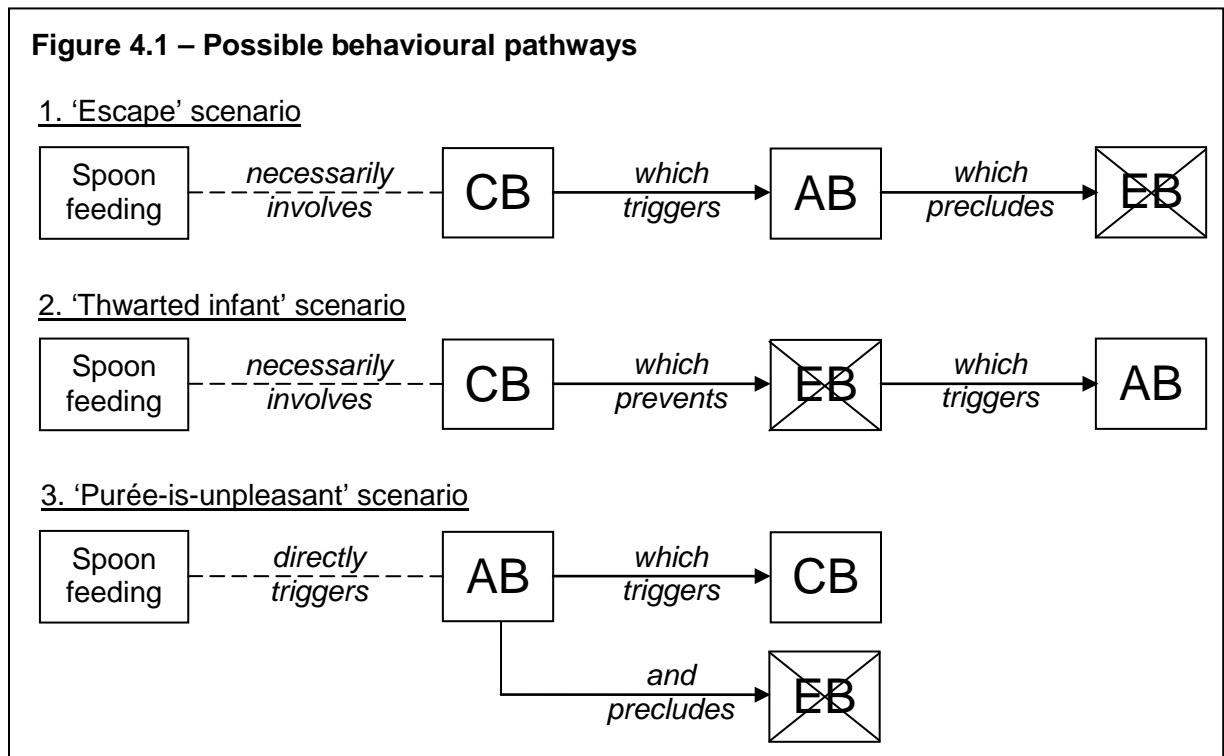


Figure 4.1 illustrates three possible behavioural pathways which may explain the inter-relationships between *exploratory behaviour* (EB) and *avoidant behaviour* (AB) on the part of the infant, and *controlling behaviour* (CB) by the mother. Each pathway relates to a proposed scenario. The arrows represent the direction of the effect and the crossed boxes denote behaviour that is prevented.

The first scenario is the 'escape' scenario. In this scenario the *controlling behaviour* inherent in spoon feeding represents a threat to the infant's role as agent, leading him to respond with *avoidant behaviour* (Lewis *et al*, 1990; Deci *et al*, 1993). This behaviour then becomes his focus, effectively precluding him from engaging in *exploratory behaviour*.

The second scenario is that of the 'thwarted infant'. This also starts from the premise that spoon feeding is inherently controlling but posits that the caregiver's control of the spoon necessarily prevents the infant from handling it, thereby making *exploratory behaviour* impossible. Thwarting of the infant's apparently instinctive and imperative goal of discovery (Gopnik, 2009) results in *avoidant behaviour* (Lewis *et al*, 1990; Deci *et al*, 1993).

The third scenario is the 'purée-is-unpleasant' scenario. This proposes that the infant's dislike of the food itself, or of having it inserted in his mouth, triggers *avoidant behaviour*. This both prompts *controlling behaviour* by the mother and precludes *exploratory behaviour* by the infant.

As seen, many researchers have identified control during weaning as a potential trigger for friction in the parent-infant relationship (e.g., Chatoor and Ganiban, 2003; Linschied *et al*, 2003; Davies *et al*, 2006; van Dijk *et al*, 2009). Others have suggested that self-feeding may reduce this risk (Brown and Lee, 2011b, 2011c; Wright *et al*, 2011; Cameron *et al*, 2012a). The scenarios described above offer three possible mechanisms by which spoon feeding with puréed food may lead to conflict, either through a direct struggle for control between caregiver and infant (the 'escape' scenario), through the prevention of opportunities for exploratory play (the 'thwarted infant' scenario), or through the infant's dislike of the format of the food itself (the 'purée-is-unpleasant' scenario). Further research may help to identify which of these scenarios is the more likely, or whether all – and perhaps others – are possible.

4.2 Reflection on the chosen methodology and research methods

Spradley (1980) has said that “[t]he physically handicapped live in a different world from those not handicapped even though they live in the same town” (p.16). It could be said that infants live in a different world from their parents and caregivers, even though they may share the same space. This concept is echoed by McNeill and Chapman (2005), who, when summarising the work of George Mead in relation to the development of phenomenology and interpretive sociology, state that:

“if we want to explain social actions, we have first to understand them in the way that the participants do. We must learn to see the world from their standpoint.”
(McNeill and Chapman, 2005, p.19)

Hunleth points out that “adult researchers’ interests often overshadow what is actually important to children” (Hunleth, 2011, p.82). As seen, this is reflected in the majority of the existing research into infants’ eating, which, through adoption of a positivist approach, has tended to ignore motivation (Graue and Walsh, 1998) and reduce the infant’s experience to a black-and-white ‘acceptance’ or ‘refusal’, or to a calculation of the number of bites taken. The current study aimed to obtain a glimpse of the world of the infant during his first encounter with solid food. By taking an interpretive approach, it was able not only to show how the ten infants responded to food offered in two different ways, but also to begin to understand what they were communicating about their experience, and to shed light on their motivation for behaving as they did.

The use of parental interviews appears to have succeeded in illuminating the observational findings. In particular, the decision to use a semi-structured format, and to invite the parents to describe their experience of eating the food in their own words (Interview #1), helped to elicit descriptions and insights beyond those anticipated by the researcher. This approach has been shown to be particularly useful where research into eating is concerned, because of the difficulty of reading the mind of the participant and the risk of limiting the information to be gained by providing them with predefined words to describe their experience (Mobini *et al*, 2011). A pleasing example of the value of this decision was the description, by two of the mothers, of the broccoli's flavour as 'green', which was not a word that the researcher would have suggested for this purpose. As hoped, the viewing of the audio/video-recording of the Observation by the infant's own mother provided useful insights and additional data; serendipitously, it also pointed to the potential value of 'video interactive guidance' (Kennedy *et al*, 2011) in helping parents to manage feeding situations sensitively.

The use of quantitative data within the study achieved the aim of temporarily isolating individual *behaviours* from their setting. This served to minimise the effects of researcher bias and allowed meaningful comparisons to be made, both between the events and between the infants. It also prevented the author from leaping to conclusions about the findings, or 'cherry picking' when reporting them, while at the same time increasing the internal generalisability of the study (Maxwell, 2010). As promised by Maxwell, the inclusion of numerical data helped to uncover information and determine patterns that might otherwise not have been seen, "*providing a clearer and more in-depth understanding of what [was] going on*" (Maxwell, 2010, p.479). In particular, it showed the extent of the variations in occurrence of the *behaviours*, which turned out to be more startling in some cases than the 'naked eye' view suggested, while also revealing unique incidents that illustrated the diversity within the data. In contrast, the background data collected on each infant contributed little to the study, although it is useful to be able to state, for example, that all the infants were Caucasian, or that only two had erupted teeth. In a larger study, designed to utilise statistical analyses, factors such as gender, birth order and maternal education might well be shown to have a bearing on both infant and maternal behaviour in relation to feeding.

The study can be considered valid, partly because of the measures taken to ensure the accuracy of the interview transcripts and the quantitative element of the analysis of the audio/video-recordings but also because it meets Silverman's (2010) criterion of raising doubts about previously accepted 'truths' and identifying questions that warrant investigation in the future. Its reliability, while being difficult to ensure owing to the interpretive nature of the enquiry, was maximised by the recording of the Observations, the use of a detailed

coding scheme for the analysis of the Observations, the implementation of an inter-rater reliability check and the maintenance of a meticulous audit trail.

The adoption of a zooming-in and zooming-out approach appeared to achieve its aim of preventing the researcher from losing sight of the whole even though she immersed herself in the specific for long periods of time. In addition, the combination of Observations of the infants and Interviews with their mothers provided the additional insights hoped for, while grounding the study in the world of real babies. The result was a wide-ranging and meaningful answer to the question, *What can observing infants of around six months tell us about how their first experience of solid food differs according to whether the food is presented as a piece, for the infant to pick up, or as a purée, on a spoon held by the parent?*

4.2.1 Limitations of the study

The study has a number of limitations. Firstly, it concerned just ten infants, all aged around six months, during a single, initial encounter with one type of solid food. No generalisations are therefore possible concerning older infants or later mealtimes involving this or other solid foods. All the mothers and infants were Caucasian and the mothers were well-educated; a study involving participants from different ethnic groups and educational backgrounds, and fathers rather than mothers, may have produced different results. It is also possible that the absence of male infants in the piece-first group may have distorted the findings for that group.

The method of recruitment to the study meant that only parents who belonged, or had friends who belonged, to the Internet groups selected could be recruited. This meant that all the mothers who volunteered had at least heard of baby-led weaning (BLW), and had either practised it with a previous child or were considering doing so with this baby. Their opinion of this approach to the introduction of solid foods was therefore already favourable. This may have made them more willing to take part in the research than mothers who had not heard of it. It may also have affected their interpretation of the intentions of the researcher and of what was required of them. For example, they may have been keen to show spoon feeding in a bad light, leading them deliberately to act in a controlling manner during the spoon event. Alternatively, their bent towards BLW may have made them *less* likely to adopt the degree of control when spoon feeding that others might have done. The data obtained may have been skewed in either direction as a result.

A similar limitation arises from the fact that the mothers knew of the researcher's interest in baby-led weaning and had in all probability previously heard her name mentioned in association with it. This may have made them eager to impress her, or even caused them to be mildly 'star-struck'. This in turn may have affected both the naturalness of their behaviour

during the Observation, and potentially therefore that of their infant, and the frankness with which they shared their thoughts during the Interviews. The mothers also knew that the researcher had been a health visitor. This information was given with the intention of engendering trust but it may have meant that they felt obliged to adopt a specific role in her presence. In particular, if their prior experience of health visitors was not favourable they may have been on their guard and reluctant to behave naturally or respond honestly. It is possible, too, that the fact that the researcher carried out the research on her own, and that she was a woman and herself a mother, may have influenced the nature of the relationship she was able to establish with the mothers, thereby affecting both the conduct of the research and the data obtained.

The lack of guidance given to the mothers on how to offer the purée will have resulted in each infant's experience being unique, and therefore not readily comparable with the next infant – something that the small number of participants in the study may have exacerbated. The differing amount of physical control exerted by each mother in the spoon event may also have accounted in part for the variation in the degree of difference between the two events noted between the infants. In relation to Interviews #1 and #2, the researcher's stated intention of comparing self-feeding and graspable foods with spoon feeding and purées may have meant that the mothers neglected to offer comments relating to attributes of either the food or their infant's behaviour that they perceived to be the same for both formats/feeding methods. In addition, their already favourable opinion of BLW may have coloured their comments about the differences they reported when eating the food themselves, leading them to exaggerate or play down certain of the sensations they were experiencing.

The use of broccoli, a food very different in appearance and texture when presented 'whole' as compared with when made into a purée, may have produced results that were more dichotomised than would be the case with another food. While this has been justified in relation to the pioneering nature of this research it means that generalisations to other foods cannot be made. The use of food served at room temperature may also have influenced the findings, especially since the infants' only experience of food thus far was breastmilk, delivered at body temperature. It is the researcher's professional experience that most parents offer their infants puréed food at room temperature but it may be that 'whole' foods are more often offered warm, especially as part of a shared meal. However, given that the main focus of the study was on the consistency of the food and the method of feeding, the decision to serve both formats at the same temperature allowed a better comparison between the two events.

As discussed, it was not possible to engineer fully naturalistic observations; in particular, the impact on the findings of the overt presence of the researcher and the video camera remains in doubt, not least because the infants spent an average of 12-13% of each event looking at her/it. At the same time, the use of a single camera with an integral microphone meant that much of the mother's behaviour and the interaction between mother and infant went unrecorded and sounds and speech were not always easy to interpret. Alternative recording equipment and procedures might have revealed additional or different data.

Underpinning the whole study is the researcher's deep interest in the subject. Although the study design aimed to minimise the effect of this it may nevertheless have shaped the outcomes of the research, both through the decisions surrounding the type of data to be collected and the manner of its collection, and by influencing both the analytical process and the reporting of the findings. The researcher's voice is also present throughout the writing up of the work, and the whole is informed by her background and experience in infant feeding. In an interpretive endeavour of this kind, especially one involving direct contact between the participants and the researcher, the possible significance of what the researcher brings to the enquiry cannot be discounted.

In all, then, the study has a number of limitations, any of which may have affected its outcomes and the conclusions derived from them. In spite of this, it would appear to offer a useful exploratory venture into the world of the infant during weaning.

4.2.2 A persistent ethical dilemma

The issue of gauging the assent of the infants to take part in the current study remained unresolved, since assent (or refusal) to participate in the research could not be distinguished from assent (or refusal) to submit to the two feeding events. According to Hardy and Armitage (2002) and Jones (2009), preventing children who are capable of doing so from making decisions about their own bodies is a form of abuse, making such an approach unacceptable (to this researcher) as a part of any enquiry. Inserting food into the mouth of an infant who does not want this to happen would seem to fit this definition, and yet the researcher's professional experience suggests that this is a normal feature of the feeding of infants during weaning. The piece event did not constitute a problem in this regard, since the infants were free to do nothing if that was their wish. However, the spoon event posed a serious dilemma, especially when the infant made it clear that he or she was not enjoying what was happening. Thus, while Gregory (2003) and Palaiologou (2014) highlight the importance of respecting the dignity and autonomy of research participants, the researcher's decision to allow actions such as restraining the infant's arm and wiping the spoon against his top lip appears to have overridden these considerations.

Many questions remain: Was the researcher's decision to bring the spoon event to a premature end for Infant B the right one, when his distress at being given a mouthful of food was probably no more intense than that considered by many parents and professionals to be a normal feature of introducing solid foods? On a more fundamental level, should the refusal by several of the infants to be spoon fed have been interpreted as refusal to engage in the research? If not, to what extent is it appropriate for a child's assent to take part in a study to be set aside because it clashes with the requirements of that study? It is possible that another researcher would have been either more or less willing than the author to allow active feeding efforts in the presence of resistance by the infant, and that different data may have been obtained as a result? The only source of comfort for the researcher concerning her decision to support repeated attempts at spoon feeding was that, as seen, the majority of studies of solid feeding appear to have overlooked the rights of participating infants in this respect. This study, by contrast, offered a chance to highlight and address this issue.

4.3 Implications of the study for infants and their parents

The study shone a light on the first encounter with solid food as experienced by ten infants. In doing so it provided at least partial answers to the first five of the six questions prompted by the literature review. Thus, both the format of the food, piece or purée, and the feeding method, self-feeding or spoon, appeared to affect both the infants' responses to the food itself, as well as the interaction between infant and mother, such that the two events constituted two very different experiences. The apparent nature and extent of the differences point to both immediate and potentially far-reaching implications.

4.3.1 The significance of the first encounter with solid food

The current study focused on the first encounter with solid food of ten infants. While no data were collected concerning subsequent encounters, the use of two formats, and the alternation of the order in which these were offered, hinted at the possibility that the first experience of solid food might affect the infant's later responses to it. Infants who had previously experienced the spoon (SFIs) appeared more reluctant to engage with the piece, displaying more displeasure and apparent wish to escape. This suggests that they may have been influenced by negative aspects of their earlier experience, as described by Birch *et al* (1980) and Koivisto *et al* (1994). These infants also displayed fewer chomping and gnawing activities, perhaps because, having tried them on the purée, they had learned that these techniques were ineffective. This notion is supported by the findings from Interviews #1 concerning the mothers' oral experience with the purée, and by evidence that infants' chewing skills develop through practice (Delaney, 2010). In contrast, the greatest incidence of empty-mouth chewing and/or lip-smacking occurred in SFIs when they were presented, subsequently, with the broccoli floret, and yet none of them took a bite of it. This suggests

an ambivalence about what they wished to do when faced with this new situation. The order of the two events also appeared to affect the behaviour of the mothers, in that mothers of PFIs appeared to interfere less with their infant's activity in the spoon event than the mothers of SFIs. A possible explanation for this is that they developed an awareness, during the piece event, of their infant's abilities or need for agency, which subsequently tempered their impulse or willingness to take control during the spoon event.

As has been shown, several researchers have suggested that the weaning period may be significant in terms of the infant's later relationship with food (Skinner *et al*, 2002b; Vereijken *et al*, 2011; Van Dijk *et al*, 2012; Hodges *et al*, 2013; Birch and Doub, 2014). It has also been established that infants of weaning age are capable of using newly acquired information, including visual data, to create reference memories and to classify things into categories of their own devising, often after only one or two experiences (Younger and Fearing, 1999; Rakison, 2000; Xu and Garcia, 2008; Aldridge *et al*, 2009; Bornstein and Mash, 2010). It seems possible, therefore, that an infant might, after a single encounter with puréed broccoli, create from it a reference classification of 'green mush'. If he dislikes it he may subsequently refuse not only puréed broccoli but also all other foods which appear to him to belong in this category. Alternatively, if he likes the broccoli purée he may approach the next 'green mush' he encounters enthusiastically, only to discover, if it is not broccoli, that it tastes completely different. In consequence, he may become wary, both of new foods and those that appear to be familiar, as a result of his very first experience.

These interpretations are, of course, speculative, but the existence of differences related to the order of the two events supports the notion that the first encounter may influence an infant's later responses. It also echoes the subsequent differences in breastfeeding competence seen between infants who are enabled to find the breast for themselves immediately after birth and those who are prevented from doing so (Moore *et al*, 2012), suggesting that it may be beneficial to allow the transition to complementary feeding to be led by the infant in the same way as the initiation of oral feeding. Since it is unlikely that parents will choose a feeding method for their infant's first solid meal that they plan to abandon immediately afterwards, it seems reasonable to speculate on the potential outcomes of the use of these two methods beyond the first encounter.

4.3.2 Implications for infants' longer term responses to food

The sixth question prompted by the literature review was, *How might any observed or inferable differences between spoon feeding with a purée and self-feeding with graspable pieces of food affect the development of food preferences and/or common feeding problems?* This relates to the areas in Figure 1.3 (p.73) that were highlighted as having hitherto not been examined, namely the possible importance of familiarity with the

appearance, feel and smell of food, and the mode and format of food presentation, as potential determinants of infants' and toddlers' overall food consumption.

The study infants appeared to want to use all their senses to learn about the food, and to have been accorded more opportunity to do this in the piece event. Since multisensory experiences are known to enhance learning (Meltzoff and Borton, 1979; Rochat, 1989), this suggests that self-feeding with the hands may be more conducive to learning about food, and to its becoming familiar, than spoon feeding by a caregiver. Perry *et al* (2015) have called for “*early interventions to encourage a wide variety of nutritious foods before neophobia peaks*” (p.7). It may be that this concept of variety should be extended to the format in which food is offered. Thus, the opportunity, from the beginning of weaning, to handle foods in the format in which they are regularly eaten by the infant's immediate family may facilitate the development of a store of food references (Aldridge *et al*, 2009) that will continue to be meaningful into toddlerhood, rather than needing to be revised as ‘table foods’ replace purées. This should mean that fewer foods will appear to the child to be ‘new’ as neophobia emerges (Carruth *et al*, 1998; Dovey *et al*, 2008; Zeinstra *et al*, 2010), resulting in less food refusal. If, in addition, mealtimes are shared within the home the infant will be able to observe his immediate family eating foods that he recognises to be the same as those he is offered, thereby increasing the likelihood that he will wish to eat them (Adessi *et al*, 2005; Shutts *et al*, 2009).

Existing research suggests that enjoyment of eating is important for children (van der Horst, 2012; Skafida, 2013) and that they need early and repeated positive experiences with healthy foods if they are to learn to prefer them (Birch *et al*, 2007). Negative feelings generated by either the characteristics of food or the experience of eating can lead to dislike of particular foods and disruptive mealtime behaviour (Birch *et al*, 1980; Birch and Marlin, 1982; Koivisto *et al*, 1994; Rolls, 2005; Spence and Shankar, 2010; Woods *et al*, 2010a; van der Horst, 2012). The greater prevalence of *avoidant behaviour* in the spoon event suggests that spoon feeding was experienced by the infants as more unpleasant than self-feeding, with the data from Interviews #1 pointing to a number of possible explanations for this. Self-feeding, by contrast, appeared to offer a more enjoyable experience. Black and Aboud (2011) found that mothers who allowed their infants to self-feed appeared to focus less on the amount eaten than those who chose active feeding; less pressure to eat may itself contribute to a positive emotional atmosphere at mealtimes. In addition, self-feeding facilitates shared mealtimes, since the caregiver, relieved of the need to feed the infant, is able to eat alongside him. It therefore permits greater modelling of healthy eating, something that has been shown to be effective in encouraging a healthy diet (Brown and Ogden, 2004; Story and Neumark-Sztainer, 2005; Greenhalgh *et al*, 2009; McClain *et al*, 2009).

4.3.3 Implications for skill development and learning

Self-feeding with graspable foods would appear to provide opportunities for multi-sensory learning and exploratory play that spoon feeding does not. It utilises the six-month-old's naturally developing fine motor and oral motor skills, so facilitating the honing of those skills (Naylor, 2001; Northstone *et al*, 2001; Delaney, 2010). It may also, as suggested by Gibson and Walker (1984), assist the further development of oral motor skills by providing information about the size and texture of pieces of food prior to their insertion in the mouth. Spoon feeding, by contrast, as found in the current study and described by Toyama (2013, 2014), requires the infant to pay attention to the movements of the caregiver rather than to the food. It also requires the learning of techniques, such as the use of the top lip to clear the spoon (Delaney, 2010; Van den Engel-Hoek *et al*, 2014), that would not otherwise be needed at this age. It is thus potentially more demanding than self-feeding, while also appearing to be developmentally inappropriate.

Self-feeding provides the infant with access to play materials that are different from those likely to be otherwise available to him, thereby potentially facilitating learning that extends beyond mealtimes. As argued, it also frees the parent to eat alongside the child; it may therefore lead indirectly to some of the subsidiary benefits of shared mealtimes, such as the development of social skills and language (Shutts *et al*, 2013) and of cultural learning (Fieldhouse, 1995).

If learning about one's world and constructing meaning, both from and within it, rely on the individual's being able to interact with that world (Crotty, 1998), and if, for infants, the key to this learning is physical interaction (Perone *et al*, 2008), it follows that, until and unless the infant has the opportunity to act on the objects around him, they hold no meaning for him. Thus, what an adult perceives as food (broccoli), or an implement to aid eating (a spoon), are neither of these to the infant who has not yet experienced them at first hand. We should therefore not be surprised when infants react negatively to having a spoonful of food inserted into their mouth. Allowing them to look at, listen to, touch, smell and taste food may not only be important for their acceptance of new flavours but for them to develop a concept of what food *is*.

4.3.4 Implications for the ongoing parent-infant relationship

The infant's relationship with his main caregiver is ideally a secure attachment based on trust (Bowlby, 1988; Erikson, 1998; Sunderland, 2007). As seen, the introduction of solid foods marks a major change in this relationship. However, the study findings suggest that the nature of this change may be very different, depending on the feeding method used. Evidence from the piece event suggests that, for the infant who is offered graspable foods

and allowed to handle and feed himself with them, the move to solid foods may simply constitute an extension of his expanding world, which he will approach in much the same way as he does any other encounter with an unfamiliar object, only discovering later that it offers an answer to hunger. In contrast, spoon feeding would appear to involve a more radical shift in the mother-infant dynamic. For an exclusively breastfed infant in particular, who has hitherto been the active partner in the feeding relationship (Crow *et al*, 1980; Mohrbacher, 2010), an attempt by his mother to insert something unfamiliar in his mouth is likely to be a completely new experience. If, in addition, he is denied the opportunity to examine what is being inserted, he may perceive this as an obstacle to his 'need to know' about his world (Gibson, 1988), or, worse, as a threat to his survival (Power, 2000).

For the infant, a situation in which his efforts to explore are thwarted may be not only frustrating or threatening but also confusing and even frightening. The comment, in Interview #2, the parent's review of the infant's first encounter with food, by the mother of Infant J that J appeared to be seeking reassurance from her when first presented with the food, indicated that she recognised a tendency for J to turn to her for support in unfamiliar circumstances. This 'social referencing' is normal in infants and young children (Bowlby, 1988; Cole, 2011; Vaillant-Molina and Bahrck, 2012), the parent's role being to provide both comfort and reassurance to enable the infant to deal with a new situation. By contrast, if, as demonstrated in the now classic 'still face' experiment by Tronick *et al* (1978), the parent is unresponsive to the infant's cues, then confusion, uncertainty and distress may be the result. The relationship of trust that the infant has developed with his mother (Erikson, 1998), and her role in regulating his stress (Schore, 2001), would seem to be at risk where the mother herself is responsible for making the infant feel threatened. The study findings suggest that this may be the case with spoon feeding. By contrast, self-feeding, through its respect for the infant's ability to assume agency, may allow the parent to maintain the role of supporter and comforter during the introduction of solid foods.

As seen, several researchers (e.g., Chatoor and Ganiban, 2003; Benton, 2004; Davies *et al*, 2006; Van Dijk *et al*, 2009) have highlighted the need for control of feeding to be transferred from caregiver to infant during weaning, in order to minimise conflict. While the need to avoid 'excessive control' has been stated (Hurley *et al*, 2011), the potential significance of the basal level of control inherent in spoon feeding has remained uncontested. This study points to spoon feeding being inherently controlling in a way that self-feeding is not. It follows that avoidance of spoon feeding throughout weaning may obviate the need to transfer control, since the control will already rest with the infant. Similarly, as has been shown, self-feeding removes the need for the infant to actively refuse the caregiver's feeding attempts in order for feeding to stop. A self-feeding approach may therefore help to prevent conflict between parents and their infants or toddlers during mealtimes.

4.3.5 Implications for infant health

The current study suggests that experience with graspable foods may have advantages for the infant over the use of spoon-fed purées, and points to the potential relevance of this for the longer-term development of food preferences and mealtime behaviour. In particular, it raises questions about whether infants may be willing to eat a wider variety of foods if they are allowed to explore them for themselves, and whether they may eat less if allowed to feed themselves at their own pace. If these possibilities are true, this may provide a mechanism to explain the findings of Brown and Lee (2015) and Townsend and Pitchford (2012), that a weaning style based on self-feeding reduces the likelihood of overeating and a preference for sweet foods in the toddler years. In addition, the opportunity to select food may contribute to nutritional balance through the operation of sensory specific satiety, as described by Rolls *et al* (1981).

The study infants' apparent concentration on examining the broccoli floret, and their interest in gnawing it rather than eating it, were reminiscent of the focus on food itself and the process of eating that are features of 'mindful eating', as described by Bays (2009) and Wansink (2009). Of course, time spent in exploratory activity necessarily means that ingestion will take place more slowly, whether or not the infant is indeed 'mindful' of the act of eating, but a sense of being 'in the moment' with the food was nevertheless evident during the piece event for most of the infants. In contrast, the predominance of *avoidant behaviour* seen in the spoon event suggested that this experience was the antithesis of mindful eating for the infants. This contrasts with descriptions even of responsive spoon feeding (e.g., Mentro *et al*, 2002; PAHO, 2003), which tend to require infants to focus on the caregiver rather than the food. As well as ignoring the growing preference of infants of five months and older for interaction with objects rather than people (Lock, 2001), such an approach encourages eating according to external cues, rather than to internal cues of appetite/satiety. As Fox *et al* (2006) have pointed out, this has the potential to interfere with the infant's natural ability to self-regulate, thereby increasing the risk of excess weight gain.

The study findings indicated that the viscosity of the purée may have made processing a mouthful difficult for the infants. However, there was also a suggestion (Interviews #1) that, for someone used to managing a variety of textures, puréed food could be swallowed more quickly than food that required chewing. Delaney's (2010) research suggests that this will be the case for infants, as they gain experience at managing puréed foods. The author's own professional experience suggests that rapid ingestion is indeed achievable when infants are spoon fed purées, especially when these are of a runny consistency. As seen, rapid ingestion has the potential to lead to excessive consumption (French and Cecil, 2001; Zijlstra *et al*, 2009; Smit *et al*, 2011; de Graaf, 2012; Higgs and Jones, 2013) and possibly

also, by limiting contact with the digestive enzymes produced in the mouth, to reduce the overall effectiveness of the digestive process (Pocock *et al*, 2013). The use of purées may therefore increase the risk of poor nutrition. In addition, the study indicated that, rather than being conducive to exploratory play with food, the combination of spoon feeding and puréed food appeared to lead to *avoidant behaviour*, which may indicate a degree of stress (Schore, 2001). As seen, a stressful feeding situation is likely to lead to low levels of circulating oxytocin and under-stimulation of digestion (Moberg, 2003), which may in turn contribute to reduced absorption of important nutrients and intestinal upset.

The study supports Delaney's (2010) finding that purées may not be as easy to manage as is usually supposed, nor necessarily easier to eat than chewable foods for infants who can chew. Coupled with existing evidence that prolonged use of foods that require little or no chewing may predispose to dental, respiratory and aural problems in later life (Corruccini, 1999; Kiliaridis, 2006; Montgomery-Downs *et al*, 2007; Gibbons, 2012) as well as to later feeding difficulties (Northstone *et al*, 2001), this raises questions about the appropriateness of the use of purées for infants who are beginning solid foods at six months. In addition, the fact that the use of a spoon tends to encourage a sucking action (Wickenden, 2010) may mean that infants are more at risk of choking when being fed puréed foods by spoon than they are when feeding themselves with graspable pieces. Further support for this suggestion comes from Logemann's (1998) assertion that coordination of oral movements is best achieved when the eater is aware of the food approaching his mouth, something that is more likely to be the case when his own arm is transporting it than when he is required to interpret the movements of his caregiver, as described by Toyama (2013, 2014). Support also comes from Gibson and Walker (1984), who maintain that handling food may provide the infant with information about how to tackle it orally. This question mark over the safety of spoon feeding and purées is particularly interesting given that, in the author's professional experience, concerns about gagging and choking are more commonly raised by parents and health professionals in relation to self-feeding than to spoon feeding.

There is some evidence that the opportunity to handle food may help infants to learn whether it is safe to eat (Cashdan, 1994). There is also evidence that the opportunity to sniff food before eating it may provide information about its suitability and the risk of its causing illness (Zdunek, 2013). The study showed that self-feeding provided the infants with these opportunities but that spoon feeding tended to deny them. This suggests that an emphasis on spoon feeding during the 'sensitive period' that is weaning (Cashdan, 1994) may reduce the infant's ability later to recognise foods that are not safe to eat.

Figure 4.2 Possible impact of the use of graspable foods and self-feeding during weaning

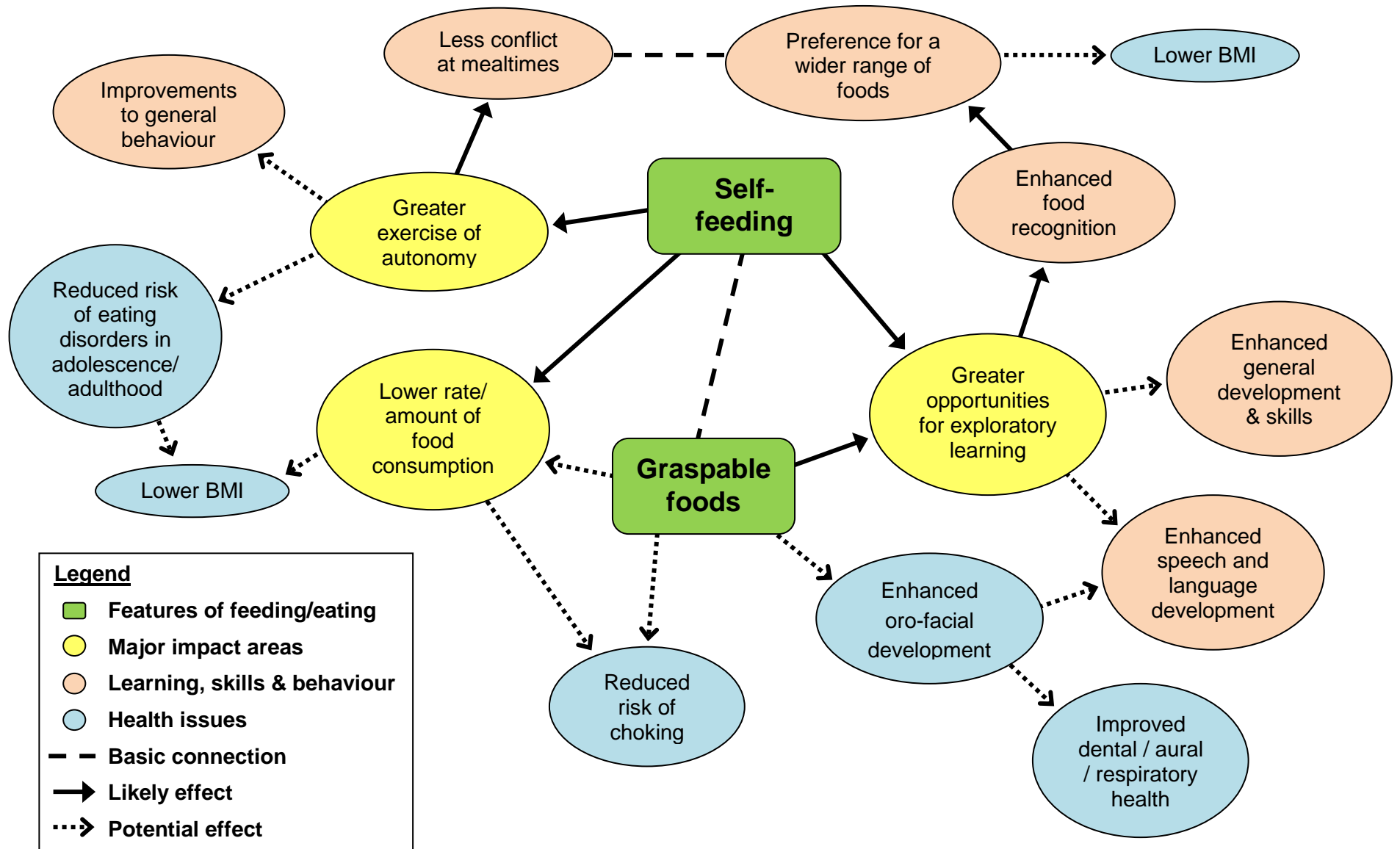
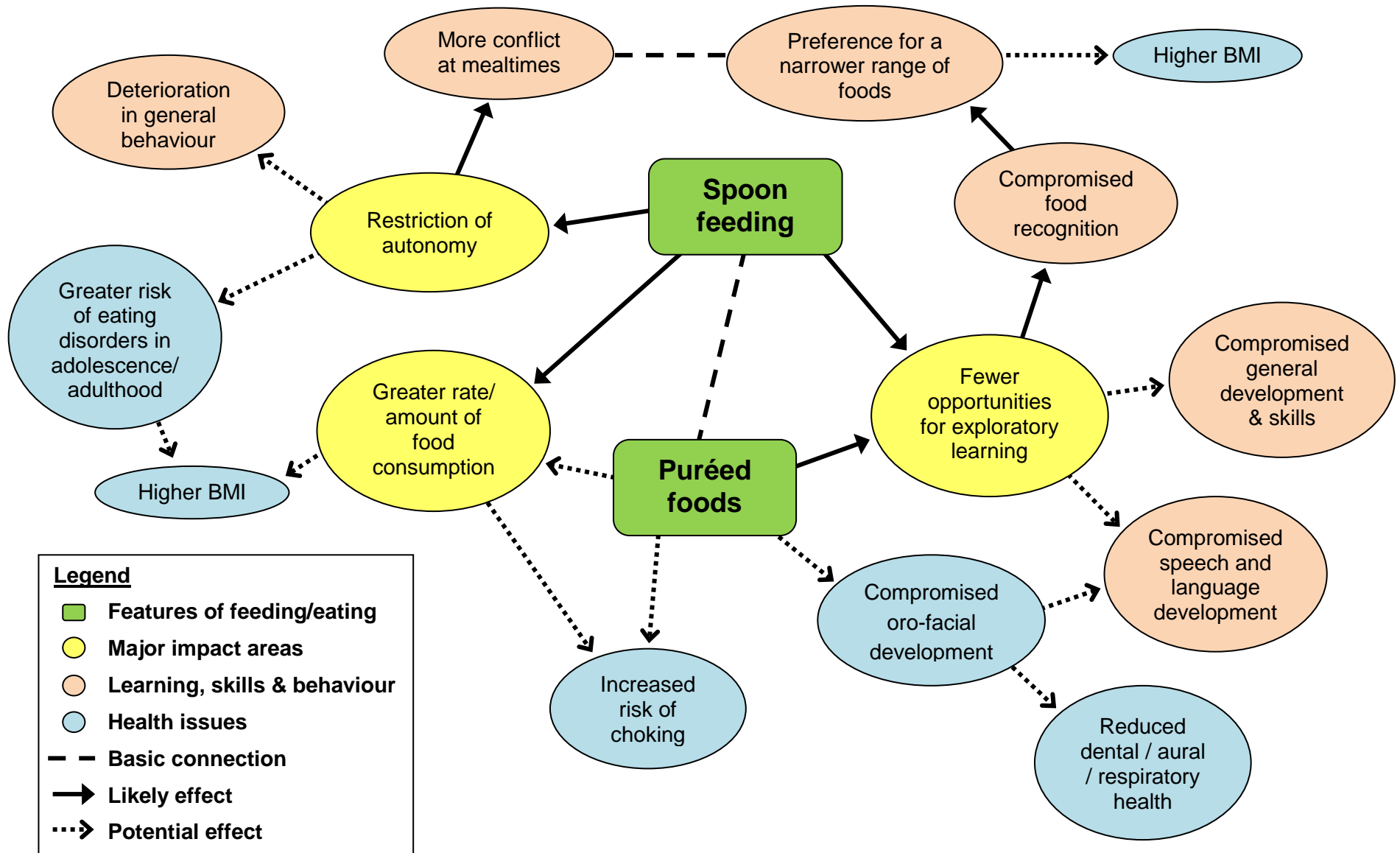


Figure 4.3 Possible impact of the use of puréed foods and spoon feeding during weaning



The current study concerned only the first encounter with solid foods. It is possible, although perhaps unlikely, that a single experience at the beginning of weaning could adversely affect an infant's future health. On the other hand, repeated implementation of the same feeding method at subsequent meals may well have longer-lasting implications.

Figure 4.2 (p.232) and Figure 4.3 (p.233) illustrate the potential wider effects of the consistent implementation throughout the weaning period of self-feeding with graspable pieces and spoon feeding and purées, respectively. In each scenario, a basic connection is assumed between the feeding method (self- or spoon) and the format of the food (graspable piece or purée), as shown in the two diagrams by the broken line connecting the green rectangular boxes. A similar link is inferred between an infant's food preferences and the likelihood of conflict at mealtimes. The arrows show the direction of possible impact on the various areas of learning, skill development and behaviour, and, more tentatively, on aspects of health and well-being.

Figure 4.2 (p.232) illustrates the finding that both self-feeding and the use of graspable foods appear to offer opportunities for exploratory learning. Such opportunities may in turn enhance food recognition, as well as general physical and psychological development and the acquisition of a range of fine motor skills. They may also facilitate the development of speech and language. The ability to recognise different foods by their appearance, smell and haptic qualities, and accurately to anticipate flavour and intra-oral texture, may lead to preferences for a wider range of foods, so reducing the likelihood of food refusal and mealtime conflict. In addition, the 'mindfulness' that appears to be a part of self-feeding for infants, coupled with the increased mouth time needed to process foods that require chewing, would seem to predispose to slower eating, improved digestion, and a greater awareness of satiety. This, coupled with the potential for broader food preferences, may predispose to a healthier diet and a lower body mass index (BMI). It may even support an ongoing healthy relationship with food into adolescence and adulthood. The regular consumption of chewable foods may promote enhanced development of the oral cavity and facial bones, leading to improved dental, aural and respiratory health and possibly a reduced risk of choking. Finally, self-feeding would appear to provide the opportunity for the infant to exercise agency while eating. This may have a subsidiary positive effect on his behaviour both during and outside mealtimes. Spoon feeding with purées, as illustrated in Figure 4.3 (p.233), appears potentially to reverse these outcomes.

4.4 Implications for policy, practice and future research

The findings of the study, and the implications of those findings for infants' health and development and their relationships with food and with their parents, point to further

implications related to policy and practice in infant feeding, and to future research surrounding this topic.

4.4.1 Implications for policy and practice

Current policy and guidelines relating to infant feeding in the UK, in common with many other countries, are based on the recommendations of the World Health Organization (DH, 2011; HPA, 2011; NHS Health Scotland, 2014). These state that parents should be encouraged and supported to breastfeed their infants exclusively for the first six months of life, then gradually to introduce a more varied diet while continuing to breastfeed for at least the first two years (WHO, 2002; WHO, 2005; WHO/UNICEF, 2003). Infants who cannot be breastfed should receive expressed breastmilk or an approved infant formula (WHO/UNICEF, 2003). The World Health Organization and UNICEF's *Global Strategy for Infant and Young Child Feeding* states that complementary foods, that is, foods to be offered alongside breastmilk, should be “*timely*”, “*adequate*” (in terms of nutritional content), “*safe*” and “*properly fed*” (WHO/UNICEF, 2003). The text gives an expanded account of each of these stipulations, the first three of which are clear and unequivocal; the meaning of ‘properly fed’, however, is open to interpretation:

“that [the foods] are given consistent with a child’s signals of appetite and satiety, and that meal frequency and feeding method – actively encouraging the child, even during illness, to consume sufficient food using fingers, spoon or self-feeding – are suitable for age.” (WHO/UNICEF, 2003, p.9)

The reader is not told what are to be considered reliable signals of appetite or satiety, what constitutes ‘sufficient food’ at any one meal, nor what degree of ‘active encouragement’ is appropriate. This thesis has argued that none of these things is universally agreed or understood, and that misinterpretation is common among both parents and professionals. For example, the findings of the current study suggest that an infant’s refusal to accept a proffered spoonful, rather than necessarily indicating a lack of hunger or an unwillingness to eat that particular food, may simply denote a desire to look at or touch it.

Of equal concern is the ambiguity contained in the requirement that the feeding method be ‘suitable for age’. In related globally directed texts this is interpreted as the need to “*feed infants directly and assist older children when they feed themselves*” (PAHO, 2003, p.14; WHO, 2005, p.21), the implication being that infants of six months either are not capable of feeding themselves or should not be allowed to. Current UK guidelines are less directive, allowing for “*finger foods*” from six months, but they nevertheless endorse the use of “*mush*” (DH, 2011), with the implication that this will be fed to the infant by spoon. The findings of

the current study suggest not only that self-feeding is possible at six months but that infants are naturally driven to do it, and that to prevent them from doing so may be detrimental.

Policies rely on language for their dissemination and here, too, there is a problem. The current study shows that exploring food through the senses naturally precedes ingestion, and that not all first encounters with food incorporate food intake. In addition, the literature reviewed suggests that spontaneous sensory exploration of food, like that of other objects, may begin before six months. This makes phrases such as 'starting solids' and 'having food' ambiguous, and potentially misleading (Rapley, 2011). Future policies will need to address these discrepancies if recommendations are to be universally meaningful.

As part of their work on children under three years, Goldschmied and Jackson (1994) asked nursery workers to spoon feed one another. The insights into how infants might feel when being fed in this way that were generated by this experience resulted in some significant changes in practice amongst this group of caregivers. In an interesting parallel to this account, and to the findings of the current study, Powell and Gouch (2012) uncovered feelings of frustration and impotence among baby room caregivers who felt unable to act autonomously or to speak up for the infants in their care. It would seem that attention to the perspectives of infants, and to how it feels to be powerless, may be an important means of improving their everyday experiences, including those connected with eating. Guidance for parents and health professionals could usefully remind readers that an infant's view of the world may be very different from an adult's.

The current study has exposed some important differences between self-feeding with pieces of food and spoon feeding with purées. In particular, it has highlighted the way in which spoon feeding favours the wishes of the caregiver over those of the child. While the existing combined evidence is not sufficient to suggest that the spoon feeding of normally developing infants should be abandoned, parents and other caregivers could nevertheless be encouraged to allow infants greater control during mealtimes. In particular, the findings should allow professionals confidently to support parents who are introducing solid foods from six months to:

- offer their infant foods that he can pick up;
- allow their infant to focus on the food and 'play' with it;
- allow their infant to feed himself, and to eat at his own pace;
- be attentive to their infant during mealtimes, rather than actively controlling.

A serendipitous finding from the study concerned the learning gained by the mothers as a result of taking part in the research, and particularly through watching the audio/video-tape of their infant's first encounter with food. Several mothers commented that they noticed

aspects of their infant's behaviour that they had been unaware of at the time. This points to the potential use of video interaction guidance to promote attunement and responsiveness in relation to feeding, in the same way as has been found to be effective for other aspects of parenting (Velderman, 2011). Parents and other caregivers could be shown audio/video-recordings of their interaction with infants and toddlers during mealtimes, enabling them to see their own and the child's behaviour in a new light, as a way of addressing or preventing feeding problems.

4.4.2 Implications for future research

The infants in the current study showed more *avoidant behaviour* and less engagement with the food in the spoon event, regardless of whether it occurred first or second. This suggests that their response was not to the broccoli *per se* but rather to the puréed format or to the fact of being spoon fed – or both. This reinforces the notion that what is commonly described as food refusal may in fact be *feeding refusal*. If so, this would appear to have implications both for future research into the development of food preferences and mealtime behaviour in infants and young children, and for the ongoing interpretation of existing studies. Indeed, the findings strongly suggest that some of what we think we know about the food preferences and mealtime behaviour of infants and young children may be at best precarious and at worst seriously flawed.

The current study concerned the first encounter of ten breastfed infants with a single food, offered by their mother in a setting other than that of a family mealtime. It may be that the findings are peculiar to broccoli, or to this particular group of mothers and their infants, or to the setting chosen. Research is therefore indicated to discover whether they are replicated with other foods, and in a wider population of infants, caregivers and settings. It would also be useful to know whether experience of home-cooked and/or commercially prepared puréed food enhances or hinders the transition to 'table food' and whether infants who can chew do indeed find purées more difficult to manage than foods that require chewing. This knowledge would directly influence the guidance offered to parents who have heeded the recommendation to wait until their child is six months old before introducing solid foods.

Previous evidence suggests that infants, and especially toddlers, may need to be offered a novel food a number of times before they will 'accept' it – that is, agree to eat it (Birch and Marlin, 1982; Sullivan and Birch, 1990; Maier *et al*, 2007). However, this conclusion is based on studies that appear not to have taken into account the feeding method, nor the relative inability of infants younger than six months to resist being fed. Indeed, the literature review undertaken for the current study pointed to an assumption that infants and children under two years old will necessarily be spoon fed, whereas children over this age will feed themselves. This thesis proposes several reasons why infants may not be willing to allow

food to be inserted into their mouth, ranging from a need to check that the food is safe to eat to a desire to discover its affordances and ascribe meaning to it. It is possible that different results might be obtained concerning the willingness of children under two years old to eat unfamiliar foods if they were allowed time to handle them, or at least to look at them, before being expected to ingest them. If so, this would challenge the accepted wisdom concerning the development of food preferences.

In a similar way, it is possible that some of the 'inappropriate' mealtime behaviours described by researchers such as Piazza *et al* (2003) are in fact triggered by spoon feeding, which the infant finds, at best, frustrating, and at worst, a direct threat to his role as agent. It would be useful to know whether avoidant-type behaviour occurs with the same frequency when the infant is allowed to feed himself. Of course, for such research to be meaningful, the tools used to carry it out would need to be amended, since behaviours such as 'infant pushes away spoon' cannot be scored in a self-feeding situation.

A particularly fruitful focus for future research would be on the incidence, in the toddler years, of food neophobia. The definition of this phenomenon relates to a wariness of food that is new *to the child*, that is, food that he does not recognise. Specifically, it relates to the outward appearance of the food. It may be that food neophobia would occur less frequently if children were exposed, as infants, to foods as eaten by the rest of the family, rather than being allowed to become familiar with them only in puréed or mashed format. Fewer foods would then be novel in appearance to the child at the age when neophobia commonly emerges. In addition, the current unfortunate juxtaposition of the onset of neophobia with the change to unmashed food and self-feeding would not exist, since no such change would be required.

There is great potential for research into the correlation, if any, between the method of feeding and/or format of the food offered in infancy, and health outcomes related to body mass index, dental, aural and respiratory health in later childhood. Obesity, in particular, is currently in the forefront of major health issues, with some early signs that self-feeding may have a part to play in reducing its incidence (Townsend and Pitchford, 2012; Brown and Lee, 2015). This needs to be pursued.

Responsive feeding is another potential area for research. DiSantis *et al* (2011b) have called for "*rigorous investigation*" of what constitutes responsive feeding in the early years. Since, even at its most responsive, spoon feeding requires the infant to accept or refuse the insertion of food in his mouth, there would appear to be a strong argument for such an investigation to include a comparison of responsive spoon feeding with supported self-feeding. As Joussemet *et al* (2008) have pointed out, autonomy support, while not

controlling, is not the same as permissiveness. It is not a *laissez-faire* approach, in which the infant is left to his own devices but one in which he is encouraged and enabled to achieve his goals. It may be that *truly* responsive feeding involves respecting the infant's intentions in relation to food, providing scaffolding to enable him to develop competency, and supporting his decisions about whether, when, and what to eat. Such research could usefully be informed by studies aimed at determining whether infants can be relied upon to select an adequate diet for themselves, assuming provision of a range of nutritious foods, or whether an element of control is, in fact, necessary to ensure an adequate intake of nutrients.

Finally, there would appear to be scope for further consideration of the issue of consent/assent in studies involving infants as participants, especially where those studies relate to aspects of life which themselves raise questions about the agency granted to very young children. The widespread use of coercion to gain their cooperation in everyday encounters, such as those connected with food, should not be presumed to be an acceptable part of research into children's feelings and behaviour.

4.5 Chapter summary

This chapter has reviewed the research questions in light of the study findings and shown that infants do indeed appear to approach their first solid food in much the same way as they do other unfamiliar objects, and to seek to explore it with all their senses. The associations found between the format of the food and/or the feeding method, the infants' responses to the food, and the interaction between the infants and their mothers has been discussed and the potential interrelation of *exploratory*, *avoidant* and *controlling behaviours* explored. The methodological framework for the study and the chosen research methods have been reviewed, and its limitations identified. The potential implications of the study findings for development and learning in infancy, for the parent-child relationship, and for infants' later health have been discussed, together with implications for policy, practice and future research in the area of infant feeding.

Reflection and conclusion

Good nutrition is important for infants' health and wellbeing but so, too, is enjoyment of eating. This thesis has provided an account of an exploratory enquiry into the differences, from the infant's perspective, between self-feeding and being spoon fed during his or her first encounter with solid food. This endeavour sprang from the researcher's professional experience of difficulties reported by parents during their infant's transition from full milk feeding to a mixed family diet, which led, via a Master's degree, to the development of the approach to the introduction of solid foods known as 'baby-led weaning', or BLW.

The study began with a review of the literature surrounding the introduction of solid foods to infants. This revealed that the potential impact on the infant's response to solid food of the feeding method or format of the food had not been considered in research to date, except in the few small studies concerned with BLW. The review also revealed a widespread assumption in the research literature that puréed foods, and spoon feeding by a caregiver, form an inevitable part of the feeding of normal infants, and that their use must necessarily precede self-feeding. This was evidenced most clearly by the lack of overt statements concerning the feeding method and/or food format in many studies relating to the development of food preferences, and by the terminology commonly used to describe and assess the eating skills and mealtime behaviour of children under the age of two years.

The process of researching and planning the methodological framework and methods for the study revealed that much of the enquiry into infant feeding in the first two years has been positivist in nature, designed to provide statistical information about practices and trends rather than qualitative information about infants' subjective experiences. In addition, the language used in conducting and reporting studies was found to betray a predominantly adult-centred view, with the voice of the infant either not present or discounted, and his efforts to exercise agency in relation to eating seen as problematic. In general, the focus appears to have been on changing behaviour rather than seeking to understand it. This pointed to the need for a study that would look through and beyond the infant's outward behaviour, to his inner, lived experience.

The study used a mixed methods approach within an overall interpretive framework. Ten infants and their mothers formed the participant sample. A single audio/video-recorded observation was made, in the infant's home, of each infant's first encounter with solid food. The food chosen for the study was broccoli, which was offered first as a graspable piece and then as a spoon-fed purée, or vice versa. Two audio-recorded interviews were carried out with each parent: one immediately following the observation of their infant, in which the parent was asked to eat the broccoli in the same two formats as the infant, and the second,

one week later, in which the parent was invited to comment on the audio/video-recording of their infant. The interviews were examined for themes using a process of coding similar to that used in Grounded Theory; the observations were analysed using basic counts of behaviours identified within the data. This dual approach was chosen partly to enable illumination of the feeding process from more than one perspective, so facilitating greater insight into the infant's subjective experience, and partly to strengthen the reporting of comparative differences between the infants' observed responses to the two feeding scenarios. Analysis of the observations was deliberately detailed, the aim being to set aside prior expectations and avoid prematurely attributing meaning to the infants' actions. As hoped, the parental interviews helped to illuminate the infants' behaviour and enabled a richer understanding of their experience, thus validating the study design.

The findings revealed a number of observable differences in the responses of the infants to the two feeding scenarios, with the interview data from their mothers supporting the notion that the two events provided similarly contrasting subjective experiences. The infants seemed to want to explore the food prior to eating it, using all their senses, in much the same way as they would any novel object capable of being handled. Spoon feeding appeared to inhibit this exploration, while at the same time restricting the infant's ability and drive to act as the agent of his own eating. There was also a suggestion that being given puréed food itself constituted an unpleasant experience and that this consistency might not be as easy for infants of this age to manage intra-orally as has been supposed. Overall, spoon feeding was associated with less exploratory behaviour and more avoidant behaviour by the infants than was self-feeding, and with more controlling behaviour by the mothers. The exact nature of the interrelation between these behaviours could not be established but they appeared to be inescapably linked.

While the study has a number of limitations, and the infants' subjective experiences and motivation for their behaviour can only be surmised, the differences observed were of a magnitude that makes them compelling. This alone points to the need to take into account the feeding method and format of the food when researching both infants' and toddlers' responses to food, and young children's mealtime behaviour. It has implications, too, both for future research and for our interpretation of our current evidence base: Researchers bring their own constructions, for example, the meaning they assign to 'food', or to 'infant', with them to the enquiry (Newman *et al*, 2003). Even if we think we have an open mind, we are constrained by the language available to us to describe what we see, with the result that our conclusions, and possibly our actual findings, are influenced. As Crotty (1998) has said, "[s]ocial construction is relativist. What is said to be 'the way things are' is really just 'the sense we make of them' (p.64). This study prompts us to look again at what we think we know about infants and solid food.

During the course of the study an interesting but disturbing parallel was noted between the lack of agency commonly accorded to infants in everyday activities such as feeding and the overriding of their right to assent to being involved in research. This, too, warrants consideration during the planning of future studies. We would do well to remember that:

“Children, especially the younger ones, inhabit a world fresh and relatively unfamiliar, a world inviting their exploration and discovery. It is this world-opening quality of anticipation and expectation – their sense of wonder – that distinguishes some of children’s most defining experiences.”

(Danaher and Briod, 2005, p.218)

The research journey

Initially, the discovery, as a result of the literature review, that almost no published studies concerned with weaning and the problems of mealtime behaviour in the toddler years had considered the feeding method or the format of the food constituted a disappointment. However, it soon became clear that the very absence of evidence offered the opportunity for an exploratory piece of work, thereby clarifying the direction the proposed piece of research should take and providing an added impetus for embarking on it.

During the carrying out and writing up of the study I have learned a great deal about the need for rigour, accuracy and ethical conduct throughout the research process, from the framing of the research questions, through searching the literature, planning and executing the investigation, handling and interpreting data, to the presentation of findings. I was surprised by some aspects of the venture, notably by the need to examine the literature on exploratory play, which I had not anticipated prior to beginning the analysis – confirming Graue and Walsh’s (1998) assertion that, “[o]ften it is only in the midst of interpretation that one realises what literature one should be searching.” (p.32). I was also surprised at how marked were some of the differences in behaviour between the two feeding events; I had not expected the disparity, if any, to be so pronounced. Throughout, I have valued opportunities to discuss my work with others, be they the families involved in my research, professional colleagues, my university peers or my supervisors. I have found these discussions to be not only a source of constructive insights but also useful for developing my own ideas and recharging my batteries. This has shown me that, were I to undertake more research in the future, I should like to do so as part of a team. However, for me the single biggest piece of revelatory learning concerned the apparent meaning of the food and the feeding scenario for the infants.

Crotty (1998) reminds us that meaning is not created from nothing but is constructed as a result of our interaction with what is around us. Indeed, it relies on that interaction. It follows

that the interaction of infants with the objects and people in their world is what enables them to construct meaning from it and gain understanding of it. It follows, too, that however the infant experiences food determines the meaning it subsequently holds for him – that is, what it *is* to him – and that, until he has had the opportunity to handle it, it has no meaning for him at all. The infants' mothers and I recognised the broccoli as food – that is, as belonging to the sub-group of plants that our shared culture has designated as being suitable for us to eat. However, for the infants it appeared to be just another interesting object, whose affordances remained to be discovered and whose meaning was yet to be constructed. The same can be said of the spoon, an object manufactured in line with a previously assigned meaning shared by adults in a Western industrialised society, but whose purpose cannot be presumed to be any more evident to an infant than that of a toothbrush or a screwdriver. This realisation, coupled with what appears to be an innate drive to confirm the safety of any new food before eating it, suggests that we should be surprised not at an infant's refusal to 'accept' a new food into his mouth but rather at the apparent willingness of so many of them to do exactly that.

Summary

Crotty (1998) has said that:

“For scientists in general, the prevailing paradigm is the matrix that shapes the reality to be studied and legitimates the methodology and methods whereby it can be studied. More than that, the prevailing paradigm is quite simply taken for granted within the contemporary scientific ethos.” (Crotty, 1998, p.35)

This study has challenged the prevailing paradigm concerning the norms of introducing solid foods to infants and the right of infants to be heard. It has highlighted a gap in our knowledge about the potential importance of the feeding method and the format of the food and, by bringing an interpretive approach to what appears at first glance to be a well-researched topic, provided a useful first step towards a more infant-friendly understanding of these issues.

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Observation protocols

Two protocols were developed for the observation of the infant's first encounter with food. These were alternated, infant by infant, in the order in which the observations took place.

Protocol A

- The parent held a piece of the 'whole' vegetable (a single broccoli floret) in front and within reach of the infant, inviting him or her to grasp it.
- The infant was allowed to explore the food with hands and mouth, smelling, tasting, chewing and/or eating it as he or she wished. If at any time the infant dropped the food, the parent either retrieved and re-presented it or offered a new piece.
- After approximately four minutes, preferably at a point where the infant had just dropped the food, thus creating a natural break, any pieces or smears of food in or on the infant's hands, face, arms, bib or tray were removed. The infant was given time, if necessary, to empty his or her mouth. Readiness to continue was confirmed by the parent.
- The parent offered the infant a small amount of the puréed broccoli, on the spoon. No specific instruction was given as to how this should be done, so the parent was free to decide whether or not to allow the infant to grasp the spoon.
- If the food was accepted the infant was given time to either swallow it or spit it out and another spoonful was offered. If the food was declined, the parent continued to keep a spoonful available to the infant and within view, moving it to the infant's mouth as the parent felt appropriate. If the spoon was grasped, the parent decided how long to let the infant hold or examine it, within the constraints of the overall requirement that the parent use the spoon to offer the food.
- After a further four minutes, approximately, the observation was terminated. The infant was allowed to continue eating or exploring the food if he or she seemed to be enjoying the experience.

Protocol B

The food was presented in the same manner, according to the format, as in Protocol A but beginning with the puréed broccoli.

Interview schedules

Interviews #1 and #2 used open questions, in order to elicit as much information as possible. These were followed up with prompts or focused questions where indicated, either to draw out the interviewee or to clarify specific points.

Interview #1: The parent's experience of the food

This interview took place concurrently with the parent picking up and eating a piece of broccoli and being offered a spoonful of puréed broccoli by the researcher. The order of the two events followed the same order as for that parent's infant. Written consent for the interview and its audio recording had previously been obtained.

Researcher: **Are you happy for me to record this interview?**

On receiving verbal confirmation of consent:

Researcher: **I'm going to ask you to eat the broccoli in much the same way as [infant's name] did. For the purposes of this research, I'd like you to try to imagine you've never seen or eaten broccoli before. I'd like you to give me as full a description as you can of what meeting it for the first time is like. Are you ready?**

On confirmation that the parent is ready the audio recorder is started and the infant's coded identifier stated by the researcher. The tub containing pieces of broccoli is placed before the parent OR the spoon is loaded and held up a short distance from the parent's mouth.

Researcher: **I'd like you to pick up a piece of broccoli and take a bite. OR: Here's a spoonful of broccoli purée.**

Once the piece is picked up or the spoonful accepted:

Researcher: **Can you describe to me what that's like for you? Tell me as much as you can about what you're experiencing, for instance:**

- **about the look and feel of the food**
- **how it feels inside your mouth**
- **how it behaves inside your mouth**
- **what you have to do with your mouth in order to eat it**
- **the overall sense of what you're experiencing**

When that mouthful has been eaten:

Researcher: **Try another bite OR: Try another spoonful.**

(Repeat as often as necessary to elicit as much information as possible.)

If anything is unclear or ambiguous, or seems to hint at something thought about but not articulated:

Researcher: **You mentioned X – can you tell me a bit more about that?**

When no more information is forthcoming:

Researcher: **Thank you, that was very helpful.**

Interview #2: The parent's review of the infant's first encounter with food

This interview took place concurrently with the parent being played the complete video recording of their infant's encounter with the food. Written consent for the interview and its audio recording had previously been obtained.

Researcher: **Are you happy for me to record this interview?**

On receiving verbal confirmation of consent:

Researcher: **I'm going to play the video I made last week of [infant's name] with the broccoli and I'd like you to talk me through what you think is happening and what you imagine s/he is thinking or feeling. Just tell me what comes into your head as you watch. I want to keep the video playing so that, later on, I can match what you say to a particular point in the video, but if there's a particular bit you want to go back to we can rewind it at the end. Is that okay?**

Once researcher is happy that parent understands what is being asked:

Researcher: **Are you ready?**

On confirmation that the parent is ready the audio recorder is started and the infant's coded identifier stated by the researcher. The video tape is started and the start announced by the researcher ("Starting video ...now"). The audio recorder is left to run.

If the parent seems to need encouragement to articulate their thoughts, or the researcher is looking for clarification of a behaviour:

Researcher: **Why do you think he/she did that? OR: What do you think that gesture / facial expression means?**

When the video recording ends:

Researcher: **Is there any part of the video you'd like to go back to? Is there anything you'd like to add as an overall comment? What will you take away from being part of this study?**

When no more information is forthcoming:

Researcher: **Thank you, that was very helpful.**

Coding scheme for Observations

Notes

1. “Item” refers to whole piece (not crumb) of food, or spoon/purée, as appropriate.
2. Overlap of coding between the seven observational criteria is expected. Overlap within the criteria is also possible, except in *Focus/direction of gaze (infant)* and *Vocalisation (infant)*, in which the codes are mutually exclusive.

Focus / direction of gaze (infant)

	Code	Apply this code whenever ...	But NOT when/if ...
Focus / direction of gaze (infant)	Look at item	Infant is looking at piece, spoon, or purée on spoon	Infant is looking at <i>crumbs</i> or <i>smears</i> of food on tray
	Look at crumbs / smears on tray	Infant is looking at crumbs or smears of food on tray, or at crumb or smear picked up from tray	
	Look at tray / bib / clothes / harness	Infant is looking at tray, bib, own clothes or safety harness	Infant’s focus appears to be on item or crumbs, rather than on tray or clothes <i>per se</i>
	Look at mother’s face	Infant is looking at mother’s face	
	Look at mother’s body / movements	Infant is looking at or following mother’s hand or body movements (e.g. while filling spoon)	
	Look at researcher	Infant is looking at researcher’s face or body, or directly at video camera	
	Look down / to side or close eyes	Infant is looking down or to the side – <i>away</i> from food, mother and researcher – or has eyes closed	Infant’s focus is on specific item or person, e.g. tray (downward gaze) or mother (sideways gaze)
	Look at other	Infant is looking at an object outside the field of study (NB: object may not be identifiable from video footage – access to field notes may be required)	
	Look up (to high point or ‘into space’)	Infant’s gaze is directed above the heads of the mother and researcher; infant appears ‘lost in thought’	
	Look miscellaneous	Infant’s gaze pauses while tracking between one object or person and another, or focus cannot be determined	Any other visual node can be applied

Gestures and body movements (infant)

	Code	Apply this code whenever ...	But NOT when/if ...
Gestures and body movements (infant)	Extend hand towards item	Infant extends hand towards item; usually followed by touch or grasp but sometimes by no contact (e.g. if attention is taken by something else or infant appears to have 'second thoughts' about touching)	Gesture is aimed at fending off item, rather than at touching or grasping it
	Lean head towards item	Infant leans head or body forward towards item, with apparent aim of making contact with mouth rather than with hands, when item is held by mother or on tray	Infant tilts head or leans forward towards item to make contact with mouth when holding item him/herself or while reaching purposefully with hand
	Turn head away from item	Infant turns (or tries to turn) head away from item, to avoid oral contact; N.B. may be difficult to judge, when mother's hand keeps pace with infant's movement	Infant is turning to engage with mother, or is changing direction of gaze only
	Extend/wave arms, or bounce in seat	Infant extends both arms, waves one or both arms, or bounces in chair, in apparent attempt to disengage from the situation	Infant is waving hand containing item or gesture is clearly directed towards item (see fend-off gesture), rather than in response to situation
	Push self back /up, arch back or rear backwards	Infant presses head or body backwards 'into' chair, pushes body backwards by extending hands/arms, or extends legs or arches back in a rearing action	
	Fend-off gesture	Infant extends hand(s) as if to fend off or push away item, without actual contact	Contact is made with item/mother or focus is not specifically on item
	Fold-in gesture	Infant curls arms and head inwards in apparent attempt to isolate self from the situation	Infant is touching or looking at item
	Reach towards mother	Infant extends hand/arm towards mother; may or may not be holding item in this hand; may appear to be offering item to mother or seeking mother's touch	Infant is reaching towards item, which happens to be in mother's hand
	Wave / bang empty hand/bib on tray	Infant waves one or both (empty) hands in air, or bangs tray or chair with hand or bib	Infant is waving two hands, one of which is holding item, or appears to be trying to hit item (but 'misses')
	Yawn / rub eyes	Infant yawns or rubs eyes with hands	

Manual contact and manipulation (infant)

	Code	Apply this code whenever ...	But NOT when/if ...
Manual contact and manipulation (infant)	Grasp item – pick up or take from mother	Infant closes hand around item and either picks up off tray or, if mother is holding item, pulls towards self (whether or not mother releases)	Infant's hold is passive, with mother in control of speed and direction
	Touch/press/scratch item with fingers/palm	Infant touches, presses or pushes item with fingertips or palm, or scratches or 'scrunches' and releases with fingers (may co-occur with mother holding passively and/or with infant holding item with other hand)	Infant grasps and picks up or takes item <i>with this hand</i> , or mother is also holding and is in control of speed and direction
	Turn/twist / hold up item / transfer hand	Infant is holding item and: turns or twists wrist or arm, holds item up in extended arm, transfers item to other hand, or manipulates with two hands (may co-occur with mother holding passively)	Mother is also holding and is in control of speed and direction
	Wave / hit item / bang item on tray	Infant is holding item in one hand and waves this hand in air or bangs it on chair or tray, or item is on tray and infant uses hand to hit it, or (if contact is with tray) appears to be <i>trying</i> to hit item, rather than tray; this code applies whether or not other hand is also being waved/banged	<i>Only</i> an empty hand is being waved/banged or aim is apparently to bang tray, not item
	Poke at / push / pick up crumbs/smears	Infant is using hand(s) or finger(s) to poke, prod, push, smear/spread, pick up (or try to pick up) crumbs or smears of food on tray, bib or clothes	Piece(s) in question is large enough for infant to grasp with fist

Manual contact and manipulation (infant) (cont.)

	Code	Apply this code whenever ...	But NOT when/if ...
Manual contact and manipulation (infant) (cont)	Grasp item and hold away	Infant closes hand around item but does not pick up or pull towards self (whether or not mother releases); may grasp and push item away in one movement	Infant pushes item away after a period of holding it
	Hold/push away item / mother's hand	Infant extends arm to push away item s/he is already holding (whether or not mother is also holding), or places hand on item or on mother's hand/arm and pushes or holds hand/item away	There is no contact between infant and item/mother (see fend-off gesture)
	Simple hold (in control, attention elsewhere)	Infant is holding item without looking at it, manipulating it or holding it to mouth – attention is seemingly elsewhere	Mother is also holding item, unless passively, or infant continues to manipulate item while looking elsewhere
	Hold item passively, mother controls	Mother and infant are both holding item, with mother in control of speed and direction	
	Drop purposely / throw item	Infant appears to drop or throw item on purpose, as an experiment or to dispose of it	Infant releases item while attention is elsewhere
	Release item to mother's grasp	Mother grasps item and infant appears to relinquish it voluntarily (rather than simply adjusting grip or to make defensive gesture)	Mother twists item to remove from infant's grasp, or infant releases item while attention is elsewhere
	Manipulate bib / clothes / harness	Infant manipulates bib, clothes or safety harness in a focused way	Contact is seemingly by accident or coincidence
	Two-handed reach/touch	Infant reaches for or holds item, or reaches for crumbs, using two hands simultaneously, or brings second hand to join first in reaching for, manipulating or pushing away item	Infant is extending both arms other than towards item, e.g. extend arms/ wave/ bounce gesture or reach towards mother

Oral/peri-oral contact and movements (infant)

	Code	Apply this code whenever ...	But NOT when/if ...
Oral/peri-oral contact and movements (infant)	Open mouth (anticipation/reflex)	Infant opens mouth prior to contact with item (even if contact does not happen); may be fleeting	Item is already in contact with lips
	Protrude tongue (no contact w/item)	Infant protrudes tongue (tip or more) prior to contact with item (even if contact does not happen)	Item is already in contact with lips, or action is part of chewing movement
	Hold item to mouth (infant)	Infant holds item touching (or almost touching) mouth; usually co-occurs with 'touch with lips/tongue', 'chomp/gnaw/bite/suck on item', or 'possible purposeful sniff'	Mother is also holding item, unless passively' or infant's apparent intention is not to make oral contact
	Touch item with lips/tongue	Infant appears to be voluntarily considering feel of item against lips/tongue, or is actively licking item	Infant is chomping, gnawing, biting or sucking on item, or mother is in control of item and holding to infant's mouth
	Chomp/gnaw/bite / suck on item	Item is partially inside infant's mouth and infant uses gums to chomp, gnaw or bite it, or closes lips and sucks on it; infant is (or was) holding item	A portion of food has been bitten/wiped off and is wholly inside mouth, not protruding or held, or infant is clamping jaws shut to resist item
	Possible purposeful sniff	Infant holds item near nose rather than mouth, or pauses momentarily with item on way to mouth, suggesting that he may be considering smell of item	Mother is also holding item, unless passively
	Suck/gnaw on fingers/hand	Infant sucks or gnaws on one or more fingers, side of hand, or fist, with or without item in same hand	
	Suck/gnaw on bib/clothes/harness	Infant sucks or gnaws on bib, clothes or safety harness, whether apparently intentionally or not	
	Chewing movements / lip-smacking (mouth empty)	Infant makes lip-smacking or chewing movements with apparently no food in mouth; may co-occur with 'hold to mouth'	Item is wholly or partially inserted in mouth, or it seems some has been bitten off, or removed from spoon with lips/tongue
	Chewing/munching (food in mouth)	Infant makes chewing movements having apparently taken some food into mouth	Portion has not been bitten/wiped into mouth (see 'chomp/gnaw' etc.)
	Unstick/eject movement	Infant opens mouth wide in apparent attempt to dislodge or eject food inside mouth	Part of a reflex action (cough, gag or shudder)
	Gag/cough	Infant displays visible or audible gag or cough; reflex action	

Oral/peri-oral contact and movements (infant) (cont.)

	Code	Apply this code whenever ...	But NOT when/if ...
Oral/peri- contact (cont)	Hold mouth open around item	Item is partially inside infant's mouth and infant holds mouth open rather than closing it around item, apparently unwilling to accept it in mouth; most likely to occur when mother is in control of item	
	Pout / push against item with lips	Infant pushes lips forward in pouting/protruding movement, with or without contact with item, as if to push item away	

Facial expression (infant)

	Code	Apply this code whenever ...	But NOT when/if ...
Facial expression (infant)	Pleasure face	Infant is clearly smiling or laughing	
	Displeasure / anxiety face	Infant shows signs of confusion, anxiety or displeasure; frowning apparent; may be brief	
	Shudder face / flinch	Infant displays an involuntary screwing-up or twitch of the face, or shake of the head (as one might when tasting a lemon); may be fleeting, and may co-occur with another expression (or with gag)	

Vocalisation (infant)

	Code	Apply this code whenever ...	But NOT when/if ...
Vocalisation (infant)	Audible lip-smacking	Infant makes audible lip-smacking noise	
	Blow 'raspberry'	Infant makes 'raspberry' noise	
	Distress noise	Infant makes noise that appears to indicate distress or wish to escape situation, or cries	
	Murmur, conversational	Infant makes communicative noise, 'talking' or murmuring	
	Sigh	Infant makes audible sigh	
	Miscellaneous vocalisation	Infant makes noise that does not fit other categories, e.g. chewing or swallowing sound	

Mother's activity

	Code	Apply this code whenever ...	But NOT when/if ...
Mother's activity	Hold item, offer hand	Mother holds item and offers it within reach of infant's hand, where infant can see it clearly, whether or not overtly inviting infant to grasp it; may sustain hold while infant is touching or taking item; may be brief pause only, before holding to mouth	Mother holds item too close to infant's mouth for infant to be able to see it clearly, or continues to hold item after infant has grasped it
	Retrieve dropped/out-of-reach item	Mother picks up dropped item and re-offers it or places it within infant's reach on tray, or moves out-of-reach item to within reach	Mother picks up dropped or out-of-reach item and does not re-offer it or move it to within reach
	Hold item passively, infant controls	Mother and infant are both holding item, with infant in control of speed and direction	
	Reach towards item, then withdraw hand	Mother moves her hand towards item but withdraws before contact is made (as if changing her mind)	
	Rest hand on tray/arm of infant's chair	Mother rests her hand or arm on tray or arm of infant's chair or 'hovers' hand over tray	
	Straighten/adjust infant's clothes/bib	Mother straightens, adjusts or tucks in infant's bib, clothes or safety harness	
	Touch infant to comfort	Mother touches or strokes infant's back or head to comfort (e.g. after gagging episode)	
	Hold item to infant's mouth	Mother holds item within 2cm of infant's mouth, or touching mouth	Infant is also holding item, unless passively
	Jiggle item against infant's lips	Mother moves item repeatedly against infant's lips to encourage infant to open mouth	Infant is also holding item, unless passively
	Hold item, insert in infant's mouth	Mother holds item and inserts leading edge in infant's mouth (beyond outer edge of lips)	Infant is also holding item, unless passively
	Wipe item against infant's top lip/gum	Item having been inserted in infant's mouth by infant or mother, mother wipes item against infant's top gum or lip to deposit food into mouth	
Insert item in infant's hand	Mother holds infant's hand and inserts item into it, whether or not infant grasps item		

Mother's activity (cont.)

	Code	Apply this code whenever ...	But NOT when/if ...
Mother's activity (cont)	Touch infant's hand / item in infant's hand	Item is in infant's hand or on tray; mother touches infant's arm or hand, or item, apparently to communicate with infant	
	Hold / turn away item (to allow time)	Mother is holding item and moves or turns it out of infant's immediate reach, to allow infant e.g. to deal with mouthful or recover from gagging	
	Take item from infant, or hold out of reach	Mother removes item from infant's hand and/or holds it beyond infant's reach to prevent infant grasping/holding it	
	Restrain infant's arm	Mother holds infant's hand or arm, preventing infant from grasping or controlling item	
	Use item to move food on tray	Mother uses spoon or piece of food to move another piece, or dollop of purée, on tray	
	Wipe infant's mouth/chin with item	Mother uses item to wipe food from infant's lips or chin	
	Wipe infant's mouth/face with cloth/bib/finger	Mother wipes infant's lips or face with bib, cloth or finger(s)	
	Wipe infant's clothes/hands with cloth/bib/finger	Mother wipes infant's clothes or hands with bib, cloth or finger(s)	

Online recruitment posts

1: Text posted on three Facebook groups, 4.4.2011

Call for help with research into babies starting solid foods

Hi,

I'm a research student at Canterbury Christ Church University. I have previously worked as a midwife and health visitor and have a long-standing interest in the introduction of solids. I am about to start a study involving videoing babies eating at home and interviewing their parents, and I am looking for families to take part. Specifically, I need volunteers who:

- have been their baby's primary caregiver from birth,
- live in the Maidstone/Medway/Sheppey/Sittingbourne/Canterbury area
- can communicate easily in English.

and who have a baby who:

- was born after at least 37 weeks of pregnancy,
- is currently between 5 and 6 months old,
- has not yet started solids,
- has no diagnosed or suspected physical, psychological or developmental disorder
- is growing appropriately for their age.

If you would like to find out more – with no obligation to take part – please contact me, either by email, at [REDACTED], or by phone, on [REDACTED].

Thank you,

Gill Rapley

2: Text posted on BLW forum, 4.4.2011

Call for help with research into babies starting solid foods

Hi,

I'm Gill Rapley. I'm a research student at Canterbury Christ Church University. I have previously worked as a midwife and health visitor and have a long-standing interest in the introduction of solids. I am about to start a study involving videoing babies eating at home and interviewing their parents, and I am looking for families to take part. Specifically, I need volunteers who:

- have been their baby's primary caregiver from birth,
- live in the Maidstone/Medway/Sheppey/Sittingbourne/Canterbury area
- can communicate easily in English.

and who have a baby who:

- was born after at least 37 weeks of pregnancy,
- is currently between 5 and 6 months old,
- has not yet started solids,
- has no diagnosed or suspected physical, psychological or developmental disorder
- is growing appropriately for their age.

If you would like to find out more – with no obligation to take part – please contact me, either by email, at [REDACTED], or by phone, on [REDACTED].

Thank you,

Gill Rapley

3: Text posted on BLW forum, 19.1.2012

Call for help with research into babies starting solid foods

Hi all,

I'm a research student at Canterbury Christ Church University. I have previously worked as a midwife and health visitor and am interested in the introduction of solids. I am currently doing a study involving videoing babies eating (at home) and interviewing their parents, and I'm looking for families to take part. I need volunteers who:

- have been their baby's primary caregiver from birth,
- live in the Maidstone/Medway/Swale/Canterbury area
- can communicate easily in English.

and who have a baby who:

- was born after at least 37 weeks of pregnancy,
- is currently between 5 and 6 months old,
- has been fully (or almost fully) breastfed since birth
- has not yet started solids,
- has no diagnosed or suspected physical, psychological or developmental disorder
- is growing appropriately for their age.

If you would like to find out more – with no obligation to take part – please contact me, either by email, at [REDACTED], or by phone, on [REDACTED].

Thank you,

Gill Rapley

Introductory Letter



Research into babies starting solid foods

Dear Parent,

Thank you for responding to my call for volunteers to take part in the research on babies starting solid foods that I am undertaking as part of my postgraduate degree at Canterbury Christ Church University (CCCU). This research involves babies who:

- have lived with at least one consistent parental caregiver since birth,
- were born after no fewer than 37 weeks of pregnancy,
- have no diagnosed or suspected physical, psychological or developmental disorder, and
- are growing appropriately for their age.

You can help me with this study if:

- you are over 18 years of age,
- you can communicate easily in English,
- your baby is currently between five and six months old,
- he or she has been fully (or almost fully) breastfed since birth, and
- he or she has not yet started solid foods.

Please read the attached Parents' Information Sheet, which explains what the research is about and what taking part in it will involve. Some important points to note are:

- Participation in the research is voluntary. You do not have to take part in the project.
- You and your child do not have to do anything strange, embarrassing or painful in order to take part in the project.
- Your doctor and health visitor (and any other health workers you or any of your children sees) won't know whether or not you are taking part in the research unless you choose to tell them yourself.
- The care you receive from healthcare professionals won't be affected by any decisions you make about this research.
- If you decide to volunteer, you can pull out of the project at any stage – for example, if you change your mind about wanting to take part, or if your circumstances make it difficult for you to continue.
- Your child's name and your name, address and telephone number will not be made public and will not appear in any documents related to the research project.

Please feel free to contact me for a chat or for more information, without any obligation to take part.

Yours sincerely,

Gill Rapley

Date: 1 November 2011

Research Office and Graduate School
Erasmus Building, Eg22
Canterbury Christ Church University
North Holmes Road, Canterbury, Kent CT1 1QU

Email: [REDACTED]
Mobile phone: [REDACTED]

Parents' Information Sheet



Research into babies starting solid foods

Introduction

My name is Gill Rapley and I am a PhD research student at Canterbury Christ Church University (CCCU). I have previously worked as both a midwife and a health visitor. This information sheet explains what my research is about and what taking part in it will mean. Please read it fully before deciding whether you would like to join the project.

Why this research is being done

Many parents of toddlers and young children find it difficult to get their child to eat the right foods. We don't know whether this is an inevitable part of childhood or whether it can be avoided. Lots of researchers have studied how babies learn to like different foods but not many have looked at how they might prefer to eat them. I am interested in finding out what starting solids is like from a baby's point of view. Because babies can't talk, I hope to gain some understanding of what eating solid foods may be like for them by observing their behaviour and facial expressions and inviting their parents to help me to interpret what I am seeing.

This part of the research – the main study – will involve up to 30 families. A smaller, pilot study has already been carried out to test and finalise the videoing procedures and interviews.

What the research involves

The research involves videoing babies' early responses to solid foods. I will be filming babies in their own homes to see what they do when they are offered a common vegetable for the first time. I will also be asking their parents to eat the same vegetable and describe to me what it is like for them. I will bring the (freshly cooked) vegetable and a video camera with me when I visit.

The study will involve **one telephone call (or email exchange) and three home visits** (each between half an hour and one hour long) with each family. If you contact me (by telephone or email, whichever you prefer) after reading this information sheet, I will ask you a few questions to ensure that it is appropriate for you to take part and I will answer any questions you may have. I will ask you to contact me again within a few days to confirm whether or not you wish to participate. If you agree to take part we will arrange a date and time for me to visit you at home. Throughout the study you will be free to rearrange times and dates or withdraw at any time without giving a reason.

At the first home visit I will explain how the filming will work and answer any more questions you may have. We will agree which vegetable is to be used, making sure it is one you like. I will ask you to sign a consent form agreeing to take part in the project, and we will arrange a date and time for the second home visit, which will take place when your baby is ready to start solids (at around six months old). I will ask you to agree not to give your baby any solid foods before then.

During the second home visit I will ask you to offer your baby the agreed vegetable in two different ways – on a spoon and as a piece to hold – and I will film how he or she responds to it. I will then ask you to eat some of the same vegetable in the same two ways and tell me what eating it is like for you. I will tape-record what you say so that I don't forget it. Before I leave we will agree a date and time about one week later for me to visit you for the third time.

At the third home visit I will show you the video recording made at the second visit and ask you to tell me what you think about your baby's responses to the food. As before, I will tape-record your answers to help me remember what you have said.

Will our identities be protected?

I will do everything I can to make sure that this is the case. I will store all your personal information separately from the video and audio recordings and written transcripts. I will give your baby a code name or a number, which I will use instead of his or her real name when I am analysing the recordings and writing up my findings. I will not pass this information on to anyone else and I will destroy it when the research is complete – or earlier, if you choose to pull out part way through.

Only your baby's face will appear on the video, not yours or that of any other family member (or any object which might inadvertently identify you, any member of your family or where you live). The video recordings will be stored digitally in password-protected files on my own computer and in my personal folders on the University's computer. Any written information that could identify you will be stored in a locked cabinet in my home or securely within CCCU premises, in accordance with the Data Protection Act 1998 and the University's own data protection requirements. Only my supervisors at the University will be shown the video recordings, unless you agree that I can use the footage of your baby to share my research findings. I will ask your permission for this at my third visit. If you do not wish me to use it I will destroy all copies of the recording of your baby once the writing up of the research is complete. The audio recordings from my interviews with you will be destroyed once they have been transcribed in writing.

I will be happy to show you what I have written about you and your baby at any time during the study – you only need to ask me. If you choose to withdraw from the study before my visits to you are completed I will destroy all existing recordings and files concerning you and your child.

The only exception to this promise of confidentiality is in the event that I encounter a child protection issue or evidence of any illegal activity. In these cases I would be duty bound to notify the appropriate authorities via my supervisor.

Is there anything good or bad in this for me or my family?

The study involves no health risks for you or your baby. The risk of choking (present in any feeding situation) is no greater than it would usually be for your baby feeding him or herself, or being fed. If your baby should become distressed during my visit I will end the visit and arrange an alternative day to try again. Taking part may help you to help your baby to enjoy eating solid foods. I will be happy to give you a copy of the video of your baby if you would like one.

Thank you for taking the time to read this. I hope you will consider volunteering to help me find out more about babies' experiences of solid foods. If you are interested, please contact me again.

Gill Rapley

Email: [REDACTED]

Date: 1 November 2011

Mobile phone: [REDACTED]

Consent Forms



Research into babies starting solid foods

CONSENT FORM #1

Name of Researcher: Gill Rapley

Contact details:

Address:

Research Office and Graduate School
 Erasmus Building, Eg22
 Canterbury Christ Church University
 North Holmes Road
 Canterbury, Kent
 CT1 1QU

Tel:

Email:

Please initial box

1. I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions.
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason.
3. I understand that any personal information that I provide to the researcher will be kept strictly confidential.
4. I understand that all video and audio recordings of me and/or my baby will be used for the purposes of the study only.
5. I understand that all information relating to me and my child will be destroyed if I decide to withdraw from the study before the end of the data collection period.
6. I agree to take part in the above study.

Name of Participant

Date

Signature

Researcher

Date

Signature

Copies: 1 for participant
 1 for researcher

Research into babies starting solid foods

CONSENT FORM #2

Name of Researcher: Gill Rapley

Contact details:

Address:

Research Office and Graduate School Erasmus Building, Eg22 Canterbury Christ Church University North Holmes Road Canterbury, Kent CT1 1QU
--

Tel:

--	--

Email:

--	--

Please initial box

1. I hereby give my permission for Gill Rapley to use video footage of my baby, obtained as part of her PhD research project, for teaching purposes and to inform future research.
2. I understand that this is the only purpose for which this material will be used and that it will not be made available to anyone else.
3. I agree that my baby will be referred to using a pseudonym *OR (delete)*
I agree that my baby will be referred to by his/her first name only.
4. I understand that no personal information will be passed on and that any material in the footage that could identify the family will be removed.

Name of Participant

Date

Signature

Researcher

Date

Signature

Copies: 1 for participant
1 for researcher

Background Data Form

Infant's research identifier Date of Intro Visit

Date of Observation/Interv #1 Date of Interview #2

Infant

Date of birth		Gestation	
Gender		Ethnic group	
Position in family / siblings			
Birth weight		Relevant growth history:	
Weight now			
Feeding history			
Experience with spoon?			
Teeth erupted? (at HV#2)			
Relevant medical history			

Primary care-giving parent

Relationship			
Age		Ethnic group	
Occupation			
Education			
Heard of BLW?			

Notes

Infant profiles

Infant A

Gender	Female
Ethnic group	White, British
Position in family	Second
Age at observation	26 weeks
Age of mother	29 years
Mother's education	Bachelor's degree
Age of father	32 years
Teeth erupted at observation	None
Experience with spoon	Occasional – to chew on (empty) while parents ate
Format order and event duration	1) Piece: 4 min 31.9 sec (271.9s) 2) Spoon: 1 min 44.2 sec (104.2s)
Previous knowledge of BLW	Reasonable understanding
Additional notes	

Infant B

Gender	Male
Ethnic group	White, British
Position in family	Third
Age at observation	26 weeks
Age of mother	25 years
Mother's education	'A' level
Age of father	32 years
Teeth erupted at observation	None
Experience with spoon	None
Format order and event duration	1) Spoon: 2 min 26.3 sec (146.3s) 2) Piece: 4 min 42.3 sec (282.3s)
Previous knowledge of BLW	Reasonable understanding
Additional notes	

Infant C

Gender	Female
Ethnic group	White, British
Position in family	First
Age at observation	24 weeks, 4 days
Age of mother	37 years
Mother's education	Post-graduate diploma
Age of father	35 years
Teeth erupted at observation	None
Experience with spoon	None
Format order and event duration	1) Piece: 3 min 56.5 sec (236.5s) 2) Spoon: 3 min 14.3 sec (194.3s)
Previous knowledge of BLW	Reasonable understanding
Additional notes	

Infant D

Gender	Female
Ethnic group	White, British
Position in family	Third
Age at observation	24 weeks, 1 day
Age of mother	36 years
Mother's education	Bachelor's degree
Age of father	40 years
Teeth erupted at observation	None
Experience with spoon	One spoonful of medicine
Format order and event duration	1) Spoon: 3 min 59.4 sec (239.4s) 2) Piece: 3min 10.4 sec (190.4s)
Previous knowledge of BLW	Reasonable understanding
Additional notes	One formula feed per day introduced two weeks prior to observation

Infant E

Gender	Male
Ethnic group	White, British
Position in family	First
Age at observation	26 weeks, 1 day
Age of mother	35 years
Mother's education	Master's degree
Age of father	37 years
Teeth erupted at observation	None
Experience with spoon	None
Format order and event duration	1) Spoon: 4 min 07.2 sec (247.2s) 2) Piece: 4 min 16.2 sec (256.2s)
Previous knowledge of BLW	Reasonable understanding
Additional notes	Parents Italian

Infant F

Gender	Male
Ethnic group	White, British
Position in family	First
Age at observation	28 weeks, 1 day
Age of mother	36 years
Mother's education	Bachelor's degree
Age of father	37 years
Teeth erupted at observation	One
Experience with spoon	None
Format order and event duration	1) Spoon: 4 min 45.6 sec (285.6s) 2) Piece: 4 min 06.1 sec (246.1s)
Previous knowledge of BLW	Reasonable understanding
Additional notes	

Infant G

Gender	Female
Ethnic group	White, British
Position in family	First
Age at observation	25 weeks, 4 days
Age of mother	27 years
Mother's education	'A' level
Age of father	39 years
Teeth erupted at observation	None
Experience with spoon	Has played with metal spoons, unconnected with eating
Format order and event duration	1) Piece: 3 min 59.5 sec (239.5s) 2) Spoon: 4 min 11.7 sec (251.7s)
Previous knowledge of BLW	Reasonable understanding
Additional notes	Grabbed piece of toast x1 from grandmother's hand – removed before eaten

Infant H

Gender	Female
Ethnic group	White, British
Position in family	First
Age at observation	26 weeks, 2 days
Age of mother	27 years
Mother's education	Bachelor's degree
Age of father	34 years
Teeth erupted at observation	Four
Experience with spoon	One (unsuccessful) attempt with medicine
Format order and event duration	1) Piece: 4 min 36.4 sec (276.4s) 2) Spoon: 4 min 36.8 sec (276.8s)
Previous knowledge of BLW	Reasonable understanding
Additional notes	

Infant J

Gender	Female
Ethnic group	White, British
Position in family	Third
Age at observation	24 weeks, 4 days
Age of mother	38 years
Mother's education	NVQ level 3
Age of father	42 years
Teeth erupted at observation	None
Experience with spoon	Two – medicine
Format order and event duration	1) Spoon: 2 min 58.2 sec (178.2s) 2) Piece: 4 min 43.4 sec (283.4s)
Previous knowledge of BLW	Reasonable understanding
Additional notes	

Infant K

Gender	Female
Ethnic group	White, British
Position in family	Second
Age at observation	25 weeks
Age of mother	34 years
Mother's education	NVQ level 2
Age of father	36 years
Teeth erupted at observation	None
Experience with spoon	Occasional medicine – not recent
Format order and event duration	1) Piece: 3 min 24.2 sec (204.2s) 2) Spoon: 1 min 39.3 sec (99.3s)
Previous knowledge of BLW	Reasonable understanding
Additional notes	Father of mixed ethnic origin

Transcription scheme for Interview #1

The following notation was devised by the researcher to enable easy and meaningful transcription of the interviews. An example of its use, from Interview #1 with Mother A, is given.

Notation	Indicates
<u>bitter</u>	<u>word</u> or <u>syllable</u> emphasised by mother
.	pause of less than 0.5 second, to reroute train of thought
..	pause of up to 2 seconds (approx) while choosing words to describe current thought
...	pause of longer than 2 seconds (approx) between thoughts
no-o	elongated syllable
e/ even	faltering start to word
the the	repeated word
er, erm, um, ummm	hesitations, as heard
[xx]	words indecipherable
<i>[Researcher:]</i>	researcher's comment/question to mother
[laughs]	researcher's descriptive note
<i>[Discussion]</i>	researcher's additional note

Examples of transcripts of Interview #1

At Interview #1 the parent was asked to give an account of their experience of eating the broccoli as a piece (floret) and as a purée. The order of the two formats in each case followed the scheme devised by the researcher and is as indicated within the transcript. Two example transcripts are presented, using the transcription scheme described in Appendix IX.

Interview #1 Mother of Infant D

Puree

It tastes nicer than I thought it was going to .. umm ... bit sticky ... hmm ... and it's cold ... er ... yeah it sort of sticks . to your lips and .. your tongue . but that's . actually quite nice because I like the taste . so ... it's staying on my tongue quite a long time . but then I like broccoli .. umm ... it's actually not that unpleasant I thought I wasn't going to like the . squidgy stuff but . it's actually quite nice .. [agrees to another spoonful] ... I think I'd prefer it if it was warmer .. but ... because normally I would eat broccoli hot ... hmm .. it's got little .. grainy bits in it ... umm . which I don't mind .. but it is a little bit . like having soft sand in your mouth ... but not sharp . if that makes sense . just a bit gravelly ... hmm

Piece

It tastes completely different .. to me ... which is quite strange [laughs] .. the pureed stuff .. almost tastes sweeter .. than this . er ... it's noisier ... hmm .. I'm trying to put it into words [laughs] .. let's have another go ... hmm . s'pose m/ . much bigger lumps moving round your mouth .. umm ... which .. is normal for me [laughs] 'cause . 'cause I don't normally eat puree .. right . yeah . it's quite pleasant ... hmm [touches top of floret to lips] ... just doing that 'cause that's what L did . wondering what it feels like for her ... quite tickly . when you get the top of the . broccoli on your lips . mm ... it's like a sponge .. when you use your tongue to squeeze the . top bit the water comes out .. which is quite nice [laughs] ... the stalk's a bit more crunchy .. it's got a different texture . it's a bit .. more chewy .. I'd say

[Researcher: Does it taste the same?]

I don't think it does .. I think the stalk is sweeter . and maybe that's why the puree tastes sweeter because you've got more of the stalk mixed in . because ... hmm ... hmm .. the stalk's sweeter than the top bit . so if you eat the top bit on its own .. it doesn't taste quite as sweet but the stalk on its own . actually's got . slightly sweeter ... I would say .. for me .. the

stalk actually is more tasty . but . I prefer the-e sensation of eating the top bit .. but it's all quite nice [laughs] ... mm hm .. and it's also mm . not slimy but it's very . it's actually . easier to swallow than it looks . if you loo/ if I look at that visually .. I would say that doesn't look like it's going to be easy to eat . but because it's .. it's s/ it's quite . soft .. breaks quite easily and then sort of mm you can swallow it quite easily

Afterthought

With the pureed broccoli, to start with, it didn't quite feel right because it was cold ... and I felt like it should be hot; as I said because normally I don't have broccoli cold. But then when I started to think about it as a pate, and if someone had served it to me as a vegetarian pate that would be cold, I actually thought that would be completely acceptable. So, obviously I've got an idea in my mind of how broccoli should be that, when I try to think of it in a different way, it was actually quite – it almost made it taste nicer

Interview #1 Mother of Infant G

Piece

It's strange because having not . really picked up food .. usually using a fork . the first thing is .. the texture ...

[Researcher: which is?]

er ... smoother than I would think ... as soon as you're biting into it you can taste all the tiny little .. bits of broccoli

[Researcher: The bobbly bits?]

.. the bobbly bits ... it's quite bitter ... and crunchy ... but it's a nice crunchy it's not a .. having to bite hard crunchy .. it's .. nice to bite into ... it's so difficult to ...

[Researcher: Sometimes you're biting stalk and sometimes you're biting the bobbly bits – I don't know if that triggers any thoughts. And there's also what happens when it's in your mouth]

The texture's changing in the mouth .. obviously .. at first . biting it . from the broccoli .. it's .. quite firm .. but then .. after . a bite you can feel the texture changing each time . and w/ whereas the stalk's quite . firm and hard umm . the bobbly bits at the end . the-ey're softer . and . you can feel them more around the mouth rather than . one big .. sort of . lump of .. food ... and the stalk seems to taste sweeter than the end bits ... mm .. different parts of the broccoli taste .. ever so slightly different it's still broccoli but . the stalk is slightly sweeter than the ends which are a little more . bitter ... and there's a bit of everything .. but you sort of .. can feel different bits in different parts of the mouth .. so .. on this side of . the mouth I

can feel . like . the . little .. end bits . but then .. I can feel on the other side of my mouth that it's firmer . you know I'm having to .. chew a bit more ... I can feel it moving around the mouth . as I'm chewing

[Researcher: G didn't particularly get any in her mouth I don't think, but she did touch it to her mouth. Have you got any comments about what that might have been like?]

The bobbly end bit .. it feels .. it moves . against the mouth .. so i-it's sort of quite . soft it's not as .. it's not as hard as the stalk ... smell-wise it all smells the same it all smells of broccoli . but . texture-wise it's .. firmer ... [experiments with both ends against lips] both of them feel firm but the bobbly bit .. gives . it . you can feel the texture . more o/ over the lips as opposed to . just . the part that .. is touching the lip on the stalk . because . the softer bits . move ... I've never felt broccoli before [laughs] ... it's so strange having to think about food

Spoon/purée

It's not as enjoyable ... there's no variety to it ... for a start I feel like it's stuck round my mouth . and I don't feel as able to move it around ... but .. whereas in . the real . bits of . real broccoli [laughs] in the .. solid broccoli .. there's differences in the taste . in different parts of .. the thing .. like the stalk's different to the end part whereas with that it's all .. mixed in .. so . whereas the stalk was slightly sweeter in the whole broccoli .. there's no-o distinction between them it's just .. all the same ... the texture's isn't as pleasant it's not .. it tastes . the same . but . not . there's no . distinction there's no variation between . the different parts ... er . don't think I like it as much ...

[Agrees to accept another spoonful]

It just feels like mush . it feels like . I'm not really eating anything .. because there's not .. it just sort of dissolves as soon as it touches the mouth rather than .. being . me being involved in the physical . process of eating it ... and .. as an adult the act of . being . fed . feels completely surreal ... and it's difficult . even now . there's little bits in my mouth that I can feel .. that I feel like I can't move about because they're .. mushy ... it's still unmistakably the same .. thing .. but ... it just doesn't feel as inviting .. if I had that on a plate and that on a plate I would go for that [points to whole broccoli] .. because .. it just feels .. like there's more variety in the whole broccoli . as opposed to the purée ... and . if I were eating it for the first time .. whilst . they . taste the same I wouldn't necessarily think that they were . the same thing . they were a different variety of vegetable because .. the sensation isn't . the same .. it feels more ... I'm struggling to find the word . it it feels less .. varied .. that's the only way that I can think about it it's not . different bits of food have different .. textures .. you know like like say a potato you've got the skin is different to .. the inside and .. with the broccoli it has got very different distinct textures and flavours in different bits of it .. eating it all together it it doesn't . e/ even eating like . a bit of the stalk and a bit of the end .

on the whole broccoli . there's still a distinction in flavour . between different parts of the mouth . whereas with the purée it's just one . lump . of food

[Researcher: You said about seeing the two on a plate: have you got any other comment on the appearance?]

On their appearance .. I would definitely pick the whole . rather than the-e purée .. but . as to . the appearance itself .. colour-wise .. the whole broccoli .. looks more inviting because there's a more .. there's more depth of colour . with the-e purée it's . just all the same all the way through . there's no . variation .. and ... [brings food to nose to sniff] ... they even smell slightly different .. not entirely sure . why but I d/ don't know if it's just because . different parts maybe smell different . i/ it's not a big difference .. but ... as for the appearance I think .. it would definitely be the whole that I would prefer . just because ... [gestures to whole piece] that looks like food .. the whole broccoli looks like food whereas the purée just .. doesn't . it doesn't look like . proper food it looks .. wrong

Afterthought

It's strange thinking about food differently for the first time because . obviously . broccoli's just broccoli .. but to G it's something new

Excerpts from thick descriptions – Infant A

Initial encounter with a piece of broccoli, 0m 00s to 0m 45s

A is exactly six months old. She is sitting in a high chair with a tray, in her family's living room. Her mother is sitting to A's right. She has rolled A's sleeves up to her elbows, so they don't impede her hand and arm movements. A is sucking the fingers of her left hand as her mother offers her a floret of broccoli, approximately 4cm across and with a graspable stalk, holding it 20-30cm in front of A, in the midline, at chest level. A looks at the piece and then reaches towards it with her right hand, with fingers semi-extended and palm facing inwards. It is clear she is interested in grasping the piece.

A closes her fist around the piece and brings it slightly closer, looking at it all the while. A's mother makes an appreciative "oh-oo" sound and A looks up. Without looking back at the piece of broccoli she brings it to her mouth, removing her left-hand fingers and opening her mouth as she does so. She seems intent on making contact with the broccoli with her mouth. A touches the broccoli to her open lips, while looking at the researcher. After a little more than one second she moves the hand holding the broccoli slightly away from her mouth and we see that her tongue is poking out. She has been touching the broccoli with her tongue as well as her lips. Although she is looking at the researcher, she has a 'faraway' expression on her face, which suggests she is concentrating on the sensations she has just experienced. It's possible she has previously tasted broccoli in her mother's breastmilk but the texture will certainly have been new to her.

A touches the broccoli to her lips briefly once more, then turns her head to the right to look at her mother. She is making slight munching movements with her mouth, although there is no evidence that she has any broccoli inside it. Maybe the touch of the broccoli has made her aware of other sensations within her mouth; maybe some of the taste is lingering – or maybe, on an instinctual level, she is connecting the broccoli with the process of eating.

While she is looking at her mother, A is twisting the hand in which she is holding the broccoli. After a second or two it appears the feeling is sufficiently novel or interesting to draw her attention back and she looks at the broccoli again. She brings her left hand up to it and gently touches the outer part of the floret with her fingers. Then she scrunches the outer part of the floret between her fingers and brings it to her mouth, transferring it from her right hand to her left hand as she does so. As the broccoli approaches her lips she breaks into a

smile and blows a lengthy 'raspberry' – a signal that she is enjoying discovering what this new object has to offer.

Using both hands to hold, twist and turn the floret, so that the floret moves against her mouth, A once again explores it briefly with her lips – and probably her tongue, since the floret is partly inside her mouth. She does not, however, close her jaws against it or compress it – she is exploring its surface rather than chewing it.

After a few seconds A removes the floret from her mouth and once again turns to look at her mother, seemingly wanting to share the experience. She then looks back at the floret, moving it farther away from her face and transferring it from one hand to the other, apparently in order to observe it from different angles. As she does so, she makes a long 'hng' noise, which may indicate pleasure or concentration, or be a comment on what she is experiencing. It is not an unhappy noise.

A appears to try to pull the floret apart with both hands and her left hand loses its grip. As she tries to re-grasp the broccoli she knocks it out of her right hand. She quickly locates it within easy reach in front of her, on the tray of her high chair. She picks it up using the thumb and first two fingers of her left hand – an advanced grip for a baby of her age. She brings her right hand up to her left hand – not to help her hold the broccoli but to help her guide it to her mouth. This time she presses it briefly to her lips (and tongue?), then holds it against her chest with both hands while looking at the researcher and making a series of rapid munching movements with her lips. Again, there is no evidence that she has any of the broccoli inside her mouth.

She turns and smiles at her mother, almost losing her grip on the floret as she does so. Its movement as it begins to fall seems to alert her and she looks back at the floret at the same time as grasping it with her left hand to prevent it from falling. She studies it for a few seconds, touching it gently with the fingertips of her right hand and expressing her feelings with another extended 'hng' noise.

Initial encounter with a spoonful of broccoli, 4m 38s to 5m 28s

A catches sight of the loaded spoon in her mother's hand and leans towards it, reaching forward with both arms and with a slightly smiling, expectant expression. She grasps the middle part of the spoon (her mother is holding the distal end) and guides it towards her mouth, opening her mouth as it approaches. It is difficult to tell how much her mother is moving the spoon and how much A is pulling it but A definitely appears keen to get the bowl of the spoon into her mouth.

She closes her jaws around the spoon but as the puréed broccoli makes contact with the inside of her mouth her expression changes. She simultaneously opens her mouth, draws her head back and pushes the spoon forward. As she does so she looks up towards the researcher and then turns towards her mother with her mouth held open and a look of what appears to be confusion and horror on her face. Her expression seems to be saying “Mum, what *is* this?” or “What on earth is *that*?” She continues to stare at her mother while making small open-mouth chewing movements, as if trying to dislodge the purée. After about four seconds, she makes an involuntary gagging movement, lifting her hands off the spoon as she does so. She looks down towards the spoon, as if to check where it has gone, and moves her hands towards it again. She looks at her mother briefly, then back at the spoon. Her eyes are watering slightly from the gagging. She keeps her hands poised as if waiting to see what the spoon will do before deciding whether or not to grasp it again. Meanwhile, her mother holds it within reach, as if waiting for her daughter’s decision.

Almost immediately, in what appears to be an unspoken moment of joint decision-making, both mother and infant decide they are ready to have another go. The mother almost imperceptibly moves the spoon closer as A closes her right hand around the middle of the handle. This time it appears to be the mother who moves the spoon towards A’s mouth, which A allows to happen, although she keeps her mouth shut. She is still making small chewing movements and clearly has some purée in her mouth. She does not appear to be trying to swallow it.

Just as the spoon touches her lips, A moves her head back slightly and pushes the spoon away. At the same time, her mother moves it back a little way, as if respecting her daughter’s signal that she is not yet ready to welcome the spoon back into her mouth. A releases the spoon, perhaps because she senses that she does not have to hold it in order for it to stay away from her mouth, but she continues to hold both arms out in front of her in a defensive gesture.

After a second, her mother again moves the spoon towards A’s mouth. A responds by grasping the handle of the spoon with both hands, as before, then seems to think better of it. She moves her body and head back and pushes the spoon away, in a single, two-part movement, casting her eyes down as she does so. Once again her mother responds by withdrawing the spoon, this time to a point slightly out of A’s reach. A second later, A looks towards the spoon and reaches for it with both hands and immediately her mother moves it forward again. This time, A pulls it towards her and opens her mouth. However, as the spoon enters she seems to have second thoughts; instead of closing her jaws around it, she draws her head backwards so that her mouth is clear of it and holds it away, releasing it as her mother understands the signal and withdraws it.

The mother moves the spoon to within A's reach and A touches it with her right hand, then withdraws her hand as if not wishing to touch it after all. She looks at her mother, then gags again, grasping the spoon with both hands as she does so. This appears to be either a reflexive movement or an attempt to maintain control of the spoon while her focus is elsewhere. She lets go, grasps the spoon briefly with her right hand once more, releases it, then grasps it again. She follows this with a deliberate combination of movements in which her right arm pushes the spoon upwards and away towards her mother and her head tips forwards, down and to her left, so that eye contact with both the spoon and her mother is lost. As her mother withdraws the spoon, A's right arm remains outstretched and her head tilted down. It is a very clear signal that, as far as A is concerned, this spoon episode is over.

Audio/video analysis: Observed behaviours, all infants

These tables present the incidence of each behaviour as the number of times it was seen (frequency) and its total duration in each of the two feeding events: the self-fed broccoli floret (PIECE) and the spoon-fed purée (SPOON). Duration is shown first in seconds (Duration (s)) and then as a percentage of the duration of that event (Duration %). The symbol ‘-’ indicates that the behaviour was not seen. Colour coding in the left-hand column refers to the grouping of the behaviours by theme, as follows:

- Exploratory behaviours (infant)
- Avoidant behaviours (infant)
- Controlling behaviours (mother)
- Other behaviours of interest (infant and mother)

Total findings for the first three themes are presented in the final table.

FOCUS/DIRECTION OF GAZE (INFANT)			INFANT										GROUP		
			Piece-first Infants (PFI)					Spoon-first Infants (SFI)					PFI	SFI	All
Behaviour	Event	Incidence	A	C	G	H	K	B	D	E	F	J			
Look at item	PIECE	Frequency	18	7	25	20	9	16	17	24	31	23	79	111	190
		Duration (s)	78.1	42.7	199.3	133.4	16.5	184.0	83.7	153.1	119.0	159.6	470.0	699.4	1169.4
		Duration %	28.7	18.1	83.2	48.3	8.1	65.2	44.0	59.8	48.4	56.3	38.3	55.6	47.0
	SPOON	Frequency	18	17	18	16	7	15	28	21	38	20	76	122	198
		Duration (s)	42.7	61.8	139.7	39.1	9.3	28.3	130.5	154.2	94.9	62.5	292.6	470.4	763.0
		Duration %	41.0	31.8	55.5	14.1	9.4	19.3	54.5	62.4	33.2	35.1	31.6	42.9	37.7
Look at crumbs / smears on tray	PIECE	Frequency	-	9	-	10	-	3	8	10	2	16	19	39	58
		Duration (s)	-	43.9	-	60.6	-	8.1	26.5	47.5	11.2	110.9	104.5	204.2	308.7
		Duration %	-	18.6	-	21.9	-	2.9	13.9	18.5	4.6	39.1	8.6	16.2	12.4
	SPOON	Frequency	-	1	-	-	-	-	1	2	1	-	1	4	5
		Duration (s)	-	4.1	-	-	-	-	1.1	10.4	2.6	-	4.1	14.1	18.2
		Duration %	-	2.1	-	-	-	-	0.5	4.2	0.9	-	0.4	1.3	0.9

FOCUS/DIRECTION OF GAZE (INFANT)			INFANT										GROUP		
			Piece-first Infants (PFI)					Spoon-first Infants (SFI)					PFI	SFI	All
Behaviour	Event	Incidence	A	C	G	H	K	B	D	E	F	J			
Look at tray/ bib/ clothes / harness	PIECE	Frequency	1	7	5	-	11	7	4	4	3	1	24	19	43
		Duration (s)	1.5	20.1	5.7	-	23.6	32.2	6.9	12.0	9.6	0.8	50.9	61.5	112.4
		Duration %	0.6	8.5	2.4	-	11.6	11.4	3.6	4.7	3.9	0.3	4.1	4.9	4.5
	SPOON	Frequency	-	6	-	6	6	1	2	4	4	1	18	11	29
		Duration (s)	-	19.6	-	18.4	6.3	2.8	4.2	8.1	4.7	3.2	44.3	23.0	67.3
		Duration %	-	10.1	-	6.6	6.3	1.9	1.8	3.3	1.6	1.8	4.8	2.1	3.3
Look at mother's face	PIECE	Frequency	16	11	9	3	8	6	6	1	8	4	47	25	72
		Duration (s)	62.7	19.2	6.8	2.8	13.9	14.2	18.4	1.8	14.7	4.7	105.4	53.8	159.2
		Duration %	23.1	8.1	2.8	1.0	6.8	5.0	9.7	0.7	6.0	1.7	8.6	4.3	6.4
	SPOON	Frequency	7	7	7	6	7	2	11	9	15	10	34	47	81
		Duration (s)	16.2	10.7	24.4	11.3	6.4	1.9	34.0	10.2	27.1	17.2	69.0	90.4	159.4
		Duration %	15.5	5.5	9.7	4.1	6.4	1.3	14.2	4.1	9.5	9.7	7.4	8.2	7.9
Look at mother's body / movements	PIECE	Frequency	1	2	-	-	1	1	1	2	3	-	4	7	11
		Duration (s)	2.6	2.4	-	-	0.9	3.0	2.3	3.5	5.2	-	5.9	14.0	19.9
		Duration %	1.0	1.0	-	-	0.4	1.1	1.2	1.4	2.1	-	0.5	1.1	0.8
	SPOON	Frequency	1	1	-	1	2	-	5	3	-	1	5	9	14
		Duration (s)	0.3	7.0	-	8.0	4.2	-	14.9	8.1	-	0.9	19.5	23.9	43.4
		Duration %	0.3	3.6	-	2.9	4.2	-	6.2	3.3	-	0.5	2.1	2.2	2.1
Look at researcher	PIECE	Frequency	20	22	9	14	19	2	10	5	2	2	84	21	105
		Duration (s)	86.6	40.8	12.2	47.8	68.6	7.5	29.5	7.0	2.6	2.6	256.0	49.2	305.2
		Duration %	31.8	17.3	5.1	17.3	33.6	2.7	15.5	2.7	1.1	0.9	20.8	3.9	12.3
	SPOON	Frequency	6	12	18	21	17	4	6	10	11	9	74	40	114
		Duration (s)	12.0	32.1	61.0	44.9	33.9	17.6	13.5	18.0	14.8	10.8	183.9	74.7	258.6
		Duration %	11.5	16.5	24.2	16.2	34.1	12.0	5.6	7.3	5.2	6.1	19.9	6.8	12.8

FOCUS/DIRECTION OF GAZE (INFANT)			INFANT										GROUP			
			Piece-first Infants (PFI)					Spoon-first Infants (SFI)					PFI	SFI	All	
Behaviour	Event	Incidence	A	C	G	H	K	B	D	E	F	J				
Look down/ to side or close eyes	PIECE	Frequency	-	2	-	-	-	-	2	10	5	1	2	18	20	
		Duration (s)	-	0.8	-	-	-	-	-	2.9	23.8	10.2	1.6	0.8	38.5	39.3
		Duration %	-	0.3	-	-	-	-	-	1.5	9.3	4.1	0.6	0.1	3.1	1.6
	SPOON	Frequency	13	11	4	26	5	22	1	4	48	26	59	102	161	
		Duration (s)	26.4	21.6	7.3	85.5	7.3	71.8	0.7	7.4	114.0	56.7	148.1	250.6	398.7	
		Duration %	25.3	11.1	2.9	30.9	7.4	49.1	0.3	3.0	39.9	31.8	16.0	22.9	19.7	
Look at other	PIECE	Frequency	-	10	-	-	3	1	-	-	1	-	13	2	15	
		Duration (s)	-	29.8	-	-	3.8	1.1	-	-	0.9	-	33.6	2.0	35.6	
		Duration %	-	12.6	-	-	1.9	0.4	-	-	0.4	-	2.7	0.2	1.4	
	SPOON	Frequency	-	-	1	-	-	1	-	-	2	1	1	4	5	
		Duration (s)	-	-	2.7	-	-	1.7	-	-	4.9	6.2	2.7	12.8	15.5	
		Duration %	-	-	1.1	-	-	1.2	-	-	1.7	3.5	0.3	1.2	0.8	
Look up (to high point or 'into space')	PIECE	Frequency	1	-	-	-	-	-	-	-	5	-	1	5	6	
		Duration (s)	1.0	-	-	-	-	-	-	-	17.3	-	1.0	17.3	18.3	
		Duration %	0.4	-	-	-	-	-	-	-	7.0	-	0.1	1.4	0.7	
	SPOON	Frequency	-	-	-	-	-	1	2	-	-	-	1	3	4	
		Duration (s)	-	-	-	-	-	3.2	12.8	-	-	-	1.1	16.0	16.0	
		Duration %	-	-	-	-	-	2.2	5.3	-	-	-	0.1	1.5	0.8	
Look miscellaneous	PIECE	Frequency	15	24	15	14	30	10	16	5	24	2	97	57	154	
		Duration (s)	39.4	36.8	15.5	31.8	76.9	32.4	20.3	7.5	55.5	3.2	200.4	118.9	319.3	
		Duration %	14.5	15.6	6.5	11.5	37.7	11.5	10.7	2.9	22.6	1.1	16.3	9.4	12.8	
	SPOON	Frequency	4	17	12	23	16	12	18	11	14	15	73	70	143	
		Duration (s)	6.6	37.4	16.7	70.0	32.0	19.4	27.8	31.0	23.4	20.7	162.7	122.3	285.0	
		Duration %	6.3	19.2	6.6	25.3	32.2	13.3	11.6	12.5	8.2	11.6	17.6	11.2	14.1	

GESTURES AND BODY MOVEMENTS (INFANT)			INFANT										GROUP		
			Piece-first Infants (PFI)					Spoon-first Infants (SFI)					PFI	SFI	All
Behaviour	Event	Incidence	A	C	G	H	K	B	D	E	F	J			
Extend hand(s) towards item	PIECE	Frequency	3	3	17	9	4	14	16	16	11	18	36	75	111
		Duration (s)	3.0	5.4	25.4	20.6	16.6	27.3	29.9	20.7	10.4	23.8	71.0	112.1	183.1
		Duration %	1.1	2.3	10.6	7.5	8.1	9.7	15.7	8.1	4.2	8.4	5.8	8.9	7.4
	SPOON	Frequency	10	13	12	6	2	4	20	23	20	3	43	70	113
		Duration (s)	11.6	33.3	26.9	10.9	5.2	13.2	30.6	40.7	28.9	7.1	87.9	120.5	208.4
		Duration %	11.1	17.1	10.7	3.9	5.2	9.0	12.8	16.5	10.1	4.0	9.5	11.0	10.3
Lean head towards item	PIECE	Frequency	-	-	-	-	4	-	3	-	-	-	4	3	7
		Duration (s)	-	-	-	-	18.2	-	10.0	-	-	-	18.2	10.0	28.2
		Duration %	-	-	-	-	8.9	-	5.3	-	-	-	1.5	0.8	1.1
	SPOON	Frequency	-	-	-	1	2	2	6	1	-	1	3	10	13
		Duration (s)	-	-	-	1.3	2.1	3.7	30.1	2.6	-	1.0	3.4	37.4	40.8
		Duration %	-	-	-	0.5	2.1	2.5	12.6	1.1	-	0.6	0.4	3.4	2.0
Turn head away from item	PIECE	Frequency	-	-	-	-	-	-	-	-	-	-	-	-	-
		Duration (s)	-	-	-	-	-	-	-	-	-	-	-	-	-
		Duration %	-	-	-	-	-	-	-	-	-	-	-	-	-
	SPOON	Frequency	-	1	4	13	1	2	-	2	29	12	19	45	64
		Duration (s)	-	3.9	11.7	71.7	0.6	5.3	-	1.9	75.0	29.7	87.9	111.9	199.8
		Duration %	-	2.0	4.6	25.9	0.6	3.6	-	0.8	26.3	16.7	9.5	10.2	9.9
Extend/wave arms, or bounce in seat	PIECE	Frequency	-	-	-	-	1	-	1	1	-	-	1	2	3
		Duration (s)	-	-	-	-	1.2	-	4.6	1.2	-	-	1.2	5.8	7.0
		Duration %	-	-	-	-	0.6	-	2.4	0.5	-	-	0.1	0.5	0.3
	SPOON	Frequency	5	-	-	8	7	4	3	-	18	5	20	30	50
		Duration (s)	9.5	-	-	88.4	60.4	12.7	3.2	-	40.2	16.8	158.3	72.9	231.2
		Duration %	9.1	-	-	31.9	60.8	8.7	1.3	-	14.1	9.4	17.1	6.6	11.4

GESTURES AND BODY MOVEMENTS (INFANT)			INFANT										GROUP		
Behaviour	Event	Incidence	Piece-first Infants (PFI)					Spoon-first Infants (SFI)					PFI	SFI	All
			A	C	G	H	K	B	D	E	F	J			
Push self back/up / arch back / rear backwards	PIECE	Frequency	-	-	-	-	-	-	2	-	-	-	-	2	2
		Duration (s)	-	-	-	-	-	-	4.7	-	-	-	-	4.7	4.7
		Duration %	-	-	-	-	-	-	2.5	-	-	-	-	0.4	0.2
	SPOON	Frequency	7	2	6	6	18	10	-	-	34	9	39	53	92
		Duration (s)	29.7	3.0	20.0	19.7	34.1	30.6	-	-	130.0	41.0	106.5	201.6	308.1
		Duration %	28.5	1.5	7.9	7.1	34.3	20.9	-	-	45.5	23.0	11.5	18.4	15.2
Fend-off gesture	PIECE	Frequency	-	-	-	-	-	-	-	-	-	1	-	1	1
		Duration (s)	-	-	-	-	-	-	-	-	-	1.0	-	1.0	1.0
		Duration %	-	-	-	-	-	-	-	-	-	0.4	-	0.1	<0.1
	SPOON	Frequency	16	-	1	2	-	9	-	-	7	13	19	29	48
		Duration (s)	36.0	-	0.8	5.0	-	23.3	-	-	8.7	22.9	41.8	54.9	96.7
		Duration %	34.5	-	0.3	1.8	-	15.9	-	-	3.0	12.9	4.5	5.0	4.8
Fold-in gesture	PIECE	Frequency	-	-	-	-	-	-	-	-	-	-	-	-	-
		Duration (s)	-	-	-	-	-	-	-	-	-	-	-	-	-
		Duration %	-	-	-	-	-	-	-	-	-	-	-	-	-
	SPOON	Frequency	-	-	-	2	-	-	-	-	-	-	2	-	2
		Duration (s)	-	-	-	5.0	-	-	-	-	-	-	11.7	-	11.7
		Duration %	-	-	-	1.8	-	-	-	-	-	-	1.3	-	0.6
Reach towards mother	PIECE	Frequency	-	-	-	-	-	-	1	-	-	-	-	1	1
		Duration (s)	-	-	-	-	-	-	1.0	-	-	-	-	1.0	1.0
		Duration %	-	-	-	-	-	-	0.5	-	-	-	-	0.1	<0.1
	SPOON	Frequency	1	-	-	1	-	-	-	-	-	-	2	-	2
		Duration (s)	2.6	-	-	2.3	-	-	-	-	-	-	4.9	-	4.9
		Duration %	2.5	-	-	0.8	-	-	-	-	-	-	0.5	-	0.2

GESTURES AND BODY MOVEMENTS (INFANT)			INFANT										GROUP		
Behaviour	Event	Incidence	Piece-first Infants (PFI)					Spoon-first Infants (SFI)					PFI	SFI	All
			A	C	G	H	K	B	D	E	F	J			
Wave/bang empty hand/ bib on tray	PIECE	Frequency	-	-	-	6	-	3	9	-	-	1	6	13	19
		Duration (s)	-	-	-	7.3	-	3.2	14.2	-	-	1.4	7.3	18.8	26.1
		Duration %	-	-	-	2.6	-	1.1	7.5	-	-	0.5	0.6	1.5	1.0
	SPOON	Frequency	-	-	-	4	-	-	5	1	-	1	4	7	11
		Duration (s)	-	-	-	11.3	-	-	5.0	2.4	-	1.1	11.3	8.5	19.8
		Duration %	-	-	-	4.1	-	-	2.1	1.0	-	0.6	1.2	0.8	1.0
Yawn / rub eyes	PIECE	Frequency	-	-	-	-	-	-	-	6	-	-	-	6	6
		Duration (s)	-	-	-	-	-	-	-	18.6	-	-	-	18.6	18.6
		Duration %	-	-	-	-	-	-	-	7.3	-	-	-	1.5	0.7
	SPOON	Frequency	-	3	-	-	-	-	-	-	-	-	3	-	3
		Duration (s)	-	5.5	-	-	-	-	-	-	-	-	5.5	-	5.5
		Duration %	-	2.8	-	-	-	-	-	-	-	-	0.6	-	0.3

MANUAL CONTACT AND MANIPULATION (INFANT)			INFANT										GROUP		
Behaviour	Event	Incidence	Piece-first Infants (PFI)					Spoon-first Infants (SFI)					PFI	SFI	All
			A	C	G	H	K	B	D	E	F	J			
Grasp item – pick up or take from mother	PIECE	Frequency	3	2	8	8	5	5	13	13	9	14	26	54	80
		Duration (s)	2.8	2.2	21.0	8.2	8.6	7.3	11.2	12.7	8.6	16.7	42.8	56.5	99.3
		Duration %	1.0	0.9	8.8	3.0	4.2	2.6	5.9	5.0	3.5	5.9	3.5	4.5	4.0
	SPOON	Frequency	2	11	8	-	-	1	12	3	5	-	21	21	42
		Duration (s)	1.9	14.2	11.3	-	-	0.8	13.5	3.6	2.8	-	27.4	20.7	48.1
		Duration %	1.8	7.3	4.5	-	-	0.5	5.6	1.5	1.0	-	3.0	1.9	2.4
Touch / press / scratch item with fingers/ palm	PIECE	Frequency	8	9	19	7	-	17	8	15	17	15	43	72	115
		Duration (s)	19.1	34.9	60.4	21.3	-	144.7	13.1	61.0	52.5	65.1	135.7	336.4	472.1
		Duration %	7.0	14.8	25.2	7.7	-	51.3	6.9	23.8	21.3	23.0	11.0	26.7	19.0
	SPOON	Frequency	-	4	4	3	-	2	14	16	7	1	11	40	51
		Duration (s)	-	8.0	16.4	3.4	-	5.8	33.0	74.9	18.1	1.5	27.8	133.3	161.1
		Duration %	-	4.1	6.5	1.2	-	4.0	13.8	30.3	6.3	0.8	3.0	12.2	8.0
Turn / twist / hold up item / transfer hand	PIECE	Frequency	24	6	18	14	2	12	7	15	24	17	64	75	139
		Duration (s)	99.1	37.2	73.0	74.8	4.1	61.6	18.1	71.4	100.7	71.8	288.2	323.6	611.8
		Duration %	36.4	15.7	30.5	27.1	2.0	21.8	9.5	27.9	40.9	25.3	23.5	25.7	24.6
	SPOON	Frequency	-	1	12	-	-	1	12	5	1	-	13	19	32
		Duration (s)	-	2.8	30.5	-	-	3.4	29.2	22.8	0.7	-	33.3	56.1	89.4
		Duration %	-	1.4	12.1	-	-	2.3	12.2	9.2	0.2	-	3.6	5.1	4.4
Wave/hit item / bang item on tray	PIECE	Frequency	-	-	1	9	1	10	6	12	6	2	11	36	47
		Duration (s)	-	-	2.7	16.4	3.4	20.3	10.7	26.9	8.0	2.4	22.5	68.3	90.8
		Duration %	-	-	1.1	5.9	1.7	7.2	5.6	10.5	3.3	0.8	1.8	5.4	3.7
	SPOON	Frequency	-	-	-	-	-	-	-	3	2	-	-	5	5
		Duration (s)	-	-	-	-	-	-	-	10.4	12.4	-	-	22.8	22.8
		Duration %	-	-	-	-	-	-	-	4.2	4.3	-	-	2.1	1.1

MANUAL CONTACT AND MANIPULATION (INFANT)			INFANT										GROUP			
			Piece-first Infants (PFI)					Spoon-first Infants (SFI)					PFI	SFI	All	
Behaviour	Event	Incidence	A	C	G	H	K	B	D	E	F	J				
Poke at / push / pick up crumbs/ smears	PIECE	Frequency	-	10	-	2	-	3	5	6	2	11	12	27	39	
		Duration (s)	-	41.4	-	8.3	-	8.1	7.7	22.8	13.9	77.5	49.7	130.0	179.7	
		Duration %	-	17.5	-	3.0	-	2.9	4.0	8.9	5.6	27.3	4.0	10.3	7.2	
	SPOON	Frequency	-	3	-	-	-	-	-	-	3	-	-	3	3	6
		Duration (s)	-	3.9	-	-	-	-	-	-	9.7	-	-	3.9	9.7	13.6
		Duration %	-	2.0	-	-	-	-	-	-	3.9	-	-	0.4	0.9	0.7
Grasp item and hold away	PIECE	Frequency	-	-	-	-	-	-	-	2	-	-	-	2	2	
		Duration (s)	-	-	-	-	-	-	-	2.6	-	-	-	2.6	2.6	
		Duration %	-	-	-	-	-	-	-	1.0	-	-	-	0.2	0.1	
	SPOON	Frequency	7	-	2	-	-	3	-	1	6	3	9	13	22	
		Duration (s)	26.7	-	6.1	-	-	7.9	-	0.8	15.4	12.0	32.8	36.1	68.9	
		Duration %	25.6	-	2.4	-	-	5.4	-	0.3	5.4	6.7	3.5	3.3	3.4	
Hold / push away item / mother's hand	PIECE	Frequency	-	-	-	-	-	-	-	1	2	-	-	3	3	
		Duration (s)	-	-	-	-	-	-	-	3.0	3.6	-	-	6.6	6.6	
		Duration %	-	-	-	-	-	-	-	1.2	1.5	-	-	0.5	0.3	
	SPOON	Frequency	3	11	3	-	-	1	-	1	3	5	17	10	27	
		Duration (s)	6.4	18.7	4.9	-	-	3.4	-	2.6	2.1	11.7	30.0	19.8	49.8	
		Duration %	6.1	9.6	1.9	-	-	2.3	-	1.1	0.7	6.6	3.2	1.8	2.5	
Simple hold (in control, attention elsewhere)	PIECE	Frequency	2	15	2	2	2	1	2	5	6	8	23	22	45	
		Duration (s)	5.3	79.9	3.1	4.1	5.0	8.8	3.0	18.3	18.2	32.2	97.4	80.5	177.9	
		Duration %	1.9	33.8	1.3	1.5	2.4	3.1	1.6	7.1	7.4	11.4	7.9	6.4	7.2	
	SPOON	Frequency	-	1	3	-	-	-	7	1	1	-	4	9	13	
		Duration (s)	-	12.1	10.2	-	-	-	30.6	4.2	2.9	-	22.3	37.7	60.0	
		Duration %	-	6.2	4.1	-	-	-	12.8	1.7	1.0	-	2.4	3.4	3.0	

MANUAL CONTACT AND MANIPULATION (INFANT)			INFANT										GROUP		
			Piece-first Infants (PFI)					Spoon-first Infants (SFI)					PFI	SFI	All
Behaviour	Event	Incidence	A	C	G	H	K	B	D	E	F	J			
Hold item passively, mother controls	PIECE	Frequency	-	-	-	-	-	-	-	-	-	-	-	-	-
		Duration (s)	-	-	-	-	-	-	-	-	-	-	-	-	-
		Duration %	-	-	-	-	-	-	-	-	-	-	-	-	-
	SPOON	Frequency	2	5	6	-	-	4	5	1	5	4	13	19	32
		Duration (s)	4.6	14.7	22.7	-	-	27.0	7.2	5.3	22.7	7.1	42.0	69.3	111.3
		Duration %	4.4	7.6	9.0	-	-	18.5	3.0	2.1	7.9	4.0	4.5	6.3	5.5
Drop purposely / throw item	PIECE	Frequency	-	-	5	-	-	3	4	2	1	4	5	14	19
		Duration (s)	-	-	5.2	-	-	3.1	3.3	2.1	1.0	4.1	5.2	13.6	18.8
		Duration %	-	-	2.2	-	-	1.1	1.7	0.8	0.4	1.4	0.4	1.1	0.8
	SPOON	Frequency	-	-	-	-	-	-	-	-	-	-	-	-	-
		Duration (s)	-	-	-	-	-	-	-	-	-	-	-	-	-
		Duration %	-	-	-	-	-	-	-	-	-	-	-	-	-
Release item to mother's grasp	PIECE	Frequency	-	-	-	-	1	-	-	-	-	-	1	-	1
		Duration (s)	-	-	-	-	0.6	-	-	-	-	-	0.6	-	0.6
		Duration %	-	-	-	-	0.3	-	-	-	-	-	<0.1	-	<0.1
	SPOON	Frequency	4	9	3	-	-	3	6	1	1	1	16	12	28
		Duration (s)	1.5	4.6	2.3	-	-	2.4	6.0	0.8	0.5	0.7	8.4	10.4	18.8
		Duration %	1.4	2.4	0.9	-	-	1.6	2.5	0.3	0.2	0.4	0.9	0.9	0.9
Manipulate bib/ clothes / harness	PIECE	Frequency	-	-	-	3	-	5	-	1	-	-	3	6	9
		Duration (s)	-	-	-	24.3	-	21.7	-	1.4	-	-	24.3	23.1	47.4
		Duration %	-	-	-	8.8	-	7.7	-	0.5	-	-	2.0	1.8	1.9
	SPOON	Frequency	-	-	-	1	-	3	-	1	-	-	1	4	5
		Duration (s)	-	-	-	19.9	-	6.0	-	4.1	-	-	19.9	10.1	30.0
		Duration %	-	-	-	7.2	-	4.1	-	1.7	-	-	2.1	0.9	1.5

MANUAL CONTACT AND MANIPULATION (INFANT)			INFANT										GROUP		
			Piece-first Infants (PFI)					Spoon-first Infants (SFI)					PFI	SFI	All
Behaviour	Event	Incidence	A	C	G	H	K	B	D	E	F	J			
Two-handed reach/ touch	PIECE	Frequency	17	13	17	14	1	18	16	12	20	20	62	86	148
		Duration (s)	169.5	56.3	57.1	85.1	2.9	109.7	62.8	66.0	108.3	74.7	370.9	421.5	792.4
		Duration %	62.3	23.8	23.8	30.8	1.4	38.9	33.0	25.8	44.0	26.4	30.2	33.5	31.9
	SPOON	Frequency	10	10	2	2	1	7	19	16	7	4	25	53	78
		Duration (s)	32.6	51.1	4.9	4.1	1.9	20.7	91.0	106.0	17.1	12.0	94.6	246.8	341.4
		Duration %	31.3	26.3	1.9	1.5	1.9	14.1	38.0	42.9	6.0	6.7	10.2	22.5	16.9

ORAL/PERI-ORAL CONTACT AND MOVEMENTS (INFANT)			INFANT										GROUP		
Behaviour	Event	Incidence	Piece-first Infants (PFI)					Spoon-first Infants (SFI)					PFI	SFI	All
			A	C	G	H	K	B	D	E	F	J			
Open mouth (anticipation/reflex)	PIECE	Frequency	8	14	7	19	9	9	15	4	5	7	57	40	97
		Duration (s)	7.6	18.0	8.4	21.0	17.2	7.9	33.9	3.9	3.6	8.9	72.2	58.2	130.4
		Duration %	2.8	7.6	3.5	7.6	8.4	2.8	17.8	1.5	1.5	3.1	5.9	4.6	5.2
	SPOON	Frequency	3	16	4	5	8	5	17	8	11	2	36	43	79
		Duration (s)	3.0	32.2	3.1	5.6	8.3	7.9	19.6	10.2	12.1	1.8	52.2	51.6	103.8
		Duration %	2.9	16.6	1.2	2.0	8.4	5.4	8.2	4.1	4.2	10	5.6	4.7	5.1
Protrude tongue (no contact with item)	PIECE	Frequency	3	-	-	-	8	-	16	10	-	-	11	26	37
		Duration (s)	3.0	-	-	-	13.2	-	22.4	10.1	-	-	16.2	32.5	48.7
		Duration %	1.1	-	-	-	6.5	-	11.8	3.9	-	-	1.3	2.6	2.0
	SPOON	Frequency	-	-	-	-	-	-	2	8	-	-	-	10	10
		Duration (s)	-	-	-	-	-	-	2.6	7.7	-	-	-	10.3	10.3
		Duration %	-	-	-	-	-	-	1.1	3.1	-	-	-	0.9	0.5
Hold item to mouth	PIECE	Frequency	19	15	19	19	7	5	15	6	23	5	79	54	133
		Duration (s)	173.3	92.9	49.4	94.9	112.5	7.1	49.9	10.7	31.8	13.4	523.0	112.9	635.9
		Duration %	63.7	39.3	20.6	34.3	55.1	2.5	26.2	4.2	12.9	4.7	42.6	9.0	25.6
	SPOON	Frequency	1	12	9	-	-	1	18	4	1	-	22	24	46
		Duration (s)	1.5	40.7	41.2	-	-	3.6	70.0	21.6	0.8	-	83.4	96.0	179.4
		Duration %	1.4	20.9	16.4	-	-	2.5	29.2	8.7	0.3	-	9.0	8.8	8.9
Touch item with lips/tongue	PIECE	Frequency	17	6	12	16	7	4	17	5	20	4	58	50	108
		Duration (s)	42.7	8.0	14.0	48.5	12.7	2.8	50.8	6.8	21.1	7.4	125.9	88.9	214.8
		Duration %	15.7	3.4	5.8	17.5	6.2	1.0	26.7	2.7	8.6	2.6	10.2	7.1	8.6
	SPOON	Frequency	-	10	14	-	4	4	14	13	11	1	28	43	71
		Duration (s)	-	26.9	41.3	-	5.1	5.6	50.8	34.6	12.4	2.0	73.3	105.4	178.7
		Duration %	-	13.8	16.4	-	5.1	3.8	21.2	14.0	4.3	1.1	7.9	9.6	8.8

ORAL/PERI-ORAL CONTACT AND MOVEMENTS (INFANT)			INFANT										GROUP		
Behaviour	Event	Incidence	Piece-first Infants (PFI)					Spoon-first Infants (SFI)					PFI	SFI	All
			A	C	G	H	K	B	D	E	F	J			
Chomp/gnaw/ bite/suck on item	PIECE	Frequency	10	14	-	4	9	-	1	-	-	-	37	1	38
		Duration (s)	119.7	63.7	-	32.7	98.6	-	1.1	-	-	-	314.7	1.1	315.8
		Duration %	44.0	26.9	-	11.8	48.3	-	0.6	-	-	-	25.6	0.1	12.7
	SPOON	Frequency	1	11	10	1	5	2	10	2	2	-	28	16	44
		Duration (s)	1.0	23.2	29.4	0.7	6.4	3.2	19.2	3.3	1.9	-	60.7	27.6	88.3
		Duration %	1.0	11.9	11.7	0.3	6.4	2.2	8.0	1.3	0.7	-	6.6	2.5	4.4
Possible purposeful sniff	PIECE	Frequency	6	4	9	11	-	2	10	-	8	5	30	25	55
		Duration (s)	5.1	4.3	8.8	8.2	-	0.7	7.3	-	6.1	3.1	26.4	17.2	43.6
		Duration %	1.9	1.8	3.7	3.0	-	0.2	3.8	-	2.5	1.1	2.1	1.4	1.8
	SPOON	Frequency	-	-	1	-	-	-	7	-	-	-	1	7	8
		Duration (s)	-	-	0.7	-	-	-	8.8	-	-	-	0.7	8.8	9.5
		Duration %	-	-	0.3	-	-	-	3.7	-	-	-	0.1	0.8	0.5
Suck/gnaw on fingers/ hand	PIECE	Frequency	1	-	-	3	3	-	1	1	-	-	7	2	9
		Duration (s)	1.6	-	-	10.1	4.5	-	2.9	1.5	-	-	16.2	4.4	20.6
		Duration %	0.6	-	-	3.7	2.2	-	1.5	0.6	-	-	1.3	0.3	0.8
	SPOON	Frequency	-	1	1	-	-	-	1	2	-	-	2	3	5
		Duration (s)	-	7.6	2.5	-	-	-	3.0	7.2	-	-	10.1	10.2	20.3
		Duration %	-	3.9	1.0	-	-	-	1.3	2.9	-	-	1.1	0.9	1.0
Suck/gnaw on bib/clothes/ harness	PIECE	Frequency	-	-	-	2	1	-	-	-	-	-	3	-	3
		Duration (s)	-	-	-	8.2	3.5	-	-	-	-	-	11.7	-	11.7
		Duration %	-	-	-	3.0	1.7	-	-	-	-	-	1.0	-	0.5
	SPOON	Frequency	-	-	-	1	-	-	-	-	-	-	1	-	1
		Duration (s)	-	-	-	15.6	-	-	-	-	-	-	15.6	-	15.6
		Duration %	-	-	-	5.6	-	-	-	-	-	-	1.7	-	0.8

ORAL/PERI-ORAL CONTACT AND MOVEMENTS (INFANT)			INFANT										GROUP		
Behaviour	Event	Incidence	Piece-first Infants (PFI)					Spoon-first Infants (SFI)					PFI	SFI	All
			A	C	G	H	K	B	D	E	F	J			
Chewing movements / lip-smacking (mouth empty)	PIECE	Frequency	4	3	2	-	-	16	12	17	25	9	9	79	88
		Duration (s)	29.6	13.1	5.7	-	-	209.0	26.9	91.5	78.5	62.2	48.4	468.1	516.5
		Duration %	10.9	5.5	2.4	-	-	74.0	14.1	35.7	31.9	21.9	3.9	37.2	20.8
	SPOON	Frequency	-	-	-	-	-	1	1	7	4	-	-	13	13
		Duration (s)	-	-	-	-	-	3.1	3.0	24.7	9.0	-	-	39.8	39.8
		Duration %	-	-	-	-	-	2.1	1.3	10.0	3.2	-	-	3.6	2.0
Chewing/munching (food in mouth)	PIECE	Frequency	8	15	-	8	6	-	-	-	-	-	37	-	37
		Duration (s)	44.4	78.2	-	47.9	44.1	-	-	-	-	-	214.6	-	214.6
		Duration %	16.3	33.1	-	17.3	21.6	-	-	-	-	-	17.5	-	8.6
	SPOON	Frequency	8	14	8	20	11	9	13	13	10	10	61	55	108
		Duration (s)	83.3	97.9	40.3	67.8	70.6	108.4	56.8	84.9	127.0	92.2	359.9	469.3	788.9
		Duration %	79.9	50.4	16.0	24.5	71.1	74.1	23.7	34.3	44.5	51.7	38.9	42.8	39.0
Unstick/eject movement	PIECE	Frequency	-	-	-	3	-	-	-	-	-	-	3	-	3
		Duration (s)	-	-	-	10.1	-	-	-	-	-	-	10.1	-	10.1
		Duration %	-	-	-	3.7	-	-	-	-	-	-	0.8	-	0.4
	SPOON	Frequency	2	10	-	18	12	-	-	1	-	10	42	11	53
		Duration (s)	2.5	20.1	-	36.9	14.0	-	-	5.3	-	17.4	73.5	22.7	96.2
		Duration %	2.4	10.3	-	13.3	14.1	-	-	2.1	-	9.8	7.9	2.1	4.8
Gag/cough	PIECE	Frequency	-	1	-	-	1	1	-	-	-	-	2	1	3
		Duration (s)	-	1.6	-	-	1.0	3.1	-	-	-	-	2.6	3.1	5.7
		Duration %	-	0.7	-	-	0.5	1.1	-	-	-	-	0.2	0.2	0.2
	SPOON	Frequency	4	1	1	4	3	4	-	2	2	6	13	14	27
		Duration (s)	4.8	0.8	1.3	50.2	3.8	5.3	-	3.0	5.9	14.1	60.9	28.3	89.2
		Duration %	4.6	0.4	0.5	18.1	3.8	3.6	-	1.2	2.1	7.9	6.6	2.6	4.4

ORAL/PERI-ORAL CONTACT AND MOVEMENTS (INFANT)			INFANT										GROUP				
Behaviour	Event	Incidence	Piece-first Infants (PFI)					Spoon-first Infants (SFI)					PFI	SFI	All		
			A	C	G	H	K	B	D	E	F	J					
Hold mouth open around item	PIECE	Frequency	-	-	-	-	-	-	-	-	-	-	1	-	1	1	
		Duration (s)	-	-	-	-	-	-	-	-	-	-	-	1.3	-	1.3	1.3
		Duration %	-	-	-	-	-	-	-	-	-	-	-	0.5	-	0.1	0.1
	SPOON	Frequency	2	5	-	19	3	1	1	2	2	5	29	11	40		
		Duration (s)	1.8	8.8	-	64.0	3.1	0.5	2.5	3.5	2.4	6.0	77.7	14.9	92.6		
		Duration %	1.7	4.5	-	23.1	3.1	0.3	1.0	1.4	0.8	3.4	8.4	1.4	4.6		
Pout / push against item with lips	PIECE	Frequency	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		Duration (s)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		Duration %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	SPOON	Frequency	-	-	-	-	-	-	-	-	-	18	-	-	18	18	
		Duration (s)	-	-	-	-	-	-	-	-	-	18.9	-	-	18.9	18.9	
		Duration %	-	-	-	-	-	-	-	-	-	6.6	-	-	1.7	0.9	

FACIAL EXPRESSION (INFANT)			INFANT										GROUP		
			Piece-first Infants (PFI)					Spoon-first Infants (SFI)					PFI	SFI	All
Behaviour	Event	Incidence	A	C	G	H	K	B	D	E	F	J			
Pleasure face	PIECE	Frequency	10	-	-	1	2	-	3	1	-	-	13	4	17
		Duration (s)	35.8	-	-	1.2	5.3	-	4.8	1.5	-	-	42.3	6.3	48.6
		Duration %	13.2	-	-	0.4	2.6	-	2.5	0.6	-	-	3.4	0.5	2.0
	SPOON	Frequency	1	-	1	1	3	-	3	-	-	2	6	5	11
		Duration (s)	2.4	-	6.2	3.2	6.3	-	7.5	-	-	2.9	18.1	10.4	28.5
		Duration %	2.3	-	2.5	1.2	6.3	-	3.1	-	-	1.6	2.0	0.9	1.4
Displeasure/ anxiety face	PIECE	Frequency	-	-	6	-	1	12	-	4	8	-	7	24	31
		Duration (s)	-	-	15.6	-	1.8	78.6	-	7.3	19.4	-	17.4	105.3	122.7
		Duration %	-	-	6.5	-	0.9	27.8	-	2.8	7.9	-	1.4	8.4	4.9
	SPOON	Frequency	9	4	18	21	7	13	-	19	24	14	59	70	129
		Duration (s)	23.9	10.8	66.1	51.2	20.1	71.8	-	40.7	65.9	63.8	172.1	242.2	414.3
		Duration %	22.9	5.6	26.3	18.5	20.2	49.1	-	16.5	23.1	35.8	18.6	22.1	20.5
'Shudder face'/ flinch	PIECE	Frequency	-	2	-	-	-	2	-	-	3	2	2	7	9
		Duration (s)	-	3.8	-	-	-	1.7	-	-	3.1	4.2	3.8	9.0	12.8
		Duration %	-	1.6	-	-	-	0.6	-	-	1.3	1.5	0.3	0.7	0.5
	SPOON	Frequency	4	13	3	4	-	14	-	3	14	9	24	40	64
		Duration (s)	10.4	22.8	3.5	4.5	-	18.3	-	5.3	25.3	13.7	41.2	62.6	103.8
		Duration %	10.0	11.7	1.4	1.6	-	12.5	-	2.1	8.9	7.7	4.4	5.7	5.1

VOCALISATION (INFANT)			INFANT										GROUP		
			Piece-first Infants (PFI)					Spoon-first Infants (SFI)					PFI	SFI	All
Behaviour	Event	Incidence	A	C	G	H	K	B	D	E	F	J			
Audible lip-smacking	PIECE	Frequency	2	3	-	-	1	-	-	2	-	-	6	2	8
		Duration (s)	3.5	14.5	-	-	1.8	-	-	2.7	-	-	19.8	2.7	22.5
		Duration %	1.3	6.1	-	-	0.9	-	-	1.1	-	-	1.6	0.2	0.9
	SPOON	Frequency	-	1	-	-	-	-	4	-	-	-	2	4	6
		Duration (s)	-	2.5	-	-	-	-	6.9	-	-	-	2.5	6.9	9.4
		Duration %	-	1.3	-	-	-	-	2.9	-	-	-	0.3	0.6	0.5
Blow 'raspberry'	PIECE	Frequency	6	-	-	-	-	1	-	-	-	-	6	1	7
		Duration (s)	12.9	-	-	-	-	1.2	-	-	-	-	12.9	1.2	14.1
		Duration %	4.7	-	-	-	-	0.4	-	-	-	-	1.1	0.1	0.6
	SPOON	Frequency	-	-	-	-	-	2	-	-	-	-	-	2	2
		Duration (s)	-	-	-	-	-	2.5	-	-	-	-	-	2.5	2.5
		Duration %	-	-	-	-	-	1.7	-	-	-	-	-	0.2	0.1
Distress noise	PIECE	Frequency	-	-	-	-	-	1	-	-	1	-	-	2	2
		Duration (s)	-	-	-	-	-	1.3	-	-	1.7	-	-	3.0	3.0
		Duration %	-	-	-	-	-	0.5	-	-	0.7	-	-	0.2	0.1
	SPOON	Frequency	-	1	-	-	-	-	-	-	2	4	1	6	7
		Duration (s)	-	2.1	-	-	-	-	-	-	2.7	8.9	2.1	11.6	13.7
		Duration %	-	1.1	-	-	-	-	-	-	0.9	5.0	0.2	1.1	0.7
Murmur, conversational	PIECE	Frequency	4	-	1	-	2	1	3	-	2	-	7	6	13
		Duration (s)	7.1	-	0.8	-	1.8	0.9	2.7	-	1.4	-	9.7	5.0	14.7
		Duration %	2.6	-	0.3	-	0.9	0.3	1.4	-	0.6	-	0.8	0.4	0.6
	SPOON	Frequency	1	4	-	1	-	-	1	1	3	1	6	6	12
		Duration (s)	0.6	6.3	-	4.0	-	-	0.2	1.4	2.3	0.9	10.9	4.8	15.7
		Duration %	0.6	3.2	-	1.4	-	-	0.1	0.6	0.8	0.5	1.2	0.4	0.8

VOCALISATION (INFANT)			INFANT										GROUP		
Behaviour	Event	Incidence	Piece-first Infants (PFI)					Spoon-first Infants (SFI)					PFI	SFI	All
			A	C	G	H	K	B	D	E	F	J			
Sigh	PIECE	Frequency	1	2	-	1	2	2	4	2	1	-	6	9	15
		Duration (s)	1.4	2.5	-	1.6	2.8	4.9	3.9	2.2	0.9	-	8.3	11.9	20.2
		Duration %	0.5	1.1	-	0.6	1.4	1.7	2.0	0.9	0.4	-	0.7	0.9	0.8
	SPOON	Frequency	1	3	-	2	4	-	1	-	-	1	10	2	12
		Duration (s)	1.4	4.3	-	3.3	5.5	-	1.1	-	-	1.5	14.5	2.6	17.1
		Duration %	1.3	2.2	-	1.2	5.5	-	0.5	-	-	0.8	1.6	0.2	0.8
Miscellaneous vocalisation	PIECE	Frequency	11	-	-	14	-	8	19	12	1	4	25	44	69
		Duration (s)	14.3	-	-	16.3	-	14.5	13.2	10.3	1.1	7.2	30.6	46.3	76.9
		Duration %	5.3	-	-	5.9	-	5.1	6.9	4.0	0.4	2.5	2.5	3.7	3.1
	SPOON	Frequency	2	7	-	17	3	6	4	2	2	9	29	23	52
		Duration (s)	2.1	11.3	-	21.9	3.1	9.6	2.7	2.0	1.2	11.4	38.4	26.9	65.3
		Duration %	2.0	5.8	-	7.9	3.1	6.6	1.1	0.8	0.4	6.4	4.1	2.5	3.2

MOTHER'S ACTIVITY			INFANT										GROUP		
			Piece-first Infants (PFI)					Spoon-first Infants (SFI)					PFI	SFI	All
Behaviour	Event	Incidence	A	C	G	H	K	B	D	E	F	J			
Hold item, offer hand	PIECE	Frequency	1	2	6	10	4	5	14	9	4	14	23	46	69
		Duration (s)	4.0	12.6	86.8	34.5	42.3	59.3	54.9	44.6	12.4	116.3	179.8	287.5	467.3
		Duration %	1.5	5.3	36.2	12.5	20.7	21.0	28.8	17.4	5.0	41.0	14.6	22.8	18.8
	SPOON	Frequency	11	6	3	4	-	-	10	12	4	10	24	36	60
		Duration (s)	26.2	16.6	21.4	10.2	-	-	39.1	41.8	17.6	27.1	74.8	125.6	200.4
		Duration %	25.5	8.5	8.5	3.7	-	-	16.3	16.9	6.2	15.2	8.1	11.5	9.9
Retrieve dropped/out- of-reach item	PIECE	Frequency	1	2	3	4	-	4	6	8	5	5	10	28	38
		Duration (s)	2.1	6.3	6.8	12.2	-	11.1	10.6	12.9	6.9	7.3	27.4	48.8	76.2
		Duration %	0.8	2.7	2.8	4.4	-	3.9	5.6	5.0	2.8	2.6	2.2	3.9	3.1
	SPOON	Frequency	-	-	-	-	-	-	-	2	-	-	-	2	2
		Duration (s)	-	-	-	-	-	-	-	5.3	-	-	-	5.3	5.3
		Duration %	-	-	-	-	-	-	-	2.1	-	-	-	0.5	0.3
Hold item passively, infant controls	PIECE	Frequency	-	-	-	-	-	-	-	-	-	-	-	-	-
		Duration (s)	-	-	-	-	-	-	-	-	-	-	-	-	-
		Duration %	-	-	-	-	-	-	-	-	-	-	-	-	-
	SPOON	Frequency	9	14	12	-	-	2	14	9	4	2	35	31	66
		Duration (s)	26.2	91.0	105.5	-	-	6.2	89.5	35.4	13.1	7.2	222.7	151.4	374.1
		Duration %	25.1	46.8	41.9	-	-	4.2	37.4	14.3	4.6	4.0	24.0	13.8	18.5
Reach towards item, then withdraw hand	PIECE	Frequency	-	-	-	2	-	-	-	-	-	-	2	-	2
		Duration (s)	-	-	-	2.5	-	-	-	-	-	-	2.5	-	2.5
		Duration %	-	-	-	0.9	-	-	-	-	-	-	0.2	-	0.1
	SPOON	Frequency	-	-	-	-	-	-	-	1	-	-	-	1	1
		Duration (s)	-	-	-	-	-	-	-	4.0	-	-	-	4.0	4.0
		Duration %	-	-	-	-	-	-	-	1.6	-	-	-	0.4	0.2

MOTHER'S ACTIVITY			INFANT										GROUP		
			Piece-first Infants (PFI)					Spoon-first Infants (SFI)					PFI	SFI	All
Behaviour	Event	Incidence	A	C	G	H	K	B	D	E	F	J			
Rest hand on tray/arm of infant's chair	PIECE	Frequency	-	1	-	5	1	1	1	2	-	-	7	4	11
		Duration (s)	-	6.4	-	67.4	12.2	162.9	2.2	3.9	-	-	86.0	169.0	255.0
		Duration %	-	2.7	-	24.4	6.0	57.7	1.2	1.5	-	-	7.0	13.4	10.3
	SPOON	Frequency	-	-	-	-	-	-	1	2	4	-	-	7	7
		Duration (s)	-	-	-	-	-	-	2.4	7.1	90.1	-	-	99.6	99.6
		Duration %	-	-	-	-	-	-	1.0	2.9	31.5	-	-	9.1	4.9
Straighten/ adjust infant's clothes/bib	PIECE	Frequency	-	-	2	2	-	1	2	-	1	-	4	4	8
		Duration (s)	-	-	7.1	5.9	-	2.2	8.6	-	1.7	-	13.0	12.5	25.5
		Duration %	-	-	3.0	2.1	-	0.8	4.5	-	0.7	-	1.1	1.0	1.0
	SPOON	Frequency	-	-	-	-	-	-	-	2	9	-	-	11	11
		Duration (s)	-	-	-	-	-	-	-	3.5	36.6	-	-	40.1	40.1
		Duration %	-	-	-	-	-	-	-	1.4	12.8	-	-	3.7	2.0
Touch infant to comfort	PIECE	Frequency	-	-	-	-	-	-	-	-	-	-	-	-	-
		Duration (s)	-	-	-	-	-	-	-	-	-	-	-	-	-
		Duration %	-	-	-	-	-	-	-	-	-	-	-	-	-
	SPOON	Frequency	-	-	-	2	-	-	-	-	-	-	-	2	2
		Duration (s)	-	-	-	25.8	-	-	-	-	-	-	-	25.8	25.8
		Duration %	-	-	-	9.3	-	-	-	-	-	-	-	2.8	1.3
Hold item to infant's mouth	PIECE	Frequency	-	-	-	-	-	-	-	-	-	-	-	-	-
		Duration (s)	-	-	-	-	-	-	-	-	-	-	-	-	-
		Duration %	-	-	-	-	-	-	-	-	-	-	-	-	-
	SPOON	Frequency	8	7	15	17	11	16	6	12	29	18	58	81	139
		Duration (s)	18.4	12.8	81.3	74.4	28.5	69.0	16.7	43.9	149.2	42.6	215.4	321.4	536.8
		Duration %	17.7	6.6	32.3	26.9	28.7	47.2	7.0	17.8	52.2	23.9	23.3	29.3	26.5

MOTHER'S ACTIVITY			INFANT										GROUP			
			Piece-first Infants (PFI)					Spoon-first Infants (SFI)					PFI	SFI	All	
Behaviour	Event	Incidence	A	C	G	H	K	B	D	E	F	J				
Touch infant's hand / item in infant's hand	PIECE	Frequency	-	2	-	1	3	-	1	-	-	3	6	4	10	
		Duration (s)	-	4.8	-	2.2	46.2	-	0.5	-	-	5.0	53.2	5.5	58.7	
		Duration %	-	2.0	-	0.8	22.6	-	0.3	-	-	1.8	4.3	0.4	2.4	
	SPOON	Frequency	-	-	-	-	-	-	-	-	-	1	-	-	1	1
		Duration (s)	-	-	-	-	-	-	-	-	-	1.7	-	-	1.7	1.7
		Duration %	-	-	-	-	-	-	-	-	-	0.6	-	-	0.2	0.1
Hold/turn away item (to allow time)	PIECE	Frequency	-	-	-	-	-	-	-	-	-	2	-	2	2	
		Duration (s)	-	-	-	-	-	-	-	-	-	14.1	-	14.1	14.1	
		Duration %	-	-	-	-	-	-	-	-	-	5.0	-	1.1	0.6	
	SPOON	Frequency	10	12	5	13	5	10	2	3	17	12	45	44	89	
		Duration (s)	28.3	44.3	26.6	55.7	14.6	49.8	6.4	8.2	46.0	33.4	169.5	143.8	313.3	
		Duration %	27.2	22.8	10.6	20.1	14.7	34.0	2.7	3.3	16.1	18.7	18.3	13.1	15.5	
Take item from infant or hold out of reach	PIECE	Frequency	-	-	-	-	1	-	-	-	-	-	1	-	1	
		Duration (s)	-	-	-	-	0.7	-	-	-	-	-	0.7	-	0.7	
		Duration %	-	-	-	-	0.3	-	-	-	-	-	0.1	-	<0.1	
	SPOON	Frequency	-	-	1	-	-	3	8	9	1	1	1	22	23	
		Duration (s)	-	-	1.2	-	-	4.9	14.8	23.5	0.7	0.4	1.2	44.3	45.5	
		Duration %	-	-	0.5	-	-	3.3	6.2	9.5	0.2	0.2	0.1	4.0	2.2	
Restrain infant's arm	PIECE	Frequency	-	-	-	-	-	-	-	-	-	-	-	-	-	
		Duration (s)	-	-	-	-	-	-	-	-	-	-	-	-	-	
		Duration %	-	-	-	-	-	-	-	-	-	-	-	-	-	
	SPOON	Frequency	-	-	-	2	-	5	-	-	1	-	2	6	8	
		Duration (s)	-	-	-	8.2	-	88.8	-	-	1.6	-	8.2	90.4	98.6	
		Duration %	-	-	-	3.0	-	60.7	-	-	0.6	-	0.9	8.2	4.9	

MOTHER'S ACTIVITY			INFANT										GROUP			
			Piece-first Infants (PFI)					Spoon-first Infants (SFI)					PFI	SFI	All	
Behaviour	Event	Incidence	A	C	G	H	K	B	D	E	F	J				
Use item to move food on tray	PIECE	Frequency	-	-	-	-	-	-	-	-	-	-	-	-	-	
		Duration (s)	-	-	-	-	-	-	-	-	-	-	-	-	-	
		Duration %	-	-	-	-	-	-	-	-	-	-	-	-	-	
	SPOON	Frequency	-	-	-	-	-	-	-	2	-	-	-	-	2	2
		Duration (s)	-	-	-	-	-	-	-	7.5	-	-	-	-	7.5	7.5
		Duration %	-	-	-	-	-	-	-	3.1	-	-	-	-	0.7	0.4
Wipe infant's mouth/chin with item	PIECE	Frequency	-	-	-	-	-	-	-	-	-	-	-	-	-	
		Duration (s)	-	-	-	-	-	-	-	-	-	-	-	-	-	
		Duration %	-	-	-	-	-	-	-	-	-	-	-	-	-	
	SPOON	Frequency	1	-	-	1	1	3	1	3	6	12	3	25	28	
		Duration (s)	1.2	-	-	0.8	1.2	5.8	0.9	4.5	7.4	20.9	3.2	39.5	42.7	
		Duration %	1.2	-	-	0.3	1.2	4.0	0.4	1.8	2.6	11.7	0.3	3.6	2.1	
Wipe infant's mouth/face with cloth/bib/finger	PIECE	Frequency	-	-	-	-	-	-	-	-	-	1	-	1	1	
		Duration (s)	-	-	-	-	-	-	-	-	-	1.1	-	1.1	1.1	
		Duration %	-	-	-	-	-	-	-	-	-	0.4	-	0.1	<0.1	
	SPOON	Frequency	1	-	-	4	-	-	-	-	1	1	5	2	7	
		Duration (s)	1.0	-	-	5.5	-	-	-	-	3.8	3.2	6.5	7.0	13.5	
		Duration %	1.0	-	-	2.0	-	-	-	-	1.3	1.8	0.7	0.6	0.7	
Wipe infant's clothes/hands with cloth/bib/finger	PIECE	Frequency	-	-	-	-	-	-	1	-	-	-	-	1	1	
		Duration (s)	-	-	-	-	-	-	4.2	-	-	-	-	4.2	4.2	
		Duration %	-	-	-	-	-	-	2.2	-	-	-	-	0.3	0.2	
	SPOON	Frequency	-	-	-	4	-	-	-	-	-	-	-	4	-	4
		Duration (s)	-	-	-	10.7	-	-	-	-	-	-	-	10.7	-	10.7
		Duration %	-	-	-	3.9	-	-	-	-	-	-	-	1.2	-	0.5

Behaviours grouped by key themes

The following tables show the total incidence and duration of all the behaviours identified within the three key themes of exploratory, avoidant and controlling behaviour.

Note: The cumulative duration (Cum Dur) of grouped behaviours can be greater than the total time available because of co-occurrence. The cumulative percentage duration (Cum Dur %) may therefore be greater than 100. Any percentage duration (Any Dur %) absorbs such overlap and is a true percentage of the time for which behaviours in each theme were displayed.

THEME			INFANT										GROUP		
			Piece-first Infants (PFI)					Spoon-first Infants (SFI)					PFI	SFI	All
Behaviour	Event	Incidence	A	C	G	H	K	B	D	E	F	J			
Total exploratory behaviour (infant)	PIECE	Frequency	81	62	77	79	31	56	72	72	101	68	330	369	699
		Cum Dur (s)	456.7	280.3	220.5	305.1	239.9	251.9	162.6	212.3	236.6	254.3	1502.5	1117.7	2620.2
		Cum Dur %	168.0	118.5	92.1	110.4	117.5	89.2	85.4	82.9	96.1	89.7	122.3	88.8	105.4
		Any Dur (s)	253.9	171.9	173.6	198.8	127.4	233.3	105.7	179.7	190.1	209.5	925.6	918.3	1843.9
		Any Dur %	93.4	72.7	72.5	71.9	62.4	82.6	55.5	70.1	77.2	73.9	75.3	73.0	74.1
	SPOON	Frequency	4	52	57	4	9	11	80	49	29	2	126	171	297
		Cum Dur (s)	4.4	119.7	170.1	4.1	11.5	22.4	215.7	180.9	49.1	3.5	309.8	471.6	781.4
		Cum Dur %	4.2	61.6	67.6	1.5	11.6	15.3	90.1	73.2	17.2	2.0	33.4	43.0	38.6
		Any Dur (s)	3.4	73.4	128.7	4.1	10.6	18.6	133.7	141.3	45.7	3.5	220.2	342.8	563.0
		Any Dur %	3.3	37.8	51.1	1.5	10.7	12.7	55.8	57.2	16.0	2.0	23.8	31.3	27.8

THEME			INFANT										GROUP		
			Piece-first Infants (PFI)					Spoon-first Infants (SFI)					PFI	SFI	All
Behaviour	Event	Incidence	A	C	G	H	K	B	D	E	F	J			
Total avoidant behaviour (infant)	PIECE	Frequency	-	2	6	-	2	13	5	18	16	3	10	55	65
		Cum Dur (s)	-	0.8	15.6	-	3.0	79.9	12.2	37.9	34.9	3.9	19.4	168.8	188.2
		Cum Dur %	-	0.3	6.5	-	1.5	28.3	6.4	14.8	14.2	1.4	1.6	13.4	7.6
		Any Dur (s)	-	0.8	15.6	-	2.0	78.7	6.7	32.4	23.8	3.9	18.4	145.5	163.9
		Any Dur %	-	0.3	6.5	-	1.0	27.9	3.5	12.6	9.7	1.4	1.5	11.6	6.6
	SPOON	Frequency	62	35	38	97	41	65	5	29	191	96	273	387	660
		Cum Dur (s)	160.4	68.9	116.9	397.2	125.6	227.3	6.4	56.9	475.3	269.5	869.0	1035.4	1904.4
		Cum Dur %	153.9	35.5	46.4	143.5	126.5	155.4	2.7	23.0	166.4	151.2	93.8	94.4	94.1
		Any Dur (s)	88.2	50.3	97.2	206.0	69.8	116.6	6.4	50.4	234.9	131.1	511.5	539.4	1050.9
		Any Dur %	84.6	25.9	38.6	74.4	70.3	79.7	2.7	20.4	82.2	73.6	55.2	49.2	51.9
Total controlling behaviour (mother)	PIECE	Frequency	-	2	-	2	5	-	2	1	-	6	9	9	18
		Cum Dur (s)	-	4.8	-	4.4	48.5	-	4.7	4.0	-	20.2	57.7	28.9	86.6
		Cum Dur %	-	2.0	-	1.6	23.8	-	2.5	1.6	-	7.1	4.7	2.3	7.6
		Any Dur (s)	-	4.8	-	4.4	48.5	-	4.7	4.0	-	20.2	57.7	28.9	86.6
		Any Dur %	-	2.0	-	1.6	23.8	-	2.5	1.6	-	7.1	4.7	2.3	3.5
	SPOON	Frequency	22	22	24	62	28	43	22	29	68	57	158	219	377
		Cum Dur (s)	50.7	62.9	115.9	185.3	55.2	229.5	51.8	82.3	221.9	111.8	470.0	697.3	1167.3
		Cum Dur %	48.7	32.4	46.0	66.9	55.6	156.9	21.6	33.3	77.7	62.7	50.7	63.6	57.7
		Any Dur (s)	50.7	62.9	115.9	176.2	51.9	143.4	49.4	82.2	215.7	111.6	457.6	602.3	1059.9
		Any Dur %	48.7	32.4	46.0	63.7	52.3	98.0	20.6	33.3	75.5	62.6	49.4	54.9	52.4

Examples of transcripts of Interview #2

At Interview #2 the parent was asked to comment, in real time, on the audio/video-recording of their infant's first encounter with food. When the recording ended the parent was invited to offer any additional comments and prompted to say what they had taken away from being part of the study. These interviews had a more narrative feel to them than Interviews #1, and could be linked to specific segments of the audio/video-recording; the transcription therefore did not need to be as detailed. Two example transcripts are presented, with the order of the two formats, piece and purée, indicated within each.

Interview #2 Mother of Infant F

Spoon/purée

He's desperately trying to hold the spoon, isn't he? He's ... He doesn't look very happy about that. It's whether he's trying to hold the spoon or push the spoon away. Hmm, funny little expression here. He's pulling a face that's, sort of, he's not sure what's going on, I don't think. He's not ... [*Researcher: Are you holding his arm there?*] No – I think I was pushing the towel back in, wasn't I, because just then he'd thrust his hips up. Yeah, he's come back again – yeah. It's almost like he's trying to escape from the situation. He doesn't really know what's going on. And he's not really engaging with the spoon at all – he's either trying to grab hold of it or turn his head away from it. Mmm – he doesn't look very happy about it. But again – you see – he just looks ... He doesn't know what's going on. He's turning his head away from it and he wants to grab the spoon. [*Researcher: Why?*] Whether he wants to feel it, to investigate it more himself? Again, perhaps it's because – similar to my experience with the spoon coming towards my face – again, for him that's a very un- ... he's never had that before and it was possibly a defensive action.

Piece

He looks a lot more interested and engaged and in ... whereas with the spoon he was almost trying to get hold of it and control it, he's feeling it and brushing it against his face, so he'll be smelling it and, although he's not actually eating it, he's tasting it, isn't he? And his facial expression is a lot more – I wouldn't say happier, but more relaxed, whereas before he was almost defensive, you know. But there he's, "I've got a bit of broccoli and I'm having a look at it". And he looks completely relaxed and comfortable and interested. And, yeah, engaged with it. He's quite ... he wants to look at it, you know. He's not just ... he's feeling it

with his hands, he's putting it against his face. So, presumably, he's exploring it with ... well, he's obviously smelling it because he's bringing it up to his nose and mouth, so he's smelling, tasting and feeling. So he's engaging all those senses, isn't he, as well as looking. The visual appears to be quite important to him because he's definitely looking at it. That was quite a nifty little move, wasn't it? That was , er ...! He seems to be licking or brushing the bobbly bits with his mouth.

Additional comments

I think that the experience I had with the spoon coming towards me, feeling that was quite threatening, I think the expression on his face when the spoon was coming towards him was ... he wasn't obviously threatened but he looked confused and not comfortable with the situation. And he wanted to take control of the spoon. He was definitely grabbing it and turning his head away from it. Whereas with the florets he appeared interested and engaged, and he was able to pick it up and he was exploring, which he wasn't really doing with the spoon at all. He was more confused and trying to ... not escape it but to not engage with it, rather than fully engage with it – which is how I felt, really. It was more pleasant to be able to pick the broccoli up myself.

Interview #2 Mother of Infant H

Piece

She didn't take it off me but when I ... Oh no, she is taking it off me now. She wants to pick it up, more. Straight into her mouth. It looks like she's munching straight away. She looks really pleased because it's really easy for her to hold, actually – easier than a lot of her other things now, we've offered. It looks like she's bitten a bit off there. She's looking at it, like, "Wow! What's this?" Fascinated. She's coming back for some more. And licking it – putting it right on her tongue and munching it. Looking at me now, as she's doing it. And it's fallen out. I've given her another bit, 'cos it fell off. And it's straight back in the mouth! She's pulling a face – I don't really know – maybe just to say, "This is new". Oh, she's actually bitten a bit off. And it's fallen out her mouth. She's making some excited noises. And waving it about. Reaching for another bit. Seems to be, like, quite happy noises. Looking at it now – really taking in what it looks like and what it feels like. And it looks like she's broken a bit off with her hand. And that's gone straight into her mouth – again! And she's lost it. She's still going. Just keeps wanting to put it in her mouth. Every time she gets a big bit in her mouth she pulls a face, 'cos I think she's used to putting things in her mouth but not them actually staying there, like, that big stuff. Pulling different faces again. And little tiny bits look like they're coming out. Another little bit. It looks like she can bite it off but she can't, kind of,

swallow chunks of it. But I think the tiny little bits are being swallowed. It's just like she's playing, but it just so happens it's different to other toys she's had. And it's very messy.

Spoon/purée

She's making really happy noises [as spoon approaches]. And I've given her the spoon, and I'm trying to put it in her mouth but her mouth's just staying open. And she's trying to take the spoon in her hand. Oh, and she's gagging. It just looked like it touched the front of her tongue but it really caused her to gag a lot. And now look – she's gone bright, really red. And I get really worried – and surprised 'cos I thought ... I didn't really expect that at all. It looked like what just came out her mouth was the purée – you can tell that quite clearly. It looks like there's been a little bit in her mouth, possibly – can't be quite sure. I'm saying I feel worried 'cos I didn't really like her reaction to that. Even though I know, really, that it's okay, it still doesn't feel right. I know in theory it's just a safety thing, something just doesn't feel right. So, her head is turning away and I'm taking the spoon with it, which ... she's saying, "I don't want it in my mouth" and I'm kind of forcing it in. Should've ... So, I'm pulling the spoon up to try and get it into her mouth, because she's not taking it off the spoon and I don't know how to get it in. So I'm sort of trying to wipe it on top of her teeth or top gum. Now she's kind of munching it a bit, so there must be, I think, a little bit in there – yeah, there's a little bit in there. And she's gagging again. Looks like she's going to be sick! She's looking down, I'm trying to offer her more ... I can't see her mouth 'cos I'm covering it with my hand. Turning her head away again – and I'm going round the side to try and get it in! And I've got a little bit more in again. She's not looking at me – no eye contact. She's looking at the spoon. Sort of fidgeting and turning to the side. Still can't get any in unless I scrape it on her top gum and top lip. And she's gagging again. And she's looking down. I don't really feel like she's engaging with me at all. She's very quiet. And now I can see that there's still some in there and yet I'm trying to give her more, which, I haven't even given her a chance to swallow what she's got. I couldn't see it from where I was there but now I can see it from this video, and the angle of the video. So, if I could have seen that was in there or something, I'd have given her some more [time]. I've put too much in there and she's gone bright red.

Additional comments

I think one thing that really stood out to me was when I saw it from the angle of the video camera. I could see, with the spoon feeding, that there was some in her mouth, which I didn't realise from where I was sitting. And so I'd kept putting more in, which was obviously making the gagging worse, 'cos I'm thinking, "I need to feed her, I have to feed her". So now, having seen that, if I did that again I'd be more aware of maybe what was in her mouth. But at least when she did it with the whole pieces she was in control of that, and, to me, that

just made me feel more comfortable. And ever since that first day I haven't spoon fed her anything. I think, when she starts to want to take a spoon, I would help her, but I'm not going to do it until she's ready. And that experience did really, really, put me off, actually – more than I'd expected.